How to Prioritize Pathologies to Integrate a Value-Based Healthcare Program?
The Collaborative Value Modelling Approach

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Declaration

I declare that this document is an original work of my own authorship and that it fulfils all the requirements of the Code of Conduct and Good Practises of the University of Lisbon.

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The work presented in this thesis was performed at José de Mello Saúde, during the period March 2019- July 2019, under the supervision of Eng. João Leal. The thesis was co-supervised at Instituto Superior Técnico by Prof. Carlos Bana e Costa and Prof. Ana Vieira.

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Abstract

Well defined criteria are critical for making complex decisions such as those to prioritise the pathologies to be covered by a Value-Based Healthcare (VBH) program in a hospital context. 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’ organisations, but also those outside them. This master thesis implements the Collaborative Value Modelling (CVM) framework to identify a set of criteria that will later allow building a requisite multicriteria model to prioritise the pathologies to be covered by a VBH program in a hospital context. The CVM enhances multicriteria Decision Conferencing (DC) with an ex-ante Web-Delphi participatory process in order to involve and support a potentially large and diverse number of stakeholders building a widely informed multicriteria model. José de Mello Saúde provided the context for the study, for which we targeted two specific objectives: the technical objective of developing a model of values that synthesises the multiple perspectives around the relevancy of a set of criteria; and the social objective of aligning stakeholders from the Portuguese healthcare market around the set of criteria under consideration. The first component of the study was the selection of the groups of stakeholders identified as having an essential role in the decision-making process at hand. Stakeholders’ groups included in this 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 researchers. The second component of the study departed from the selection of the stakeholders and involved them in a Delphi process. The Delphi process was designed to include an open first round, where participants were invited to add aspects to a pre-determined list of potential criteria. Twenty-eight VBH stakeholders completed this first round, with 17 aspects being proposed for further consideration. The same group of participants then assessed the relevancy of both the initial and the selected proposed criteria in two subsequent Delphi rounds. Once concluded the Delphi process, a total of 18 aspects (64%) reached group agreement, one aspect (4%) was rejected, and the remaining nine 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. The set of criteria identified can align healthcare providers’ strategy with the interests of the remaining players of the VBH market. Each stakeholder shall take a strategic role that is aligned with others, as it is expected that the broadness of the concept and framework of VBH promotes the discussion around results and what matters most to patients.

Keywords: Value-Based Healthcare; Prioritization; Pathologies; Stakeholders; Alignment; Collaborative Value Modelling Framework; Delphi process; Decision Conference
Resumo

Critérios de avaliação bem definidos são críticos para a tomada de decisões complexas, tais como as que priorizam as patologias a serem integradas num programa de Value-Based Healthcare (VBH) em contexto hospitalar. No entanto, a revisão da literatura mostra que a seleção de critérios para este contexto não foi ainda significativamente explorada. Além disso, o sistema VBH como sistema de prestação de serviços de saúde envolve um grande número de stakeholders, havendo assim a necessidade de considerar perspectivas e valores não apenas provenientes da própria entidade prestadora de cuidados de saúde, mas também de fora dela. O presente estudo implementa a estrutura CVM (Collaborative Value Modelling) para identificar um conjunto de critérios que permitirão posteriormente a construção de um modelo multicritério para priorizar patologias a serem cobertas por um programa de VBH em contexto hospitalar. Esta estrutura aprimora uma conferência de decisão multicritério com um anterior processo Web-Delphi, pretendendo envolver e apoiar um número potencialmente grande e diversificado de stakeholders na construção de um modelo multicritério amplamente informado. A José de Mello Saúde (JMS) forneceu o contexto do estudo, para o qual definimos dois objetivos específicos: o objetivo técnico de desenvolver um modelo de valores que sintetize as múltiplas perspectivas em torno da relevância de um conjunto de critérios; e o objetivo social de alinhar os stakeholders do mercado de saúde português em torno do conjunto de critérios em consideração. O primeiro componente do estudo foi a seleção dos grupos de stakeholders identificados como tendo um papel essencial no processo de tomada da decisão em questão. Os grupos incluídos neste estudo foram: profissionais de saúde - incluindo médicos, enfermeiros e técnicos; setor de tecnologia da saúde; associações de pacientes; gestores e administradores hospitalares; companhias de seguros; gestores de informação clínica; académicos e investigadores. O segundo componente do estudo partiu da seleção destes grupos e envolveu os stakeholders num process Delphi, projetado para incluir uma primeira ronda aberta, na qual os participantes foram convidados a adicionar aspectos a uma lista pré-determinada de potenciais critérios. 28 stakeholders VBH completaram a primeira ronda, com 17 aspectos propostos para posterior análise. O mesmo grupo de participantes avaliou a relevância dos critérios, tanto iniciais como propostos, em duas rondas Delphi subsequentes. Uma vez concluído o processo, 18 aspectos (64%) chegaram a um acordo de grupo, um aspecto (4%) foi rejeitado e os nove aspectos restantes (32%) não chegaram a acordo. Por fim, um especialista validou os resultados obtidos e reduziu a lista para que um número necessário de critérios possa diferenciar as patologias da integrar um programa de VBH, dando origem a uma árvore de valor de 14 critérios.

O conjunto de critérios identificados pretende alinhar a estratégia dos prestadores de cuidados de saúde com os interesses dos demais stakeholders do mercado de VBH. Cada stakeholder deve assumir um papel estratégico alinhado com os restantes, sendo esperado que a amplitude do conceito e da estrutura do VBH promova a discussão sobre o que é mais importante para os paciente.

Palavras-chave: Value-Based Healthcare, Priorização, Patologias, Stakeholders, alinhamento; Collaborative Value Modelling, Processo Delphi, Conferência de Decisão
Índice

Acknowledgements ...................................................................................................................... vi 
Abstract ..................................................................................................................................... vii 
Resumo ....................................................................................................................................... viii 
List of Figures ............................................................................................................................ xiii 
List of Tables .............................................................................................................................. xv 
List of Acronyms ......................................................................................................................... xvi 

1. Introduction ............................................................................................................................ 1 
  1.1 Context ................................................................................................................................. 1 
  1.2 Motivation ............................................................................................................................. 2 
    1.2.1 José de Mello Saúde case-study .................................................................................... 2 
  1.3 Objectives and methodology ............................................................................................... 4 
  1.4 Thesis Outline ....................................................................................................................... 5 

2. Background Concepts and Literature Review .......................................................................... 5 
  2.1 The Value-Based Healthcare approach ............................................................................... 5 
  2.2 Stakeholder Identification .................................................................................................... 13 
  2.3 Multiple Criteria Decision Analysis Overview .................................................................... 14 
    2.3.1 Problem Identification and Structuring ........................................................................ 16 
    2.3.2 Model Building ............................................................................................................. 16 
      2.3.2.1 Model Structuring ............................................................................................... 17 
  2.4 The Collaborative Value Modelling Framework ................................................................ 19 
  2.5 Participatory processes ....................................................................................................... 20 
    2.5.1 Delphi Method .............................................................................................................. 21 
    2.5.2 Decision conference ..................................................................................................... 23 
  2.6 Summary .............................................................................................................................. 23 

3. Methodological Approach ...................................................................................................... 24 
  3.1 Methodological Overview .................................................................................................... 24 
  3.2 Phase 1: Process Design ..................................................................................................... 25 
  3.3 Phase 2: Web-Delphi ........................................................................................................... 26
3.4 Phase 3: Multicriteria Decision Conference ....................................................... 31

4. Application of the methodology ........................................................................ 32

4.1 Phase 1: Process Design .................................................................................... 32
   4.1.1 Defining the evaluation problem ................................................................... 32
   4.1.2 Identifying stakeholders .............................................................................. 33
   4.1.3 Defining a facilitation team ......................................................................... 34

4.2 Phase 2: Web-Delphi ....................................................................................... 36
   4.2.1 Web-Delphi round one ................................................................................ 36
      4.2.1.1 Design ........................................................................................................ 36
      4.2.1.2 Implementation ......................................................................................... 42
   4.2.2 Web-Delphi rounds two and three ................................................................. 52
      4.2.2.1 Design ........................................................................................................ 52
      4.2.2.2 Implementation ......................................................................................... 53
   4.2.3 Web-Delphi summary results ...................................................................... 60

5. Discussion ......................................................................................................... 66

5.1 Interpretation of the main findings and contributions for the VBH context in
    Portugal ............................................................................................................... 66

5.2 Strengths and Limitations ................................................................................. 68

5.3 Conclusions and Future Work .......................................................................... 69

References ............................................................................................................. 70

Appendices ............................................................................................................. 75

Appendix A- Examples of Delphi applications in healthcare field ......................... 75
Appendix B- Review of some MCDA studies in Healthcare ..................................... 76
Appendix C- Review of some studies which used participatory methods .................. 77
Appendix D- 1st round invitation e-mail template ..................................................... 78
Appendix E- Web-Delphi 1st round screens ............................................................. 79
Appendix F- 2nd round invitation e-mail template ..................................................... 85
Appendix G- 2nd round results ................................................................................ 86
Appendix H- 3rd round invitation e-mail template ..................................................... 88
Appendix I- Web-Delphi 3rd round screens ............................................................. 89
Appendix J- Final results ......................................................................................... 90
Appendix K- Comments provided by the participants ................................................. 92
List of Figures

Figure 1.1: JMS VBH program timeline (adapted from: Relatório da Qualidade e Segurança Clínica, JMS, 2018) .........................................................................................................................3

Figure 2.1: VBH equation ........................................................................................................6

Figure 2.2: Exponential growth of VBH related publications (source: Harvard Business School, 2018). ..........................................................................................................................6

Figure 2.3: The strategic agenda (source: Porter & Lee, 2013) .....................................................7

Figure 2.4: The MCDA process (adapted from: Belton & Stewart, 2002; Bana e Costa et al., 2008; Vieira et al., 2019) ..................................................................................................................15

Figure 3.1: Overview of the proposed methodology illustrating the relationship between the CVM framework and the structuring activities ..................................................................................25

Figure 3.2: Post-first round analysis flowchart ...........................................................................28

Figure 3.3: 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. ............................................................................................................30

Figure 3.4: Web-Delphi post-assessment steps ............................................................................30

Figure 4.1: Generalized VBH implementation model ..................................................................35

Figure 4.2: Web-Delphi 1st round main screen .........................................................................43

Figure 4.3: Distribution of the sex of the participants (left); distribution of participants age (right). 44

Figure 4.4: Participants experience in VBH (left); Opinions of the participants regarding the influence that VBH can assume in Portuguese healthcare market (right). .........................................................45

Figure 4.5: Distribution of proposed aspects by VBH stakeholder group ...................................49

Figure 4.6: Experience in VBH of participants that have proposed new aspects .......................49

Figure 4.7: Web-Delphi 2nd round main screen .........................................................................53

Figure 4.8: Third round participants experience in VBH (left); VBH Stakeholder groups represented in the third round (right) .......................................................................................................57

Figure 4.9: Modifications in responses from round 2 to round 3 .............................................58

Figure 4.10: Number of comments by aspect ..........................................................................59

Figure 4.11: Absolute distribution of answers by likert scale level, discriminated by VBH stakeholder group, on the Burden of the pathology aspect .................................................................61

Figure 4.12: Absolute distribution of answers by likert scale level, discriminated by VBH stakeholder group, on the Burden of PROMs instrument associated with the pathology aspect .................61
Figure 4.13: Flowchart of the analysis on the list of aspects after the Web-Delphi process ............64

Figure 4.14: Value-tree created using the M-MACBETH software......................................................65
List of Tables

Table 2.1: The wide range of Delphi types (Source: Keeney et al [62]). ..................................................22

Table 4.1: Proposed aspects and corresponding reasons for including ..............................................................37

Table 4.2: The 17 proposed aspects and corresponding descriptions provided in the platform to participants in the first Web-Delphi round ..................................................................................................................40

Table 4.3: Distribution of the respondents’ field of studies .........................................................................................44

Table 4.4: Distribution of the respondents’ occupation .................................................................................................44

Table 4.5: Summary of the new proposed aspects and correspondent option for inclusion/exclusion ............................46

Table 4.6: New aspects and the corresponding descriptions .........................................................................................50

Table 4.7: Quantitative, percentual results at the end of the third Web-Delphi round ....................................................55

Table A.1: Some examples of studies which applied the Delphi method application in the healthcare research field .............................................................................................................................................75
# List of Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CROs</td>
<td>Clinical Report Outcomes</td>
</tr>
<tr>
<td>CSH</td>
<td>Critical Systems Heuristics</td>
</tr>
<tr>
<td>CVM</td>
<td>Collaborative Value Modelling</td>
</tr>
<tr>
<td>DALY</td>
<td>Disability Adjusted Life Year</td>
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<tr>
<td>DC</td>
<td>Decision Conferencing</td>
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<tr>
<td>DM</td>
<td>Decision Maker</td>
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<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>ICHOM</td>
<td>International Consortium for Health Outcomes Measurement</td>
</tr>
<tr>
<td>IPU</td>
<td>Integrated Practice Units</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>JMS</td>
<td>José de Mello Saúde</td>
</tr>
<tr>
<td>MCDA</td>
<td>Multi-Criteria Decision Analysis</td>
</tr>
<tr>
<td>OECD</td>
<td>Organização para a Cooperação e Desenvolvimento Econômico ou Económico</td>
</tr>
<tr>
<td>PREMs</td>
<td>Patient-Reported Experience Measures</td>
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<tr>
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</tr>
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<tr>
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<td>Value-Based Healthcare</td>
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<td>World Health Organization</td>
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<tr>
<td>YLL</td>
<td>Years of Life Lost</td>
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<tr>
<td>YLD</td>
<td>Years of Life Lived with the Disability</td>
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Chapter 1

1. Introduction

1.1 Context

Lifestyle changes and advances in science are leading to substantial shifts in global population health, with many of the world’s citizens living longer, but also with a higher probability of having chronic conditions. Health systems are feeling the strain on their health budgets caused by an ageing population, a rise in the prevalence of chronic conditions and the acceleration of medical innovations that have increased demand for state-of-the-art treatment. As a result, the share of gross domestic product (GDP) spend on healthcare is increasing in all countries belonging to Organization for Economic Co-operation and Development (OECD), from on average 4.6% of GDP in 1970 to 9.0% of GDP in 2016 [1], expecting to reach 14% by 2060 [2].

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 [3]. New estimates point that between 20 and 40% of total health spending is consumed in ways that do little to improve people’s health [4] and 10% of patients in OECD countries are unnecessarily harmed at the point of care [5]. Given this tendency, European countries have been trying to rebalance with strict cost-containment policies: France and Ireland reduced salaries, Greece implemented policies to cut physician’s wages and fees, and health budgets were reduced in Italy, Spain, Portugal and Ireland [1]. Additionally, providers have some lack of understanding of how much it costs to deliver patient care, lacking the knowledge necessary to improve resource use, reduce delays, and eliminate activities that do not improve outcomes [6]. This lack of understanding, by itself, is a source of escalating costs.

In 2006, Michael Porter and Elizabeth Teisberg’s [7] first introduced the term Value-Based Healthcare (VBH). 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 [7]. Michael Porter [8] states that the only way to, truly, contain costs in healthcare is to improve patients’ outcomes, as achieving and maintaining good health is inherently less costly than dealing with poor health. Later on, Porter and Thomas Lee [9] went further, designating VBH approach as the only strategy that will solve escalating healthcare costs and quality problems.

Thirteen years after VBH first definition, the adoption of this model assumptions in Europe has been piecemeal so far. Furthermore, there are significant variations in the extent to which
European health systems measure patient outcomes, how they define value, and how they choose the metrics used to do so.

1.2 Motivation

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 delivery model, from patients to providers or payers. As such, these strategies should optimally be defined in an as inclusive as possible manner, considering all these multiple parties. However, the later ones often assume very distinct perspectives and objectives, given their different roles or positions in the healthcare delivery system.

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. MCDA techniques improve the decision-making process, by providing clarity on which criteria are relevant, the importance attached to each, and how to use this information in a framework for assessing the available alternatives. 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. Hence, in such a large and diverse stakeholder environment like the one verified in the healthcare sector, some frameworks become useful to capture the consequent wide range of values and perspectives. Within such a complex environment, the CVM (Collaborative Value Modelling) framework [10] come into sight as a tool to build widely informed multicriteria evaluation models.

It becomes intuitive that an innovative healthcare delivery model, like the VBH approach, has its implementation process involved in a multistakeholder environment. Conflicts over organizing principles and structures have been found to form obstacles to implementing management innovations [11]. Hence, it has become clear the importance of management, extensive education in the new improvement before implementation, and a systematic implementation approach in order to succeed [12]. Additionally, involving a multidisciplinary team in healthcare decisions assures not just that all legitimate interests take part and that more useful and relevant evaluation information is provided, but also ensures better political buy-in to improve the impact of the emerging management model [13].

1.2.1 José de Mello Saúde case-study

José de Mello Saúde (JMS) is a Portuguese private group of healthcare provision founded in 1945. Currently the biggest private healthcare provider, JMS operates through a network of seven CUF hospitals, 10 CUF outpatient clinics and two semi-private hospitals, performing a total of 19 health units widely dispersed across the country [14]. JMS assumes a market position defined by
five elements: differentiating clinical projects, patient’s irreprehensible experience, consistent and efficient operation, growth agendas capable of generating value and investment on human talent. JMS launched the VBH program in 2015, presenting it as one of the group differentiating clinical projects [15]. The implementation of the program started in patients who needed cataract surgery, in Hospital CUF Descobertas; in 2018, the group has consolidated health value monitoring processes across a wide range of pathologies [15]. The activities of the VBH program involve the administration of PROMs (Patient Reported Outcomes Measurement) forms, the administration of clinical forms to be filled by clinicians, the design of patient and clinical pathways, the development of web registry platforms, detailed data processing and analysis, and production of follow-up reports to monitor all activity. All these activities had been involving several participants that integrate one of the two program teams: the VBH team and the clinical team. The VBH team is composed by the project lead, the project manager, four non-clinical health technicians and one administrative assistant and is responsible for the back-office activity of the program, which includes all tasks except for those that require the direct contact with JMS clients. The clinical team includes more than one doctor, one clinical lead and one production manager. Additionally, most of the times, the team also includes nurses and/or clinical health technicians. The clinical team executes the front-office tasks, which includes the administration of PROMs to the clients, filing of clinical forms and clinical validation of the clinical and patients’ pathways.

According to the last available integrated report, the VBH program is operating in six hospitals, involving 11 multi-disciplinary teams, nine pathologies and more than 3750 patients [15]. Figure 1.1 illustrates the timeline of the VBH program of JMS from 2015 to 2018.

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 into the VBH program over the next three to five years. These 13 medical conditions were chosen based on three factors, defined by the clinical board: firstly, the volume of JMS clients diagnosed with a given medical condition; secondly the availability of ICHOM
standard set; thirdly the level of alignment with the clinical differentiating project strategic element of JMS [16]. However, the group have now identified the need for developing a standardised implementation approach for VBH model. JMS also identified the need that such an approach includes a tool to prioritise pathologies to be included in VBH model within their hospitals. Indeed, despite the widespread acceptance of VBH approach, its adoption and implementation are gradual, and the group stated the impracticality to apply VBH strategies to all pathologies at the same time, mainly because of its novelty and associated uncertainty. Nevertheless, on what evaluation aspects should JMS base itself to choose one pathology over another? How can one get to an informed decision?

There is currently no literature regarding relevant evaluation aspects that one should follow during a prioritising process for VBH implementation. JMS has conducted a previous study [16] which aimed to construct a multicriteria model to prioritise pathologies. However, the group found it necessary to re-explore the topic, asking for a more inclusive approach in the evaluation selection process to include a broad set of stakeholders.

1.3 Objectives and methodology

The overall objective of this master thesis is to involve and support healthcare stakeholders in identifying a set of evaluation aspects. Once validated, these evaluation aspects will be the criteria to be included in a requisite multicriteria model to guide the prioritisation process of pathologies to be covered by the VBH plan at JMS. It is our ambition that the set of criteria reflects the broad perspective of healthcare stakeholders in Portugal, and can, therefore, be applied to hospitals besides the ones of JMS group. The CVM framework was selected for this objective as it allows the involvement in model building activities of a large and multidisciplinary group of stakeholders [10][10][10]. Under a unique collaborative learning and constructivist paradigm, the CVM allows to meet the technical objective of developing a model of values that synthesises the multiple perspectives around a set of criteria; and, the social objective of aligning stakeholders around the set of criteria under consideration. Furthermore, we expect that by involving healthcare stakeholders, we will increase the dissemination and uptake of these results [17].

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 (later called VBH stakeholders);
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 VBH 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 multicriteria decision conferencing (DC) process with a strategic group of experts to 1) validate objective 4 and 2) conclude model structuring.

1.4 Thesis Outline

This master thesis is organized as follows: Chapter 2 explores key notions for the overall comprehension of the problem and concepts involved in this thesis. Namely, it includes the theoretical foundations of VBH approach and its strategic agenda, alongside with some applications; stakeholder concept and identification techniques; an MCDA overview; and finally the exploration of the available participatory methods, focusing on the Delphi method and DC. Chapter 3 provides an overview of the proposed methodology and details each of its steps. Chapter 4 documents how the proposed methodology was applied for the present research, alongside with the main results. These results are further discussed in Chapter 5, critically reflecting on the main findings and pointing on the main achievements and limitations of the work conducted. Additionally, Chapter 5 also outlines the main conclusions and future work suggestions.

Chapter 2

2. Background Concepts and Literature Review

This section explores key concepts for the overall comprehension of this master thesis. In the first section, the VBH concept and its strategic agenda will be explored. Because one of the primary goals of this master thesis participatory process is to be as inclusive as possible, section 2.2 focuses on stakeholder identification. Section 2.3 provides an MCDA overview, presenting it as a tool to support decision making in multiple stakeholder environment. In section 2.4, participatory methods will be reviewed, focusing on the Delphi method and DC. Section 2.5 introduces the CVM framework as a possible solution to deal with the complexity arising from a very complex stakeholder environment and section 2.6 provides a summary of the whole chapter and illustrates how the covered concepts apply in this master thesis context.

2.1 The Value-Based Healthcare approach

Healthcare institutions are continuously challenged by balancing economic requirements against individual patients’ preferences and needs. Costs are rising, diagnosis errors and preventable treatment errors are common, there is the overuse of care in some services, and standards of care often lag and fail to follow accepted benchmarks [7]. For professors Michael Porter and Elizabeth Teisberg, the root of the problem is straightforward: the competition in the health care
system takes place at the wrong levels and is not centred on increasing value for patients [7]. Accordingly, realign competition with value for patients by organising healthcare delivery system around the medical conditions and measuring the outcomes that matter to patients and the costs to achieve them - is the way to transform health care.

Value-Based Healthcare concept emerged based on these ideas. Its formal definition arises from the ratio between the health outcomes relevant to the patient's quality of life and the costs associated with the treatment cycle that are required to achieve those outcomes. Figure 2.1 illustrates the model value equation.

Value = \frac{Health\ Outcome}{Dollar\ of\ Cost}

Following the introduction of VBH concept, there has been worldwide interest in the topic from all sectors of the health care industry, being today an essential topic in health care transformation. Illustrating model noteworthiness, the number of peer-reviewed publications addressing value-based health care has increased exponentially, as Figure 2.2 illustrates.

Figure 2.1: VBH equation

Figure 2.2: Exponential growth of VBH related publications (source: Harvard Business School, 2018).
Michael Porter named the current competition in health systems as a “zero-sum competition”, based on shifting costs between the involved stakeholders, increase each one’s bargaining power, and restricting services in order to reduce costs; additionally, delivered health services are rewarded either if they deliver value for the patient or not [7]. On the other hand, the value-based competition proposed by Porter and Teisberg is based on eight main principles [7]:

1. The focus should be on value for patients, not just lowering costs;
2. There must be unrestricted competition based on results;
3. Competition should centre on medical conditions over the full cycle of care;
4. High-quality care should be less costly;
5. Value is driven by provider experience, scale, and learning at the medical condition level
6. Competition should be regional and national, not just local;
7. Information on results and prices needed for value-based competition must be widely available.
8. Innovations that increase value must be strongly rewarded

To move from a zero-sum to a value-based competition, healthcare leaders need to restructure how healthcare delivery is organized, measured and reimbursed. Porter and Lee [9] proposed a strategic agenda that every organization should follow to achieve this value transformation in healthcare. The strategic agenda for moving to a high-value health care delivery system has six components, which are interdependent and mutually reinforcing [9]. Figure 2.3 outlines these components, further detailed.

Figure 2.3: The strategic agenda (source: Porter & Lee, 2013).
1. **Organize into Integrated Practice Units (IPUs)**

An important first step to value transformation is changing the way clinicians are organized to deliver care: the first principle in structuring any organization or business is to organize around the customer and the need. Such centralized structure is called an IPU, characterized by being "organized around the patient and providing the full cycle of care for a medical condition, including patient education, engagement and follow up and encompass inpatient, outpatient and rehabilitative care as well as supporting services"[18, pp.1]. IPUs treat not only a disease but also the related conditions, complications, and circumstances that commonly occur along with it, maximizing the patient’s overall outcomes as efficiently as possible [9], being an approach of restructuring the organization and work processes of multidisciplinary teams to achieve value in healthcare [19].

An example of a successful IPU is the West German Headache Center model. In this approach, neurologists, psychologists or physical therapists evaluate a migraine patient that shows up to the centre. Depending on the evaluation, they refer the patient to one of the following: a primary care physician, hospital inpatient unit, affiliated imaging unit, or affiliated “network” neurologists. Hence, rather than having multiple examinations over some time, the patient can be evaluated and, if necessary, referred to the proper sector immediately. Since all parties are affiliated, the handling of the medical records is much more easily, drastically improving the value to the patient. The results are convincing so far: by restructuring to create an IPU, the West German Headache Center was able to lower their costs in about 20%, with an improvement in symptoms in about 54% of the patients [20]. This success enabled them to expand, opening more centres in other cities and developing new programs in conditions such as vertigo, rheumatoid arthritis, and acute back pain.

As another example, one can take the care for patients with low back pain at Virginia Mason Medical Center. In a first instance, patients are seen by a “spine team” with a physical therapist and a physician who is board-certified in physical medicine and rehabilitation, identifying patients with serious causes of back pain and referring them to a process designed to address the specific diagnosis; other patients will require surgery and will enter a process for that; for most patients, physical therapy is the most effective next intervention, and their treatment often begins the same day. The impact on value has been striking: compared with regional averages, patients at Virginia Mason’s Spine Clinic miss fewer days of work (4.3 versus 9 per episode) and need fewer physical therapy visits (4.4 versus 8.8). Also, the use of magnetic resonance imaging scans to evaluate low back pain has decreased by 23% since the clinic’s launch, in 2005, even as outcomes have improved. Virginia Mason has also increased revenue through increased productivity, rather than depending on more fee-for-service visits to drive revenue from unneeded or duplicative tests and care. The clinic sees about 2,300 new patients per year compared with 1,404 under the old
system, and it does so in the same space and with the same number of staff members. Indeed, better care has lowered costs [9].

2. **Measure outcomes and costs for every patient**

Rapid improvements in any field require measuring results, being that a rigorous measurement of value is perhaps the single most crucial step in improving health care [9]. The outcomes that matter to patients fall into 3 categories [21]:

1. Health status, including functional level, pain level, and ability to work;
2. Care cycle, involving time to begin the treatment, length of hospital stays, infections and need for reoperation;
3. Sustainability of care, involving the ability to live independently;

Medical condition-specific and general Patient-Reported Outcome Measures (PROMs) and patient-reported experience measures (PREMs) had been developed to close this critical knowledge gap. These measures are both reported by patients but capture different insights:

I. PREMs are surveys posed to patients focused on the process of healthcare delivery. They measure and monitor patient's perceptions of their experience of care, involving aspects like the waiting time for the treatment, their involvement in their own health decisions, the opportunity they had to ask questions and the time doctor spent with them during the consultation and easily-understandable explanations.

II. PROMs are surveys posed to patients but instead of being focused on the care process, are focused on the patient's perceptions of their health status and quality of life [2]. PROMs are standardized, validated questionnaires that are completed by patients' during the perioperative period to ascertain perceptions of their health status. These questionnaires are given to patients both pre and post-operatively to allow comparison of outcomes pre and post-procedure, being a means of measuring clinical effectiveness and safety [22].

The Cleveland Clinic was a pioneer in publishing its mortality data on cardiac surgery and subsequently mandating outcomes measurement across the entire organization. Currently, the clinic publishes 14 different “outcomes books” reporting performance in managing a growing number of conditions [9].

As another example, at Dartmouth-Hitchcock's Spine Center, patient scores for pain, physical function, and disability for surgical and nonsurgical treatment at different phases are now published for each type of low back disorder [23]. Locklear [24] summarized a set of programs that incorporates PROMs for both care and research, and Weldring & Smith [25] provides an overview of patients’ involvement in clinical research and healthcare evaluation along with its benefits and limitations.
ICHOM has accelerated the development of a comprehensive and standardized outcome measurement on a global basis, [9] ICHOM is a non-profit organization which was established to promote a transition towards VBH, developing minimum outcome sets by medical condition by bringing together clinical leaders from around the world to develop standard outcome sets, while also gathering and disseminating best practices in outcomes data collection, verification, and reporting [9]. Since 2012, it has developed standardized outcome measurement sets for a range of health conditions. Working with patients, leading providers, and registries to create a global standard for measuring results by a medical condition, it supports one of the key strategic agenda items in VBH framework. The achieved success is outstanding, and to date, there are 28 standard sets published covering different conditions and for specific patient populations.

Regarding costs measurement, time-driven activity-based costing is the most appropriate process to measure healthcare costs [6]. This tool requires mapping each step over the full cycle of care and estimating for each step the time devoted to each patient by medical resources, as well as the capacity and support costs of each resource. This approach enables managers to report their costs on an ongoing basis in a way that reveals both the costs of a business’s activities as well as the time spent on them [26]. Through this method, providers are achieving savings of 25% by identifying cost-saving opportunities such as better capacity utilization [9]. In his publication Introduction to Time-Driven Activity-Based Costing in Healthcare, professor Robert Kaplan details this approach, providing multiple real applications examples.

3. Move to bundle payments for care cycles

Bundled payments is a value-based reimbursement payment approach where a single payment covers the treatment of a patient with a given medical condition over the full cycle of care, including common complications and comorbidities. The payment approach best aligned with value is a bundled payment that covers the full care cycle for acute medical conditions, the overall care for chronic conditions for a defined period (usually a year), or primary and preventive care for a defined patient population [9]. This reimbursement model is argued to improve care delivery by accomplishing the following goals: 1) Improve coordination between hospital and physicians as well as between different care teams; 2) Improve the efficiency of care, thereby reducing spending; 3) Incentivise quality improvement [27]. Hence, bundle payments are “the only approach that aligns providers, payers, and suppliers in a healthy competition to increase patient value” ([6], p.1) allowing them to know the true cost of the delivered care.

Governments, insurers, and health systems in multiple countries are moving to adopt bundled payment approaches. For example, the Stockholm County Council initiated such a program in 2009 for all total hip and knee replacements for relatively healthy patients. In essence, the result was lower costs, higher patient satisfaction, and outcomes improvement [9]. More recently, UnitedHealthcare has launched its ‘Spine and Joint Solution’, a bundled payment program for total hip and knee arthroplasty as well as spine procedures. Within this program, hospital readmissions have decreased by 10% and complication rates by 3.4% among spine surgical
procedures. Moreover, the company's internal analysis shows savings of nearly $15,000 for lumbar spine fusions [28].

4. **Integrate care delivery systems**

As providers distribute services in the care cycle across locations, they must learn to tie together the patient's care across these sites. To achieve true system integration, organizations must grapple with four related sets of choices: defining the scope of services, concentrating volume in fewer locations, choosing the right location for each service line, and integrating care for patients across locations [9]. Integrating mechanisms, such as assigning a single physician team captain for each patient and adopting common scheduling and other protocols, help to ensure the delivery of a well-coordinated, multidisciplinary care in a cost-effective and convenient way [9].

In 2011, Michael Porter and Robert Kaplan [6] suggested a four-step framework to achieve a clinical care integration:

1. Definition of the scope of services each provider can deliver with true excellence, limiting the range of services offered;
2. Concentration of the healthcare services provided by each provider in fewer locations, to guarantee high volume. This step is related to the evidence that exists between volume and value and allow providers with a higher volume of patients with a given medical condition to become significantly experienced in treating that medical condition, achieving better outcomes.
3. Definition of a proper location for each service. Complexity of medical conditions and skills requirements should match with the resource intensity of locations [9].
4. Integration of care for individual patients across several locations, meaning that IPUs should direct care, but recurring services need not take place in a single location.

5. **Expand geographic reach**

Health care delivery remains heavily local, but if value substantially increases on a large scale, superior providers for particular medical conditions need to serve far more patients and extend their reach through the strategic expansion of excellent IPUs [9].

According to Porter and Lee, geographic expansion under VBH principles takes two principal forms: a "hub-and-spoke model" and a clinical affiliation mode. The first one requires that each IPU has a hub that addresses the most complicated medical conditions and has satellite facilities where less complicated care is delivered; In the second one, partnerships between IPUs and community providers promote clinical affiliations, that allows IPUs to use community facilities instead of adding capacity. This is, indeed, a win-win relationship: IPUs sees its brand expanding to more regions and benefits from management fees, while local community providers benefit from the expertise and experience of the IPUs.
6. **Build an enabling information technology platform**

A common IT (Information Technology) platform centred around the patient allows an effective coordination within IPU teams, allowing for data extraction, comparison and reporting.

Michael Porter and Thomas Lee [9] advocates that an IT platform must have six elements:

1. Is centred around patients, with data following the patient across healthcare sites, and over the full life cycle of care;
2. Terminology and data fields are standardized, avoiding misunderstandings;
3. Includes all types of patient data, from physician notes, to images, medicine prescriptions, or lab tests results;
4. The medical record is shared with all the involved parties, so everyone can be fully aware of patient health status;
5. Includes templates for each medical condition that help clinicians identify the next steps and possible risks;
6. Facilitates the information extraction through natural language processing techniques.

To finish, one can refer to a highly successful VBH application. Santeon is a cooperative network of seven top-performing Dutch hospitals which embraced the VBH concept in 2012, among five patient groups: breast cancer, prostate cancer, lung cancer, cerebrovascular accident and hip arthrosis. Implementation in each group consists of four phases:

1. Use a multidisciplinary team to define the right metrics to improve outcomes;
2. Share and learn internally, and then initiate a strict and simultaneous cadence of improvement cycles within the member hospitals, using a benchmarking logic and scorecard outcomes, costs and process indicators;
3. After a few internal cycles to validate and stabilize the process and data, share results externally to accelerate improvements;
4. Engage with patients and payers to move toward value-based contracting involving bundled prices and rewards.

The results are outstanding: in breast cancer patients, Santeon has achieved reductions of nearly 30% in unnecessary inpatient stays and up to 74% in the rate of reoperation due to clinical complications [29]. Key lessons can be learned from this example: 1) medical specialists, patients, and external stakeholders should unite around a shared ambition to create transparency and improve health care outcomes at similar or lower costs; 2) It should be assumed a smooth start with a scorecard based on existing quality standards for a limited number of promising
conditions, and 3) prioritization should be based on clear criteria, beginning with conditions that have clear improvement potential and a fair amount of good data available, with doctors who are enthusiastic or who are already implementing VBH in isolation [29].

Besides being a successful VBH application, it is not public how Santeon prioritizes VBH strategies and which set of criteria they use to decide which is the next medical condition that should be covered by their VBH program. Barnieth [30] discuss the challenges that clinicians face in participating in health care prioritization and outline how they can incorporate the cost of health care and the concept of value for money in their decision making. Rodrigues [16] applied the prioritization process to the VBH context and developed a tool which helps providers to prioritize pathologies to be covered by a VBH plan. However, the study is lacking in inclusiveness since it did not involve a representative set of stakeholders in the model structuring phase. Ten criteria, defined in collaboration with JMS clinical board, were on the basis of the development of the model. However, the main study conclusions set that a revision of criteria had to be done in order to reflect, as accurately as possible, the reality of the healthcare providers.

This literature limitation demands a tool capable of helping providers prioritizing VBH strategies considering all relevant criteria that can influence the prioritization process. Ideally, this tool should be as inclusive as possible and representative of the healthcare market stakeholders’ views and interests. Nevertheless, two questions naturally follow:

- Who to involve in order to ensure representativeness?
- How should this involvement be conducted?

The following two chapters provide some solutions for both questions, based on the theoretical concepts of stakeholder identification (Subchapter 2.2) and MCDA (Subchapter 2.3).

### 2.2 Stakeholder Identification

Complex systems like healthcare affect, and are affected, by many different stakeholders. The healthcare system needs to be aware of these elements and manage them properly, either for effectiveness, legitimacy or ethical reasons [31]. World Health Organization (WHO) highlights the importance of stakeholder engagement, asserting that health policies and strategies are more likely to be effectively implemented if their development and negotiation are inclusive of all stakeholders of the health sector [32].

Within the VBH context, the stakeholder engagement should also be considered when defining the best strategies for the implementation of this emerging delivery model. Aligned with this inclusive perspective, a systematic stakeholder identification is a crucial step to ensure the representativeness that this work needs.

There are many definitions of what is a stakeholder. Freeman [33] provided the most classic definition, stating that a stakeholder is “any group or individual, who can affect or is affected by the achievement of organization’s objectives” ([33], p. 46); Clarkson [34] stated that stakeholders
“have or claim ownership, rights or interests in a corporation and its activities” ([34], p.6). As the identification of all relevant stakeholders is one of the principles of a successful project - and failure in this field may lead to some bias in the following phases of the process [35] - there are currently many different stakeholder identification methods for different organizational management contexts. Bryson [36] presents fifteen different techniques for stakeholder identification, and Luyet [35] summarised the most widely-adopted ones:

- Brainstorming sessions, where the team members all sit together and call out names and groups of stakeholders [35];
- Snowball sampling, where individuals from initial stakeholder categories are interviewed to identify new stakeholder categories and contacts [35];
- Stakeholder maps, which visually represent the various stakeholders and their relevant categories [35].

More recently, Crane & Ruebottom [37] proposed a stakeholder identification technique based on social identity, claiming that stakeholder groups are both socially and economically defined and their model is a cross-mapping of economic roles and social identities. Wu [31] describes another two techniques for stakeholder identification: the Soft System Methodology, based on organization levels and their relationships; and a framework of different categories of potential stakeholders. Tavella [38] proposed the use of the Critical Systems Heuristics (CSH) approach to guide the management of participatory processes in technology assessment and policymaking in agriculture, allowing for stakeholders’ different concerns and values to be included. The CSH approach comprises 12 questions that help address situations in four dimensions: motivation, control, knowledge and legitimacy.

In sum, a wide variety of approaches exist for stakeholder identification and engagement. However, the choice of a specific technique will mainly depend on the project context, the project phase and the available resources [35] [39].

2.3 Multiple Criteria Decision Analysis Overview

A variety of methods have been proposed to support the complex decision-making processes in healthcare, like MCDA. When introducing a new healthcare delivery model like VBH, multiple and conflicting objectives can emerge. In these cases, MCDA assumes particular importance and can be a useful approach to support complex decisions, such as those to prioritise the pathologies to be covered by a VBH program in a hospital context.

Belton and Stewart ([40], p.2) defined MCDA “as “an umbrella term to describe a collection of formal approaches, which seek to take explicit account of multiple criteria in helping individuals or groups explore decisions that matter”. There is a vast range of healthcare decisions to which MCDA might be applied (Appendix B presents some examples of MCDA studies applied to
healthcare), namely benefit-risk assessments, health technology assessments, priority setting frameworks, disease classification, resource allocation and performance measurement [41][42][43]. Several authors have described in detail the main phases of an MCDA process. Figure 2.4 represents the MCDA process based on Bana e Costa et al., Belton and Stewart and Vieira et al. work [44] [40][10], illustrating both the problem identification (in blue) and the model building (in orange) phases.

![MCDA Process Diagram](image)

*Figure 2.4: The MCDA process (adapted from: Belton & Stewart, 2002; Bana e Costa et al., 2008; Vieira et al., 2019).*

Given this master thesis purpose, one will focus this review on problem structuring and model structuring phases.
2.3.1 Problem Identification and Structuring

The first phase in any decision process is the understanding of the broader context and characteristics of the problem. In the problem identification and structuring phase, “the decision context is characterized, the boundaries and scope of the analysis are established, the stakeholders involved and their primary motivations and objectives for the analysis are identified, and the potential options that will constitute the point of application of the analysis are typified” [45, pp.2].

One can state that the driving question in this initial phase is “what is the problem?” [46] and this phase should involve the answer for a set of questions, particularly: [40]

- Which is the key issue and constraints of the decision problem?
- Which is the purpose of the MCDA model to be developed?
- Who are the relevant parties to be considered in the decision problem? and, What is the extent of their desired participation?

Answering these questions will help to define the problem and its scope [40] and have an effect in the subsequent steps. A poorly defined problem often leads to a poorly structured and ill-informed decision. In contrast, a clearly defined problem can lead to a higher level of understanding and a wealth of new information. Some tools are available for this structuring phase. Smith and Shaw [48] provide an exploratory review of Problem Structuring Methods (PSM) characteristics, pointing out some examples of works where PSM built shared understanding and commitment to the problem through several group processes including facilitation [47], participation [46] and stimulating dialogue [49]. Other methods are the CAUSE checklist approach [40]- which considers the Criteria, Uncertainties, Stakeholders and Environment of the decision problem- cognitive mapping or dialogue mapping [47].

Regarding the actors to be involved in the MCDA process, three different parties are commonly identified by assuming important roles: decision-makers (DMs), stakeholders and decision analysts or facilitators [40]. A DM is an individual, group, organization or other decision-making entity responsible for the decision. In contrast, a stakeholder is an individual that may affect and be affected by the outcome of a decision. Lastly, the role of the facilitator is essentially to impartially control and moderate the MCDA process, while encouraging active participation of the other members of the group [40].

2.3.2 Model Building

Following the identification and structuring of the decision problem, the next phase is the model building phase. This phase includes structuring, evaluation and validation phases [44], and aims to build a preliminary representation of a model intended to be used for aid decision-makers [40]. Despite there is a variety of MCDA approaches, they should have in common a set of phases that include the selection of the different options to be part of the decision, the criteria or objectives to
evaluate the performance of the different options and the measures to access the different levels of impact in each criterion [40]. One will organize this chapter according to Bana e Costa et al. [44], which divide the model building phase into three main steps: structuring, evaluation and validating the requisiteness of the model. However, it is worth to mention that only the model structuring phase will be detailed since model evaluation and model validation phases are not in the scope of this work.

### 2.3.2.1 Model Structuring

Angelis and Kanavos [50] define three main phases for the structuring step: 1) structuring a value tree that identifies and represents the key concerns of the decision-maker, 2) defining descriptors of performance that measure the extent to which these objectives are achieved, and 3) selecting decision alternatives. Following these three phases allows for both the definition of the criteria that stakeholders view as fundamental for evaluation purposes and the insurance that those criteria are operational for evaluation purposes, by associating them a descriptor of performance. However, since this work does not aim to set descriptors and performance levels, one will focus this review on the criteria identification phase. As such, only a small revision of descriptors of performance will be provided.

- **Identify criteria**

There is very little research which explores systematic approaches to the identification of relevant criteria. Keeney’s Value-Focused Thinking book (Keeney, 1992) provides structured guidelines for criteria identification, using distinctions between fundamental or means-end objectives [40]. Accordingly, two approaches can be followed: the top-down and the bottom-up approach. A top-down approach tends to be objective led, with a general statement of the overall objectives and expanding these initial values into more detailed concepts. In contrast, a bottom-up approach identifies characteristics that distinguish alternatives, which are grouped to form higher-level objectives. Hence, top-down approaches often generate sets of criteria that are fairly general but may be difficult to relate to a particular alternative, whereas bottom-up approaches produce sets of criteria that are very specifically relevant to the problem at hand [51].

The criteria identification phase can require further refinement of the criteria present in it [40]. Indeed, very “data-rich” environments often lead to a desire on the part of those tasked with deciding to make sure everything is taken into account. The complexity of the decisions and the factors motivating different stakeholders can also lead to a very large set of criteria, which are more “descriptive” of the situation rather than reflecting what matters in the specific context [52]. Even though there is no rule as to how many criteria should be included in an analysis, it is a good practice to have a few criteria as is consistent with making a well-founded decision [51]. Hence, the analyst should consider the trade-off between an increase in validity from a complete

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1 There are several definitions for this concept founded in the literature, such as evaluation criteria, decision criteria or value dimensions. In this work we will refer to this concept simply as criteria in order to avoid misunderstandings.
set of criteria and the potential for reducing the validity of scores as a result of the time and cognitive effort associated with more criteria [51].

Aware of this issue, Braunschweig [53] developed a conceptual framework for identifying criteria with three main phases: 1) criteria generation, 2) evaluation of criteria relevancy and 3) evaluation of criteria applicability. In a first instance, the core team generated the initial list of criteria based on relevant literature and interviews with experts, where it was asked if there were criteria that should be deleted from the list or if there were important criteria lacking. After that, the relevancy of the criteria was evaluated by conduction of a workshop, where criteria “irrelevant, of negligible importance, or that measure the same dimension as other criteria” ([53], p. 727) were excluded. Finally, in the third phase, it was evaluated “the availability of data to apply the criteria”, that is, evaluate if one could measure the criteria. Hence, in this phase, some criteria were eliminated due to lack of data about the alternatives, as “it might be better to remove a criterion from the list rather than use poor or ambiguous indicators” ([53], p. 727). Each phase resulted in a more specific list of criteria. Thus, the main goal of the developed framework is to narrow down a broad list of criteria to the point where a minimum set of criteria can characterize research alternatives, giving rise to a “structured list of criteria for the decision-making process” ([53], p. 727). However, for the authors, further modifications can take place in the subsequent phases of criteria weighting or during the assessment of research alternatives.

As another example, Marttunen et al. [54] demonstrate the importance of using an approach in the early phases of an MCDA process to identify and communicate which of the initially identified criteria are most important to include in the model. This so-called relevancy analysis was developed to support the hierarchy building phase of an MCDA when a large number of criteria is initially identified, and it is desirable to reduce their number for MCDA modelling.

Additionally, one should always guarantee the appropriateness of criteria structuring, which can become a potential weakness of MCDA if this step is not done correctly. When an additive model is applied, criteria should, indeed, obey some requirements [52] [45] [40] summarised as follows:

- **Value relevant** every selected criterion must add value to the model in the decision-maker perspective.
- **Completeness**: the criteria list should capture all the key aspects, considering all important consequences of alternatives and stakeholders concerns in a decision context.
- **Conciseness**: every selected criterion should be brief in form but comprehensive in scope.
- **Non-redundancy**: There must be no double counting or partially overlapping elements in the criteria list, meaning that one selected criterion must not indicate the consequences of another one present in the list.
• **Understandable**: criteria should be understandable by any interested individual, avoiding misinterpretations, conflicts and subsequent undesired outcomes.

• **Operational**: every selected criterion must be defined in such a way that allows measuring the performance of alternatives against each criterion.

• **Preferential independence**: The definition of criteria must ensure that the performance of a particular criterion should not be influenced by the performance of another one when applying an additive model, safeguarding mutual independence.

Finally, the identification process can be hierarchy structured in the form of a value-tree - a visual representation of the identified criteria that decomposes the objective of an evaluation into sub-criteria, organizing them into a hierarchy and clustering them into higher-levels and lower-levels [51].

• **Build descriptors of performance**

After the definition of the criteria, attributes -or descriptors of performance [44 ]- must be defined for each criterion. Commonly defined in the literature as a plausible ordered set of impact levels, a descriptor of performance intends to measure the extent to which a particular criterion is fulfilled by the different options in the model [55]. There are several types of descriptors, divided into three categories depending on their respective nature. Each descriptor is described by one of the elements of each category: quantitative, qualitative or pictorial, depending on if the descriptor uses numerical values, semantic and numerical expressions or visual representations to describe the levels of performance; continuous or discrete, depending on if it allows infinite levels of performance or is represented by finite levels of performance. Direct, indirect or constructed, depending on whether the levels reflect, directly or not, the ends.

2.4 **The Collaborative Value Modelling Framework**

In a multi-stakeholder context, a useful approach would be one that combines two or more participatory approaches, aiming to develop a widely informed multicriteria evaluation model.

With this purpose, Vieira et al. [10] developed the CVM framework which “enhances multicriteria DC with an all-embracing ex-ante Web-Delphi participatory process” ([10], pp.2), to ensure that model building captures the full panoply of views. By creating space for a substantive meaningful and enlarged participation, this socio-technical approach aims to improve the quality of the knowledge construction process. Within this overall goal, two specific objectives can be pointed: the technical objective of developing a model of values that synthesizes the multiple perspectives about the decision problem; and, the social objective of aligning stakeholders around the model under construction.

The proposed framework develops in three main phases:
1. Process design, where the model-building environment for the following phases of the framework is established.

2. Web-Delphi, a knowledge construction process that elicits and analyses individual judgmental knowledge from a broad set of stakeholders. Depending on the purpose, this phase can include a single or multiple Web-Delphi processes.

3. Multi-criteria DC, allowing the digestion of the acquired knowledge by a small group of key-players.

The selection of VBH stakeholders for the Web-Delphi process is typically conducted by purposive sampling. In contrast, the chosen set of VBH stakeholders for the multicriteria DC phase should involve a group of participants representing a diversity of perspectives on the problem at study. Furthermore, the level of engagement varies according to the context and with DM objectives. In some situations, it might be enriching if the key-players were also engaged in the Web-Delphi phase, while in others it may be more useful if the key-players are merely receptors of knowledge ([10], pp.6).

The next subchapter will explore the participation concept and will also detail both the Delphi and Decision Conference methods.

2.5 Participatory processes

As explored previously, MCDA is a structured and transparent method to represent diverse stakeholder perspectives. It can be flexibly used within a range of participatory approaches, forming an essential step in decision making and conflict resolution. Hence, it is important to understand the key concepts of participatory process and their applications. Further to the technical tools used in MCDA, it is critical to design an adequate social process to promote shared understanding around key evaluation issues while capturing multiple stakeholders’ values and perspectives [10]. Hence, this chapter will provide some contextualization regarding participatory processes.

Participation is a very broad concept which has been defined conceptually and operationally in many different ways. Eyben and Ladbury define it as “a process whereby those with a legitimate interest in a project influence decision which affect them” [60, p.192], and according to the Institute of Development Studies, participatory methods include a range of activities with a common threat: involve all participants in the process of collecting information and decision making, in order to reach a compromise when there is a wide variety of opinions. The result is an improvement in the quality of the decision, engaging much more knowledge, experience and expertise [57].

Regarding participation levels, one can divide the revised ladder of participation in four levels: one level of non-participation (i.e. ignorance), three levels of low participation (awareness, information and consultation) and three levels of high participation (discussion, co-design and co-decision making) [58]. However, regarding the co-decision making participatory level, one should associate it to the collaborative participation concept. The collaborative participation is the highest
level of participation since the participants significantly contribute to the construction of the evaluation model [10].

Concerning its applications, one can use a participatory in either evaluation, planning or implementation context [57]. Given its vast range of applications, the literature contains a wide variety of studies that include participatory processes in their methodologies (Appendix C).

Further to the variety of applications, literature also illustrates a variety of methods within participatory processes. Slocum [57] summarized the main ones and proposed a useful comparison chart to choose the best participatory process for a given situation, considering the study’s main objectives, topic, participants, time and budget availability. However, since the Delphi method and the DC were the participatory methods applied in this master thesis, one will only focus this review on these two methods.

2.5.1 Delphi Method

Literature has documented the use of the Delphi method within the MCDA context [10] mostly to support model structuring- mainly to select, define and refine criteria. Given its significant importance in the development of this master thesis methodology, it is provided with a detailed contextualization of this method.

Delphi was designed to improve a group communication process while accessing multiple perspectives and views on a given topic of discussion [59]. Delphi allows a group of individuals to deal with a complex problem [60], aiming to suppress more negative features of group discussions such as dominant individuals and opinions [61].

Even though one can point out several types of Delphi - summarized in Table 2.1 based on Keeney et al. [62] work- Rowe and Wright [61] identified four key features that may be regarded as necessary for defining a process as a ‘Delphi’:

1. **Anonymity.** It allows individual group members the opportunity to express their opinions and judgments privately. Keeney et al. [62] states that complete anonymity cannot be guaranteed when using this method, because the facilitator knows the panel and their responses, and because often the panel members know each other, even though it is not possible to associate responses to any one member. Accordingly, the process is a quasi-anonymity case.

2. **Iteration.** The questionnaire is sent to participants over several rounds, allowing participants to change their opinions and judgments.

3. **Controlled feedback.** Between each round, facilitators inform group members of the opinions of their peers.

4. **Statistical aggregation** of the results.

The process develops through a succession of rounds that collects participants’ answers to the same questionnaire. Afterwards, while keeping anonymity, a facilitator statistically aggregates the
participants’ responses, sometimes along with the reasons given for the responses [61]. Individuals are then invited to submit a revised response, after considering the variety of responses received, or to resubmit their first response. This iteration and controlled feedback process continue over various ‘rounds’ until a consistent pattern of responses is reached, for example in the form of an apparent consensus (i.e., a general agreement within the group) or notable dissensus [63].

Several review papers have discussed a broad range of design features associated to the Delphi process, such as: the procedure to be followed at each round of Delphi and sorts of questions that should be asked [63] [64], the number of experts to be involved [61], what constitutes an ‘expert’ [65] or the type of response scale to use [66].

The number of rounds is another design feature widely discussed in the literature. In its original form, a Delphi survey consists of two or more rounds of questionnaires [62], but, in general, three rounds are enough [63]. The original approach sets the foundation for an idea-generation strategy to uncover the issues about the topic under study, and experts are asked to put forward as many relevant issues as possible in the first round. This round is, therefore, unstructured, allowing the individual experts relatively free scope to identify issues they see as important [61]. However, being all-inclusive can put panel members off participating and can become very difficult to sustain [67]. Hence, there is now some support for revising the approach and providing pre-existing information [62]. Regardless of the chosen structure of the first round, feedback is provided in the form of a second questionnaire and opinion is asked on the issues raised.

Delphi method has been widely cited in the literature as a practical group-based judgment and decision-making approach, particularly in the domains of healthcare and quality-indicator developments, providing a more useful process than traditional group meetings [63]. In Appendix A it is summarized some Delphi studies founded in the literature within the healthcare research context.

*Table 2.1: The wide range of Delphi types (Source: Keeney et al [62]).*

<table>
<thead>
<tr>
<th>Delphi Type</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classical Delphi</td>
<td>Uses an open first round to facilitate idea generation to elicit opinion and gain consensus, and three or more postal close rounds. Can be administered by email;</td>
</tr>
<tr>
<td>Modified Delphi</td>
<td>Modification usually takes the form of replacing the first postal round with face-to-face interviews or focus group. May use fewer than three postal rounds;</td>
</tr>
<tr>
<td>Decision Delphi</td>
<td>Same process usually adopted as a classical Delphi, but focuses on making decisions rather than coming to consensus;</td>
</tr>
</tbody>
</table>
### Policy Delphi

Uses the opinions of experts to come to consensus and agree future policy on a given topic;

### Real Time Delphi

Similar process to classical Delphi except that experts may be in the same room. The consensus is reached in real time rather than by post rounds;

### Online Delphi

Same process at classical Delphi but questionnaires are completed and submitted online;

#### 2.5.2 Decision conference

Decision conferences have been typically adopted for interactive development of some of the multicriteria value modelling activities [10] resulting in "a tested approach to working with key players that creates shared understanding of the issues, a sense of common purpose and commitment to the way forward" ([68], pp.2).

This social process promotes the gathering of a set of key players who wish to overcome relevant issues of their field or organization [76] and, albeit each one has its unique nature, they all share some common elements, namely: key players participation; the presence of an impartial facilitator; on-the-spot modelling with continuous display of the developing model and an interactive and iterative environment [70]. As the model is built, new intuitions about the issues arise, sometimes leading to revisions to the model and shared understanding of the issues is created. As this process settles down, agreement about the way forward will most likely emerge.

#### 2.6 Summary

Besides being a concept relatively recent in the healthcare system, VBH has successful applications in some health systems around the world. However, the literature lacks in many methodological details regarding the practical implementation of VBH strategic agenda. Hence, there is space in the literature to develop VBH implementation strategies that facilitate its full embracing by healthcare systems. In such a multi-stakeholder environment like the healthcare system, it is desirable to involve a broad set of stakeholders in the decision-making processes, particularly when involving such a dynamic concept like VBH. As such, an appropriate stakeholder identification should be carried out to ensure fair and balanced representation of individuals, groups and organizations.

Once identified the stakeholders, MCDA methods appear as a structured method for gathering their perspectives, breaking down complex problems and producing a systematic representation of multiple, often contradictory, stakeholder perspectives. When applied in association with a wide range of participatory approaches, MCDA allows enhancing representativeness and transparency in the decision-making process. In such a context, the CVM framework presents itself as a useful
socio-technical approach, as it combines two participatory processes: a web-based Delphi method and decision conferencing. The next chapter will describe in detail the methodology that will be implemented in this dissertation for later application to the problem under analysis.

Chapter 3

3. Methodological Approach

The proposed methodology departs from the CVM framework [10] and further explores it for multicriteria structuring activities. This chapter aims to describe the proposed methodology in detail and as clearly as possible.

3.1 Methodological Overview

An overview of the proposed methodology is illustrated in Figure 3.1. It starts with a process design phase (Phase 1), where the decision problem is formulated and structured, together with the identification of the VBH stakeholders and the facilitation team to be involved in the subsequent phases. Afterwards, two participatory processes are conducted for the development of model structuring activities: a 3-round Delphi process (Phase 2) and a DC process (Phase 3). The perspectives and values of a large number of VBH stakeholders regarding the aspects that should be considered during the prioritization of pathologies to integrate a VBH program in a hospital context are collected in Phase 2, whereas Phase 3 will adjust, refine and validate the previous decisions and the overall results, ascertaining its future applicability. The output of this combined process will be a widely informed set of criteria that aim to be the structure of a multicriteria model. The relationship between the CVM framework phases and the corresponding problem and model structuring activities is represented in Figure 3.1.
3.2 Phase 1: Process Design

The first phase of the CVM framework is process design. At this phase, the environment components for the remaining components will be set up. Specifically, the tasks performed at this phase will include: i) defining the evaluation problem; ii) identifying VBH stakeholders and iii) defining a facilitation team.

Evaluation contexts with a multiple-stakeholders environment are characterized by a high degree of complexity. Therefore, the process needs “to depart from clear definitions of the evaluation problem” ([10], pp.4). Hence, at this initial phase, it will be performed a characterization of the decision context [45] and a clear definition of the evaluation problem at scope [10] and key issue, which will be made explicit in the form of a question. 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 VBH stakeholders that participate in the Web-Delphi phase, and the small group of key-players that will take part of the DC phase [10]. Holistic stakeholder identification and analysis will be a key phase in the process design of this study and should take into consideration the context of the study and resources available while trying to ensure the inclusion of all relevant perspectives.

In the first instance, the facilitation team should identify the VBH stakeholder groups to be included in the study, with no limitation on the number of groups to be included. In a second step, the individual participants of the social-technical processes (Web-Delphi and DC) are established. The literature is scarce regarding the adequate number of participants to be included in the Delphi process. There is no maximum number of participants established, albeit the minimum number is established to be between 5 to 20 experts [63]. Furthermore, literature also recommends ensuring
The heterogeneity of the Delphi panel [63]. As such, our Delphi panel should ideally involve between 50 to 100 participants, even though the biggest concern should be to include participants from all the VBH stakeholder groups previously identified. Finally, in a third instance, the individual participants of the decision conference should be identified. Similarly to the Delphi process, no extensive literature was found regarding the DC appropriate group size, although McCartt and Rohrbaugh [71] research indicated that that the effectiveness is greater for smaller groups (from 4 to 8 participants) than for medium-sized (from 9 to 11) or large groups (from 15 to 18). Additionally, regarding their previous participation in the Web-Delphi process, in some cases “it might be enriching if the key-players were also engaged in the Web-Delphi process”, but in others “it might be more useful if the key-players are merely receptors of knowledge” ([10],pp.6). Nevertheless, regardless of their previous participation in the Web-Delphi process, one needs to ensure that the selected key-players for the decision conference represent a diversity of perspectives on the problem at hand [10]. As such, the DC should include at least one participant per VBH stakeholder group represented in the Delphi process.

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 [69] “guiding the group through the phases of discussing the issues” ([70], 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. According to the concept of a DC, mentioned before, during the DC this team should provide all the materials and data necessary to the discussion, encourage the participants to participate in an active discussion, and assist them in any question the participants may have. As such, it is essential to include members with the appropriate background in both the conduction of decision analysis socio-technical processes and also on VBH concept and practical application.

3.3 Phase 2: Web-Delphi

The model structuring step involves the structuring of a value tree that identifies and represents the key evaluation criteria of the 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 in order to be suitable for being called criteria and take part of the value tree, and also the creation of alignment between VBH stakeholders. Hence, one can divide the overall objectives of the process as follows:

I. Technical objectives: ensuring the fulfilment of the technical properties of the aspects that make them suitable criteria for integration in a multicriteria model;

II. Social objectives: create alignment between the involved VBH stakeholders, promoting learning and convergence between them and around the structuring activity.

The ideal number of rounds to hold during a Delphi procedure is a frequent topic of debate in the literature [61]. Belton at al. [63] recommend that the appropriate number of rounds should ideally be determined by looking for a pattern of stability, i.e. once the panellists show a level of stability
in their individual responses the Delphi procedure can cease. However, in some cases, the number of iterations or rounds to achieve opinion stability requires an unanticipated continuing time commitment from participants, which can increase drop-out rates [72], being often difficult to retain a high response rate within a Delphi that has many rounds [62]. 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. Hence, the pre-defined number of rounds is the stopping criteria of this Delphi process.

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 and comprehension 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 fulfill in order to become criteria suitable to integrate a multicriteria model. Specifically, these two rounds will allow ensuring that the aspects are non-redundant, concise, specific, understandable and relevant for the decision problem at scope. Additionally to the technical objectives, the three rounds also intend to enhance a common sense of commitment, guaranteeing that all the involved VBH stakeholders feel represented in the model.

In the beginning of the Web-Delphi process an invitation letter that “informs participants of what they will be asked to do (the objectives of the process) and of how long the process will be (duration and timing)” ([10], pp.6) will be prepared. In the first round, the invitation e-mail should include the purpose of the study, provides its contextualization and indicate the deadlines for answering the survey. For the following two rounds, the invitation e-mail should contain just a brief description of the round and once again the deadlines for answering each survey.

Below is presented a description of the three rounds, detailing their organization and objectives.

- **Web-Delphi first round**

  The first step in a modelling structuring phase is to identify the aspects considered fundamental to evaluate options [40]. 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.

  In this initial phase one will use the denomination “aspects”. Once these aspects are refined and structured, one can denominate them as “criteria” and suitable for application in a multicriteria model.
Furthermore, these aspects should be formulated as clearly as possible, be presented with a logic sequence, and be provided in a friendly format, so the participants can quickly consult them [10]. Since in this Delphi process there are participants with diverse backgrounds, there is the need of providing a common conceptual language to the involved ones, avoiding misunderstandings of the information or different interpretations that could influence the final results. Hence, descriptions of each aspect will be set by the facilitation team and made available in the survey. It should be ensured that the descriptions are concise, objective and understandable by all the participants, regardless of their level of expertise. Moreover, descriptions will be provided in a standardized way to avoid splitting bias [10] and in a friendly format to be consulted by participants. 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.

As the first round assumes an explorative and open-ended format- aiming to collect the views and opinions of the participants- once it is finished, an aggregation and refinement approach should be performed. This should ideally be performed by a team of researchers in order to avoid biases resulting from individual judgement. Hence, the facilitation team performs this step- whose main tasks are outlined in Figure 3.2- 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.

I. Critically consider all the comments made by the participants in the first round.

II. Critically consider each of the suggested aspects and add them to the initial list, if relevant.

III. For each added aspect, associate a straightforward, concise and comprehensive description.

IV. If a participant suggests modifying a previously defined description of an aspect, consider his/her suggestion and, if appropriate, set a new description.

*Figure 3.2: Post-first round analysis flowchart*
• Web-Delphi second round

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 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. 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.

• Web-Delphi third round

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 VBH stakeholders, promoting learning and convergence between them, and it is important to evaluate the stability of the answers provided by the participants.

At the end of the Delphi process, a final structuring step is performed with two main objectives:

I. Set the final list of criteria by following aspect approval/rejection rules based on the final statistical summary.

II. Guarantee that all the aspects obey to a set of structural properties and requirements (detailed in subchapter 2.3.1). Once these properties are assured, the aspects may be called criteria and may be included in the structure of a multicriteria model.

As Freitas et al., [73], this study used the level of agreement rather than consensus since the level of agreement is “less strict and easily interpretable” ([73], pp.15). However, there is no unanimity in literature “on what percentage of participant responses constitutes an acceptable level of agreement” ([73], pp.16). In this study, the level of agreement could be either for approval or rejection. The flowchart in Figure 3.3 illustrates the adopted approval and rejection rules of an aspect.
Additionally, the flowchart presented in Figure 3.4 is a useful guide for the post-assessment step.

![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.](image)

**Figure 3.3: 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.**

Consider the percentage (%) of responses, given in each Likert item, for each indicator in the third round, provided by the WELPHI platform.

Reject aspects based on the adopted decision rules. Keep the approved aspects and the aspects that did not reach agreement.

Ensure there is no overlapping or redundant elements in the list. Eliminate and merge aspects if needed.

 Guarantee the operationality of every element by ensuring that it is possible to measure the performance of an alternative against each criterion. Eliminate aspects if needed.

**Figure 3.4: Web-Delphi post-assessment steps**

Comments provided by the participants in both second and third rounds are an important input for this structuring step. Hence, and in order to facilitate the analysis, each provided comment is associated to a criteria property (when applicable). The analysis of the provided comments is
particularly useful when guaranteeing that the properties of the criteria are assured. Once completed this structuring step, a value-tree is constructed and proposed in the following DC.

Consistent with the initial identification of the aspects, the value-tree followed a top-down approach, as it decomposes the overall areas of concern into sub concerns, which takes place before the selection of any options. Since in this study context, the options are not previously defined, the top-down approach was the only possible approach to follow. Hence, a generic value tree was developed outlining higher-level criteria that were decomposed into lower-level criteria that aims to reflect all the essential criteria relevant for the prioritization process. Both the summary report and the value-tree are considered the output of the second phase and simultaneously the trigger for the third phase, as they should be used as data to inform the following multicriteria DC [10].

3.4 Phase 3: Multicriteria Decision Conference

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. At this phase, the CVM framework positions the key-players at the highest participatory modelling level, contrary to the participants of the Web-Delphi phase, “only engaged in discussion and information sharing” ([10], pp.6]. The final DC should have a representative from each VBH stakeholder group that has participated in the previous Delphi process and will include five main steps:

I. Summary of the work done, presenting the Delphi process main results.
II. Vote on the aspects that did not reach an agreement in the prior Web-Delphi process.
III. Validate the previously undertaken decisions, namely the refinement and structuring analysis actions that conducted to the elimination, refinement and/or merging of aspects.
IV. Refinement of the value tree depending on the results of the previously undertaken voting.
V. Create a sense of commitment to the way forward.

The planning tasks of the multicriteria DC phase begins with the preparation of a calling letter [10]. As Vieira et al. [10] suggest, the letter should remind the key-players of the overall objective of the DC as well as inform about the conduction of model structuring activities. Additionally, it should also indicate the day, location and duration of the DC.

Besides the preparation of the calling letters, the visual display of the results of the Web-Delphi processes also need to be prepared, “guaranteeing that it provides the key-players with comprehensive information regarding the outputs of the previous phase” ([10], pp.7). As such, this support will involve a table summarizing the Web-Delphi final results and their analysis per group of VBH stakeholder. Additionally, in order to promote the discussions and validate the undertaken decisions, a visual representation of the main final refinement steps will also be made.
available. Mainly, it will be made explicit the basic steps that were performed and that ended-up with the construction of the value tree, which will also be presented to the participants.

Furthermore, when designing the DC process, it is important to consider the conference environment. It should be provided with an environment that “stimulates a fruitful discussion and involvement of the group in an interactive and iterative process” ([10], pp.7), improving the effectiveness of the group work. Hence, the layout of the conference room must be set up in a way that ensures easy eye-to-eye contact between the participants and visual access to the screens in use.

As Vieira et al. [10] suggest, the process needs to be documented in the form of small executive reports. This reporting is important “not only for future and more in-depth analysis, but also to acknowledge participants’ work and to further motivate them to participate in future processes” ([10], pp.8). To conclude, one should note that in this study, it is assumed that the results of the Delphi may not be consensual within the conference key-players since it is not an objective to reach consensus. However, regardless of the consensus level achieved between the key-players, the central records and conclusions taken from the DC should be present in the final report.

Chapter 4

4. Application of the methodology

This chapter describes the application of the previously detailed methodology in order to structure a multicriteria model for the VBH case study.

4.1 Phase 1: Process Design

4.1.1 Defining the evaluation problem

As already mentioned in the introductory chapters of this work, when a particular hospital decides to apply a VBH delivery model, it is part of its strategy to select a pathology to integrate a VBH program. This should be an informed decision, aligned with a variety of VBH stakeholder’s interests. It is of the own hospital interest to gather all their views, both because their knowledge and experience can improve the chance of adopting the best strategies, but also because it enhances the commitment of the full range of VBH stakeholders to the hospital and its VBH program.

However, to date, there is very little literature regarding approaches to prioritize pathologies to be included in a VBH program of the hospital, being a possible barrier for VBH improvement as a widely adopted delivery model. Therefore, it is important to come through this drawback by developing a tool capable of helping hospital strategic managers to prioritize pathologies. JMS
group identified this need, and previous work [16] was done in order to fill this gap. However, the
group pointed out that this was not an inclusive work since the process of the definition of criteria
only involved the participation of a restricted set of JMS clinical board members. Hence, this
master thesis aims to refine those set of criteria by applying the CMV framework to model
structuring activities. Ultimately, the future multicriteria model will evaluate pathologies based on
a set of evaluation criteria that represents as accurately as possible the full panoply of VBH
stakeholder's perspectives.

In sum, the key issue can be stated as: “How should one prioritize pathologies to be covered by
a VBH program?” and the desired output of this work is a structured set of criteria that should be
the basis for the development of the multicriteria evaluation model.

4.1.2 Identifying stakeholders

As already mentioned, 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 VBH 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, illustrated in Figure 4.1. This representation provided an appealing and
   organized tool for mapping the involved VBH stakeholders. Stakeholder mapping
   technique [35] was used as it highly facilitates the identification process since the
   visualization of the delivery model path enhances the identification of all the relevant VBH
   stakeholders that may have a role in it.

2. Brainstorming sessions and one-on-one interviews with JMS experts with extensive
   experience in the healthcare market and VBH implementation strategies.

Regarding the VBH implementation model, represented in Figure 4.1, some considerations
should be performed. This visual representation is a generalization to all hospitals, but it was, in
a first instance, constructed based on the JMS VBH program implementation model. Two JMS
experts with active participation in the group VBH program were interviewed, asking them to
describe the VBH path within, pointing out the main actors and their functions. Once identified,
the model was generalized in order to be easily understood and suitable for any hospital.

As Figure 4.1 illustrates, a VBH path can be divided into three main phases: 1) strategic planning,
2) implementation and 3) measurement and monitoring. In the strategic planning phase, a
strategic team works in collaboration with a multidisciplinary team. The strategic team consists of
a small group of managers and doctors (usually directors of medical specialities) that define the
orientation of the VBH program of the group, defining its priorities and number of pathologies to
be included in the program. The multidisciplinary team comprises a clinical director, hospital
director and product manager, which are responsible for the decision of pathologies to be included
in the program. Additionally, one can note in Figure 4.1 the presence of ICHOM in the strategic
planning of the VBH program, since it provides guidelines for what is essential to measure in each
pathology- which is usually an input for the definition of pathologies to be included in the program.
The implementation phase is the responsibility of the VBH team, the DSI (Portuguese acronym for Direcção de Sistemas de Informação, which can be translated into Information Systems Direction), the technical team and the hospital team. The VBH team defines the collection processes and comprises clinical information managers. The DSI provides means for data collection, which implies a technical team (or outsourcing services) for the creation of proper databases. The VBH team operates in collaboration with a hospital team (comprising production managers and clinical leads), which in turn are responsible for the selection of doctors, nurses and other clinical technicians. These collaborators are responsible for the measurement and monitoring phase, allowing for the collection of data in the hospital— for example, by delivering questionnaires that will allow the collection of PROMs and CROs (Clinical Reported Outcome Measures).

The VBH stakeholder identification process departed from this generalized model and consulted a set of JMS experts in order to add some other groups that were not yet identified but should take part in the decision-making process. This process ended-up with nine groups of VBH stakeholders identified as having an essential role in the decision-making process:

1. Healthcare professionals (including doctors, nurses and technicians);
2. Policymakers;
3. Health technology industry;
4. Patient associations;
5. Hospital managers and administrators;
6. Insurance companies;
7. Clinical information managers;
8. Academics and researchers;
9. Health law experts.

Once defined the VBH stakeholder groups that should participate in the subsequent technical-social steps, a list of individuals was set up, covering all the predefined groups of VBH stakeholders, most of them with more than one representative.

### 4.1.3 Defining a facilitation team

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 engineering. 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.
Figure 4.1: Generalized VBH implementation model
### 4.2 Phase 2: Web-Delphi

The Web-Delphi process took place between 31st July 2019 and 7th October 2019. Three rounds were conducted, the first one with an open-ended format and the following two rounds with a close-ended format. Aligned with Belton et al. [63] recommendations, the content was restricted to what can reasonably be answered in 30 min. Furthermore, inclusive language was used when constructing the surveys for a clear understanding of the content by the participants. As Vieira et al. [10] suggest, all the three rounds used the same platform and the layout was consistent among the different rounds, as it “improves users’ experience” and “engagement” ([10], pp.6).

The selection of the decision support system to conduct the Web-Delphi process should take into account the “technical nature of multicriteria activities” ([10], pp.6). A Delphi process can be conducted in a variety of formats- from paper to web-based, but the latter one was chosen as it was considered that it could facilitate the process by allowing experts to answer wherever they wish to and according to their own time and availability. 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 platform used to implement the Delphi process was WELPHI (http://www.welphi.com/), which was established for both implementing and monitoring the web-based participatory process. The WELPHI has both delivered the survey and performed the follow-up of the process, presenting some interesting features, namely:

1. Allowing researchers to efficiently manage the study implementation;
2. Providing a statistical summary of each round;
3. Being a user-friendly interface;
4. Allowing for a real-time monitorization of the response rate.

Finally, worth to mention that, at the beginning of each round, experts were personally contacted by means of an e-mail- written in Portuguese, in order to avoid misunderstandings. Besides stating the objectives of the round, the e-mails also contained the link that redirected the user to the corresponding survey. The next subchapters detail the design and implementation of each round.

#### 4.2.1 Web-Delphi round one

##### 4.2.1.1 Design

The facilitation team decided to define a proposed list of evaluation aspects to share with participants in order to promote the discussion and align the participants with the objective of the process.

In order to define the proposed list, a systematic review was conducted between March and May 2019 on the databases: Science Direct, PubMed, Web of Science and Google books. A search protocol was applied with a keyword combination within the range of Value-Based Healthcare and priority-setting
approaches, including: *Value-Based Healthcare program, prioritization, choice and pathologies*. This literature search was restricted to both review articles and books written in English, with no time constraints being applied given the novelty of the VBH approach.

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 - also conducted under the JMS supervision [16] - was performed 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:

1. Consultation of the only study with a similar purpose [16].
2. 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 the previous work conducted under the JMS supervision [16], and the remaining ones generated from experts consulting. The proposed aspects, alongside with an explanation for their inclusion in the proposed list, are listed in Table 4.1.

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Reason to be included</th>
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</table>
| **National prevalence of the pathology** | Prevalence is defined as a “morbidity frequency measure that reflects the number of individuals who have the pathology at any moment” (WHO, 2019), including both new and pre-existing cases. It is calculated as a percentage of the population, as follows:  

\[
\text{Prevalence} = \frac{\text{All new and preexisting cases of a given medical condition during a given period}}{\text{Population during the same period}} \times 100\%
\]

As Rodrigues [16], the facilitators considered that the prioritization of pathologies can be highly impacted by the commonness of the pathology in the country, trying to reach as many patients as possible. Investing in such an enlarged group of patients could possible lead to earlier significative and measurable results. |
| **Prevalence of the pathology in the hospital** | This aspect was included in the list since it was considered that possibly it could matter most for the hospital to adopt a more centralized view, considering its own clients and their current needs. |
| **Burden of the pathology** | Back in 1990s the Harvard School of Public Health, the World Bank and the WHO defined burden of disease as the “death and loss of health due to
diseases, injuries and risk factors for all regions of the world". The burden of a particular disease or condition is estimated by adding together: 1) the number of years of life a person loses as a consequence of dying early because of the disease (called YLL, or Years of Life Lost) and 2) the number of years of life a person lives with disability caused by the disease (called YLD, or Years of Life lived with Disability). Adding together the YLL and YLD gives a single figure estimate of disease burden, called the Disability Adjusted Life Year (DALY). One DALY represents the loss of one year of life lived in full health. The mathematical expression associated is as follows:

\[
DALY = YLL + YLD = (N \times L) + (P \times DW)
\]

Where:

- \(N\) = Number of deaths
- \(L\) = standard life expectancy at age of death in years
- \(P\) = number of prevalent cases
- \(DW\) = disability weight factor

Hence, one can easily conclude that burden of a given pathology is greater for both the ones with a high mortality rate, and the ones with low mortality rates but high prolonged rates of disability. The facilitators included the aspect as their members considered that a pathology should also be evaluated concerning the consequences it has to the patient, the way it interferes with patient daily life and life expectancy, and not just how frequent it is.

### Clinical complications associated with the pathology

In this master thesis context, a clinical complication is defined as any undesirable and unexpected result of any medical or surgical intervention associated with the pathology cycle of treatments, since the patient is admitted in the hospital until the patient is discharged.

This aspect could be relevant if assuming that a VBH program intends to cover firstly the pathologies associated lower quality of health service, giving opportunity to the model to improve it. As clinical complications can possibly be an objective indicator to evaluate the quality of healthcare services of the hospital, the facilitators found it relevant to be included in the list.

### Readmissions of patients with the medical condition after treatment

In this master thesis context, the hospital faces a readmission whenever a patient experiences an unplanned readmission within 30 days after being discharged from a previous hospital stay. Like in the clinical complications’ context, the number of readmissions is also a way to evaluate the quality of care: a higher number of readmissions can possibly mean worse quality of care and consequently a more urgent need for VBH program coverage.

### Availability of ICHOM standard set for the Medical Condition

As previously explored, ICHOM is an organization that develops standardized outcome measurement set for a range of health conditions, creating a global standard for measuring results by medical condition. Hence, given this previous solid work, it is theoretically much easier to integrate in the VBH program of the hospital pathologies that already have an ICHOM standard set.

### Lack of Solid Clinical Guidelines for the pathology

The facilitators decided to include this aspect as it considered that lack of relevant and suitable clinical guidelines for the pathology can possibly give chance to the VBH model to contribute for the dissemination of good clinical guidelines.

---

3 DW reflects the severity of a pathology on a scale from 0 to 1, where 0 means perfect health and 1 means death
<table>
<thead>
<tr>
<th>Aspect</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Burden of PROMs instruments associated with the pathology</strong></td>
<td>In this thesis context, burden of PROMs is measured by the demanded time in minutes consumed to fill and the total number of PROMs forms of a given pathology in one year. This aspect considers the direct relation between patient engagement and the required demands to administrate a given PROM instrument, namely to the time and effort required. Since PROMs is an important element of the VBH model, and since it changes from pathology to pathology, the facilitators considered that it could potentially be a relevant aspect when choosing pathologies to be covered by a VBH program.</td>
</tr>
<tr>
<td><strong>Burden of CROs instruments associated with the pathology</strong></td>
<td>In this thesis context, burden of CROs is measured by the demanded time in minutes consumed by the clinical team to fill and the total number of CROs forms of a given pathology in one year. Once again, CROs is an important element of the VBH model that changes from pathology to pathology, which can potentially become a relevant aspect when choosing pathologies to be covered by a VBH program.</td>
</tr>
<tr>
<td><strong>Clinical team commitment to the program</strong></td>
<td>This aspect considers the level of commitment to the program of the clinical team involved in the pathology cycle of treatments. The facilitators considered that, more than the availability of human resources, it is important their level of commitment to the VBH program of the hospital, how they find it relevant or not, and how much they want to contribute to its implementation.</td>
</tr>
<tr>
<td><strong>Availability of new technologies to gather evidence associated with the pathology</strong></td>
<td>This aspect considered the existence of state of the art and cutting-edge technology that help to monitor and gather evidence during the pathology cycle - from its diagnostic to its treatment. The facilitators considered that it could potential be useful not just to document the value of treatments more efficiently, but also because it could allow the use of VBH model as a tool to evaluate this new technology, assessing its efficacy and efficiency in creating value to the patient.</td>
</tr>
<tr>
<td><strong>Human resources requirements</strong></td>
<td>This aspect considers the ease of integration of the pathology in the hospital's VBH plan according to the human resources that this integration requires and the ones currently available in the hospital.</td>
</tr>
<tr>
<td><strong>Information systems requirements</strong></td>
<td>This aspect considers the ease of integration of the pathology in the hospital's VBH plan according to the information’s system resources that this integration requires and the ones currently available in the hospital. For example, the existence of clinical information registry platforms for a given pathology or patient-outcomes platforms can facilitate the introduction of the pathology in a VBH program, as it facilitates data gathering.</td>
</tr>
<tr>
<td><strong>Possibility to face legal barriers</strong></td>
<td>This aspect considered the possibility of facing legal obstacles related to the integration of the pathology - and the interventions associated with its treatment cycle - in the hospital VBH plan, namely due to the sensitive nature of the collected data (eg: genetic data collection).</td>
</tr>
</tbody>
</table>
Costs associated with the normal pathology treatment cycle

This aspect considered the average cost (per patient) of the pathology treatment cycle. It may be relevant since the VBH also intends to identify and rectify unnecessary expenses that do not bring the corresponding value to the patient.

Implementation and Monitorization Costs

In this master thesis context, implementation costs refer to all costs related to the necessary staff to run the program, like clinical team and VBH team working costs, while monitorization costs include the costs of the IT infrastructure and PROMs license fees.

Existence of risk sharing agreements

Considers the existence of risk-sharing agreements regarding the pathology treatment cycle between the various stakeholders. The facilitators considered that these agreements can potentially mitigate the uncertainty about clinical outcomes and the cost-effectiveness of the process, allowing for conditional reimbursement dependent on the collection of clinical evidence resulting from the pathology cycle of treatments.

The next step was to provide descriptions for each of the proposed aspects, allowing participants to understand them fully. Hence, the facilitators analyzed each aspect and set a description as clear as possible. These descriptions are provided in Table 4.2.

Table 4.2: The 17 proposed aspects and corresponding descriptions provided in the platform to participants in the first Web-Delphi round

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Provided description</th>
</tr>
</thead>
<tbody>
<tr>
<td>National prevalence of the pathology</td>
<td>Considers the occurrence of the pathology at national level.</td>
</tr>
<tr>
<td>Prevalence of the pathology in the hospital</td>
<td>Considers the occurrence of the pathology at hospital-level.</td>
</tr>
<tr>
<td>Burden of the pathology</td>
<td>The “burden of pathology” is defined by the WHO as “death and loss of health” due to pathology and is estimated by summing the number of years of life lost as a result of early death due to pathology with the number of years lived with the pathology.</td>
</tr>
<tr>
<td>Clinical complications associated with the pathology</td>
<td>Gross number of clinical complications associated with the medical condition in the hospital between the admission day and the discharge day.</td>
</tr>
<tr>
<td>Readmissions of patients with the medical condition after treatment</td>
<td>Gross number of unplanned readmissions of patients with the given medical condition in the hospital within 30 days after being discharged from a previous episode.</td>
</tr>
<tr>
<td><strong>Availability of ICHOM standard set for the Medical Condition</strong></td>
<td>ICHOM standard sets are built for each medical condition and include a combination of patient reported outcomes, case-mix variables (variables that can affect outcomes and allows the building of risk-adjustment models), measurement tools (validated instruments to measure outcomes), and timelines that specify the moments for PROMs administration.</td>
</tr>
<tr>
<td><strong>Lack of Solid Clinical Guidelines for the pathology</strong></td>
<td>Lack of relevant and suitable clinical guidelines for the medical condition, giving chance to VBH model to contribute for the dissemination of good clinical guidelines.</td>
</tr>
<tr>
<td><strong>Burden of PROMs instruments associated with the pathology</strong></td>
<td>The burden of PROMs is measured by the demanded time in minutes consumed to fill and the total number of PROMs forms of a given medical condition in one year.</td>
</tr>
<tr>
<td><strong>Burden of CROs instruments associated with the pathology</strong></td>
<td>The burden of CRO is measured by the demanded time in minutes consumed to fill the CROs and the total number of forms of a given medical condition in one year.</td>
</tr>
<tr>
<td><strong>Clinical team commitment to the program</strong></td>
<td>Level of commitments to the program of the clinical team involved in the treatment of the medical condition.</td>
</tr>
<tr>
<td><strong>Availability of new technologies to gather evidence associated with the pathology</strong></td>
<td>Availability of state-of-the-art technology that help to monitor and gather evidence.</td>
</tr>
<tr>
<td><strong>Human resources requirements</strong></td>
<td>Considers the human resource requirements currently available in the hospital for the cycle of treatments of the pathology.</td>
</tr>
<tr>
<td><strong>Information systems requirements</strong></td>
<td>Considers the information systems requirements currently available in the hospital associated with the pathology (ex: databases).</td>
</tr>
<tr>
<td><strong>Possibility to face legal barriers</strong></td>
<td>Possibility of facing legal obstacles related to the integration of the disease - and the interventions associated with its treatment cycle - in the hospital VBH plan, namely due to the sensitive nature of the collected data (e.g.: genetic data collection).</td>
</tr>
<tr>
<td><strong>Costs associated with the normal pathology treatment cycle</strong></td>
<td>Average cost (per patient) of the pathology treatment cycle.</td>
</tr>
<tr>
<td><strong>Implementation and Monitorization Costs</strong></td>
<td>Considers the personnel-related costs required to execute the program, the information technology system infrastructure costs, and the PROMs license fee costs associated with integrating the pathology into the hospital's VBH plan.</td>
</tr>
<tr>
<td><strong>Existence of risk sharing agreements</strong></td>
<td>Existence of risk sharing agreements regarding the pathology cycle of treatments between the various stakeholders.</td>
</tr>
</tbody>
</table>
The list of proposed aspects and corresponding descriptions was made available to the participants on the WELPHI platform. Additionally, participants were also presented with an open-ended space that allowed them to add any aspects they thought 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 corresponding description. These features aimed to ensure that the list of proposed evaluation aspects was as inclusive as possible and aligned with the Classical Delphi described by Keeney [62], which uses an open first round to facilitate idea generation. Also, it intended to guarantee that both the aspects and their descriptions were correctly and rigorously defined.

The next design step was the formulation of the question to be asked in the Delphi process, and the response options available to participants. Both the question and the answering scale “must be carefully deliberated, with close reference and consideration to the overall aims and hypotheses of the study” ([63], pp.4). In this first questionnaire, participants were faced with the following statement: “\textit{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: “\textit{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.

4.2.1.2 Implementation

A personalized invitation e-mail (Appendix D) was sent to a total of 95 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 availability. Additionally, personal communications were established \textit{a priori} with a particular group of VBH stakeholders. This approach is suggested by Belton et al. [63] to prevent panellists 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.

Following the access link contained the invitation e-mail, the participant was redirected to a page with seven different screens (Appendix E), organized as follows:

- 1st screen: welcome page, presenting the main goal of the study.
- 2nd screen: instructions.
- 3rd screen: consent form.
• 4th screen: demographic and professional data- including previous experience in VBH design/ implementation activities- and personal opinion regarding the influence that VBH approach can potentially assume in the current healthcare market dynamics.

• 5th screen: Main screen containing the proposed list of decision aspects (alongside with their descriptions) and the open-space to add any additional aspect; There is also the possibility to comment on each aspect. This screen is illustrated in Figure 4.2.

• 6th screen- acknowledgment and useful information for the next round.

![Figure 4.2: Web-Delphi 1st round main screen](image)

Participants had the option to go back on the questionnaire whenever they wish- reviewing their answers whenever they found it appropriate until the survey deadline was reached- by simply following the link provided in the invitation e-mail.

In order to increase the number of responses, four reminder e-mails were sent on August 5th, 8th, 12th and 19th, and the deadline to answer this first e-mail was extended to August 21st, 2019. In this first round, a total of 28 answers were collected (from the 95 invited participants, meaning a response rate of approximately 30%) and only the participants that have finished the whole survey were considered. Figure 4.3 (left) illustrates that the panel of 28 participants that has completed the first round was balanced between male and female participants and that they most occupied the age range between 40 and 59 (Figure 4.3, right).
Concerning the field of studies (Table 4.3), medicine was the most represented one, followed by economics and management, and the majority of the participants were healthcare professionals, as Table 4.4 illustrates.

<table>
<thead>
<tr>
<th>Field of Studies</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medicine</td>
<td>9</td>
</tr>
<tr>
<td>Economics</td>
<td>6</td>
</tr>
<tr>
<td>Management</td>
<td>5</td>
</tr>
<tr>
<td>Engineering</td>
<td>2</td>
</tr>
<tr>
<td>Public Health &amp; Epidemiology</td>
<td>2</td>
</tr>
<tr>
<td>Bioethics</td>
<td>1</td>
</tr>
<tr>
<td>Nursing</td>
<td>1</td>
</tr>
<tr>
<td>Law</td>
<td>1</td>
</tr>
<tr>
<td>Do not specify</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 4.4: Distribution of the respondents’ occupation

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthcare professionals</td>
<td>7</td>
</tr>
<tr>
<td>Academics and researchers</td>
<td>6</td>
</tr>
</tbody>
</table>
Concerning the experience in VBH area, a relative balance is also observed (Figure 4.4, left), with 56% of the participants answered 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, the results also summarized in Figure 4.4 (right).

Once reached the final deadline, 17 new aspects were added. The facilitating team did the aggregation of the answers given by the experts. Answers that appeared to have no meaning for the purpose, or not sufficiently explicit, were not considered. Table 4.5 summarizes the aspects added in the Web-Delphi first round (first column), explanations provided by the participants (second column), the indication if each aspect was, or not, included (third column), and an explanation (fourth column) for the decision when the team opted by not including the aspect.

<table>
<thead>
<tr>
<th>Hospital manager</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Researcher</td>
<td>2</td>
</tr>
<tr>
<td>Insurance Manager</td>
<td>1</td>
</tr>
<tr>
<td>Administrator</td>
<td>1</td>
</tr>
<tr>
<td>Director</td>
<td>2</td>
</tr>
<tr>
<td>Epidemiologist</td>
<td>1</td>
</tr>
<tr>
<td>HTA administrator</td>
<td>1</td>
</tr>
<tr>
<td>Patient association director</td>
<td>1</td>
</tr>
<tr>
<td>Do not specify</td>
<td>4</td>
</tr>
</tbody>
</table>

Figure 4.4: Participants experience in VBH (left); Opinions of the participants regarding the influence that VBH can assume in portuguese healthcare market (right).
### Table 4.5: Summary of the new proposed aspects and correspondent option for inclusion/exclusion

<table>
<thead>
<tr>
<th>Proposed aspect</th>
<th>Additional comments</th>
<th>Inclusion (Yes/No)</th>
<th>Reason for exclusion (if applicable)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social burden of the pathology</td>
<td>-</td>
<td>Yes</td>
<td>-</td>
</tr>
<tr>
<td>Diagnostic age of the pathology</td>
<td>-</td>
<td>Yes</td>
<td>-</td>
</tr>
<tr>
<td>Percentage of patients that are considered active population</td>
<td>“Considers the percentage of patients that suffers from the pathology that are considered “active population in terms of productivity”</td>
<td>Yes</td>
<td>-</td>
</tr>
<tr>
<td>Expected number of years the patient will live with the pathology</td>
<td>-</td>
<td>Yes</td>
<td>-</td>
</tr>
<tr>
<td>Predicted health gains associated with the treatments of the pathology</td>
<td>-</td>
<td>Yes</td>
<td>-</td>
</tr>
<tr>
<td>Synergies generated with health gains in other pathologies</td>
<td>-</td>
<td>No</td>
<td>The facilitation team did not fully understand the context</td>
</tr>
<tr>
<td>Social cost reduction potential associated with pathology treatments</td>
<td>-</td>
<td>No</td>
<td>Similar to “social burden of the pathology”</td>
</tr>
<tr>
<td>Predicted profit that arises from the investment in the pathology</td>
<td>-</td>
<td>No</td>
<td>This aspect was considered by the facilitation team very theoretical for a work that aims to be implementable. Although it is an interesting concept, it might be too unpredictable to be applied in the model.</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>----</td>
<td>----</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>Resource preparation for the inclusion of the pathology in the VBH plan</td>
<td>-</td>
<td>Yes</td>
<td>-</td>
</tr>
<tr>
<td>Degree of attribution of clinical outcomes to hospital care</td>
<td>“There are conditions whose clinical outcome, in the medium and long term, can be very much attributable to hospital outcomes, after adjusting for baseline risk, and others that do not depend on the patient and primary care. It may be of more interest to prioritize pathologies whose clinical outcomes are more dependent on the quality of hospital care.”</td>
<td>Yes</td>
<td>-</td>
</tr>
<tr>
<td>Variability of costs</td>
<td>“There may be more potential for impact on VBH implementation in situations of high cost variability than in uniform cost situations, even if these are on average higher.”</td>
<td>Yes</td>
<td>-</td>
</tr>
<tr>
<td>National involvement capacity for comparative pathology data collection</td>
<td>“Several pathologies already have national clinical records and / or study groups that are more fit and interested in developing a regular information system for VBH implementation. Other pathologies are dealt with above all in some well-identified centers, so the implementation and involvement of professionals may be easier”.</td>
<td>Yes</td>
<td>-</td>
</tr>
</tbody>
</table>
**Prediction of New Therapeutic Options / New Treatment Models**

“There are conditions for which technological innovation and/or care delivery model (eg, rehabilitation centers) are predicted, where information on the impact of clinical outcomes will be very relevant and welcomed by decision makers, institutions, health professionals and patient associations. In such cases, there may be greater receptivity to the creation of proprietary financing models based on results and risk sharing.”

Yes

Once again, this aspect was considered by the facilitation team very theoretical for a work that aims to be implementable. Although it is an interesting concept, it might be too unpredictable to be applied in the model.

**Outcomes Variability**

“The greater the variability, the greater the associated potential for improvement.”

Yes

**Pathology complexity**

“Pathologies with smaller cycles allow quicker results, which will help reinforce validity and relevance to the more complex and time-consuming pathologies.”

Yes

**Pathology integration in different contexts and systems**

The greater the variability, the greater the associated potential for improvement.”

No

The facilitation did not fully understand the context.

**Importance to the patients**

-  

No

It was considered by the facilitation team that this aspect is already considered in already provided aspects—particularly, the ICHOM guidelines availability. When ICHOM researchers choose to define guidelines for a particular pathology, they have patents interests in mind.
Regarding the VBH stakeholder group from which the proposed aspects came from, there is a clear predominance of Academics and Researchers group, which have proposed a total of 11 new aspects. Patients Associations group and Health Technology Industry were also represented, both with three proposed aspects each. Figure 4.5 illustrated the distribution of the new proposed aspects by VBH stakeholder group.

![Figure 4.5: Distribution of proposed aspects by VBH stakeholder group](image)

Additionally, it was also analyzed the experience in VBH of the participants who have proposed new aspects (Figure 4.6).

![Figure 4.6: Experience in VBH of participants that have proposed new aspects](image)

At the end of the first round, descriptions for each new aspect were prepared to be presented to the participants in the next rounds. It is relevant to notice that the majority of the participants did not provide additional explanations for the new aspects, and, when provided, these explanations often 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. Hence, new impartial and objective descriptions were defined for each new aspect. This work was particularly crucial for aspects that can intuitively cover more than one perspective. For example, by analyzing the “diagnostic age of the pathology” aspect, suggested by one participant, one can easily understand that two perspectives can
raise from: one that associates a biggest interest in prioritizing a pathology which a bigger (average) diagnostic age, and one that assumes the opposite side. Hence, the description of the aspect mentioned that both perspectives should be considered by the participant when attributing a level of reference for the aspects, but, if he/she finds in relevant, they could share their perspectives by adding a comment. Table 4.6 summarizes the conducted work, presenting the new aspects (left column) together with the corresponding descriptions (right column).

Table 4.6: New aspects and the corresponding descriptions

<table>
<thead>
<tr>
<th>New aspect</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social burden of the pathology</td>
<td>The social burden of a pathology is the cost to society imposed by the existence / dissemination of the same pathology (including invalidity pensions costs, disability allowance costs and sick leaves).</td>
</tr>
<tr>
<td>Percentage of patients considered working population</td>
<td>Percentage of patients suffering from the pathology who are considered active in terms of productivity.</td>
</tr>
<tr>
<td>Degree of attribution of outcomes to clinical care</td>
<td>Pathologies whose outcomes are poorly attributable to clinical care are the ones whose outcomes depend largely on the patient and primary care.</td>
</tr>
<tr>
<td>Variability in outcomes</td>
<td>Variability in outcomes after the pathology cycle of treatments between different hospitals.</td>
</tr>
<tr>
<td>National involvement capacity for comparative pathology data collection</td>
<td>National involvement capacity for data collection, involving, for example, a larger network of clinical pathology records.</td>
</tr>
<tr>
<td>Pathology complexity</td>
<td>Consider that a less complex pathology is, in this context, a pathology with smaller cycles. It considers both possible perspectives: either that a greater complexity should mean a higher prioritization of pathology, either the opposite. Thus, your answer should reflect the relevance you give to this aspect when prioritizing pathologies to be included in a VBH plan. In addition, if you wish, you can always add a comment where you specify your perspective between the two possible ones, by clicking on &quot;Comments&quot;.</td>
</tr>
</tbody>
</table>
Human resources preparation for VBH implementation
Consider human resources preparations the existence of culture and training necessary for health value measurement by the clinical team involved in the pathology cycle of treatments, implying the necessary mindset and openness for the implementation of the VBH model.

Treatment costs variability
Consider treatment cost variability as the discrepancy between different hospitals in terms of costs of the pathology cycle of treatments.

Diagnosis age of the pathology
Average age of patients when pathology is diagnosed. It considers both of the possible perspectives: either that an older age of diagnosis should mean a higher prioritization of the pathology, either the opposite. Thus, your answer should reflect the relevance you give to this aspect in prioritizing pathologies. In addition, and if you wish, you can always add a comment where you share your perspective between the possible ones, by clicking on "Comments".

Expected number of years the patient will live with the condition
(Predicted) number of years the patient will live with the pathology.

Health impact associated with pathology treatments
Health impact associated with the pathology cycle of treatments.

Considering the above table, one should mention an additional detail: the aspect “human resources preparation for VBH implementation” emerged from the aspect “resources preparation for VBH implementation in the pathology”. As it was not specified which kind of resources would they be, the facilitation team specified it according to what made more sense on its members own perspective.

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:

I. One suggestion to modify the definition of a decision aspect:
II. Three suggestions to modify aspects’ descriptions.

After discussing the suggestions with an expert, all of them were considered appropriate and took into account. Hence:

I. The term “burden” was translated into carga instead of peso;
II. The descriptions of the aspects “burden of pathology”, “national prevalence of pathology” and “prevalence of pathology in the hospital” were modified. Regarding the last two aspects, it was made clear in the description that the term prevalence is indeed a proportion and not an absolute number; regarding the “burden of pathology” description, it was specified that this measure is calculated not by adding the number of years lost due to premature mortality (YLL) with the
number of years living with the pathology but with the weighted number of years living with disabilities caused by the pathology (YLD). Hence, it was made explicit that, when calculating the last parameter (YLD), a disability weight factor reflecting the severity of the disease on a scale from 0 (perfect health) to 1 (dead) is considered.

4.2.2 Web-Delphi rounds two and three

4.2.2.1 Design

The second round took the form of a structured questionnaire that provided the participants with the list of aspects that 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, and also aligned with Belton et al. (2019) recommendations, a “Don’t know/ Don’t want to answer” option was also available.

The decision of opting for a scale with 5 response categories was supported by two main reasons:

I. More response options promote more fine-grained measurement, but also increase the risk of random errors owing to the potential failure of respondents to interpret the subtle differences in meaning between options. Thus, a trade-off should be reached.

II. These response categories provide participants with a mid-point reflecting a neutral level of agreement, accommodating those respondents who have well-considered neutral opinions [63].

Furthermore, when constructing the scale, it was decided to provide verbal labels for all response categories instead of for only those at the poles, in order to produce scales with better psychometric quality [63].

Finally, in the third round, participants have access to statistical summaries of the results from round 2, and have the opportunity to change their previous answers, at the light of the feedback provided. Once again, it is provided the same Likert-like scale as the previous round, so that participants can change- or keep - their opinion regarding the relevancy they attributed to each aspect.
4.2.2.2 Implementation

At the beginning of the second round, an invitation e-mail (Appendix F) was sent to 95 participants by the WELPHI platform on September 6, 2019, asking for answers until September 16, 2019. One has decided to re-invite all of the 95 participants initially identified, even if they are not in the group of the 28 respondents that have completed the first opened round.

After a welcome screen, presenting the objective and a concise set of instructions, the participant was redirected to the main screen (Figure 4.7) containing the enlarged list of decision aspects, resulting from the post first round assessment. Once again, a description of each aspect was provided - by clicking on the “eye” bottom-, as well as an open space for comments.

![Figure 4.7: Web-Delphi 2nd round main screen](image)

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 sent by the platform. 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 the second round.

Delphi data output can be analyzed in different ways, which can include both qualitative and quantitative forms of data analysis [63]. In this study, both qualitative and qualitative type of data exist. Quantitative data consist in the distribution of responses by each Liker-level, per each aspect (either percentage or absolute-based), whereas qualitative data are the comments provided by the participants (which can be consulted in Appendix K). Both quantitative and qualitative data from the second round was provided to
the participants in the third round by the WELPHI platform. The second round results can be consulted in Appendix G.

At the beginning of the third round, an invitation e-mail (Appendix H) was sent to a total of 22 participants on September 22nd, 2019, asking for answers until September 30th, 2019. For this last round, the sending of the invitations was restricted to the ones who have participated in the second Web-Delphi survey. As the second and third rounds take part of an iterative process, this decision allows the participants’ responses to “be continuously assessed and integrated into the group feedback” (Freitas et al., 2018) [p.15]. The invitation e-mail followed the same logic as the previous ones, containing a brief and objective summary of the round, and the link that allowed participants to answer the online survey. Once accessed the link provided in the invitation e-mail, participants were presented with a welcome screen followed by the main screen (Appendix I), presenting the same list of decision aspects as the previous round.

Similarly to the second round, participants were faced with the following statement preceding the list of aspects: “this aspect is relevant to prioritize pathologies to integrate a VBH program in a hospital context.” However, this time, a statistic summary of the results of the second round was provided to the participants. This 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. 

Quantitative, percentage-based results of the third round are provided in Table 4.7

Regarding the panel participation, a response rate of 76% was achieved in the second round and 91% was achieved in the third round, meaning that the dropout rate decreased from 24% in the second round to 9% in the last round.
### Table 4.7: Quantitative, percentual results at the end of the third Web-Delphi round

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Totally disagree</th>
<th>Disagree</th>
<th>Neither agree nor disagree</th>
<th>Agree</th>
<th>Totally agree</th>
<th>Don’t know/ don’t want to answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>National prevalence of the pathology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prevalence of the pathology in the hospital</td>
<td>5%</td>
<td>10%</td>
<td>50%</td>
<td>35%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burden of the pathology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social burden of the pathology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Readmissions associated to the pathology</td>
<td>10%</td>
<td></td>
<td></td>
<td>35%</td>
<td>55%</td>
<td></td>
</tr>
<tr>
<td>Clinical complications associated to the pathology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pathology complexity</td>
<td>5%</td>
<td>5%</td>
<td>15%</td>
<td>75%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagnosis age of the pathology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage of patients considered working</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>population</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human resources requirements</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commitment of the clinical team involved in the</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cycle of treatments of the pathology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human resources preparation for VBH implementation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>National involvement capacity for comparative</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pathology data collection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Availability of ICHOM standard set for the</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pathology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost/Issue</td>
<td>5%</td>
<td>10%</td>
<td>25%</td>
<td>40%</td>
<td>60%</td>
<td>100%</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------</td>
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<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>Costs associated to the normal cycle of care of the pathology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variability in costs associated with the cycle of treatments of the pathology</td>
<td>5%</td>
<td>10%</td>
<td>10%</td>
<td>25%</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>Outcomes variability</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree of attribution of outcomes to clinical care</td>
<td>5%</td>
<td>10%</td>
<td>25%</td>
<td>50%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Burden of PROMs Instruments associated with the pathology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burden of CROs Instruments associated with the pathology</td>
<td>5%</td>
<td>20%</td>
<td>15%</td>
<td>50%</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>Existence of risk-sharing agreements</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Implementation and monitorization costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information systems requirements</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Possibility to face legal barriers</td>
<td>5%</td>
<td>15%</td>
<td>25%</td>
<td>50%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Availability of state-of-the-art technologies to gather evidence associated with the pathology</td>
<td>5%</td>
<td>25%</td>
<td>25%</td>
<td>25%</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>Lack of solid clinical guidelines for the pathology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health impact associated with pathology treatments</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expected number of years the patient will live with the condition</td>
<td>15%</td>
<td>5%</td>
<td>35%</td>
<td>45%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
65% of the 20 participants that had completed the Delphi process had experience in VBH design or implementation, as Figure 4.8 (left) elucidates. Additionally, analyzing Figure 4.8 (right), one also concluded that healthcare professionals group (which includes doctors, nurses and technicians) was the most represented VBH stakeholder group in the third round (with a total of eight participants), followed by insurance companies members and academics/researchers, with three participants each.

Figure 4.8: Third round participants experience in VBH (left); VBH Stakeholder groups represented in the third round (right)

It is also possible to analyze the evolution of responses by aspect from round two to round three (Figure 4.9), being possible to conclude that two aspects presented the most significant 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. As Figure 4.10 elucidates, 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 tough in the case of comments that regards the Diagnostic age of the pathology, some comments have also demonstrated the personal point of view for that particular aspect, with two participants going further and arguing that the pathologies with earlier diagnosis age (children and young people) should be more valued.
Figure 4.9: Modifications in responses from round 2 to round 3
Figure 4.10: Number of comments by aspect
4.2.3 Web-Delphi summary results

The detailed data of the results considering the adopted decision rules (subchapter 3.3.4) are synthesized in Appendix J. 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 a group agreement. These aspects were not eliminated as it was decided to instead 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.

An analysis of the answers by the stakeholder group is also interesting to conduct as it allows us to analyze if there is a pattern of response or a particular interest in a specific aspect within a stakeholder group. Figure 4.1 and Figure 4.2 illustrate the distribution of answers by Likert scale level, discriminated by stakeholder group, on a criterion that reached a considerable agreement (Burden of the pathology, Figure 4.11) and a criterion that did not reach agreement (Burden of PROMs instruments associated with the pathology, Figure 4.12).
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 (Appendix K).

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 (referred in the *pathology complexity* description in Table 4.2).
- 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. This interview resulted the conclusions summarized in Table 4.8.

Table 4.8: Conclusions of the interview with an expert regarding the aspects that did not reach agreement

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Expert judgement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Availability of ICHOM standard set for the pathology</td>
<td>This criterion is important, but not fundamental. The existence of a measurement standard (which guarantees global adhesion) allows the possibility of benchmark in the future. Without parallelism in the measurement of outcome outcomes and the respective risk factors in the analysis, there will be capacity for analysis, but comparison of results and / or population management based on these data will be anything but a linear exercise. Bearing this in mind, there are still countless positive aspects in measuring outcomes in a systematic way for pathologies without a standard set.</td>
</tr>
<tr>
<td>Outcomes variability</td>
<td>This aspect seems redundant with the VBH methodology: one only knows if exists variability in outcomes if one measures it. As such, it is something that occurs a posteriori, and should not be maintained at this phase</td>
</tr>
<tr>
<td>Burden of PROMs</td>
<td>If there are &quot;digital&quot; systems that can facilitate this collection, this criteria is not fundamental.</td>
</tr>
<tr>
<td>Existence of risk-sharing agreements</td>
<td>The measurement of outcomes and the respective analysis / decision on results is something that should lead to the existence of agreements /contracts based on risk sharing. In any case, this is still a step that lacks maturity in the VBH model for several stakeholders. As such, it is also not a fundamental criterion.</td>
</tr>
<tr>
<td>Information requirements systems</td>
<td>This criterion should be maintained. Although it is not an eliminatory factor, the need for information systems should not be neglected. A program for monitoring and evaluating clinical and patient outcomes that works without IT requirements (information storage, integration with electronic clinical process, data analysis tools, etc.), increases the complexity. On the other hand, if we want to fulfill both parts of the value equation, there is no way to analyze costs by clinical pathway without the support of IT tools.</td>
</tr>
</tbody>
</table>
One can summarize the whole analysis that conducted to this final value tree in the flowchart illustrated in Figure 4.13.

![Flowchart](image)

Figure 4.13: Flowchart of the analysis on the list of aspects after the Web-Delphi process

Considering the final list of evaluation criteria presented, an initial division was made according to areas of concern:

- Prevalence of the pathology, which included the *National Prevalence of the pathology* and the *Prevalence of the pathology in the hospital*.
- Burden of the pathology, which included the *Burden of the pathology* and the *Social burden of the pathology*. 
• Quality and efficiency of care, which included all the criteria that characterize the current provided care related to the pathology. These aspects include the \textit{Outcomes association with clinical results} aspects, \textit{Cycle of treatment costs}, \textit{Clinical complications} and \textit{Costs variability}.

• Implementation complexities, which included the \textit{Clinical team suitability}, \textit{Availability of digital facilities} and \textit{Burden of CROs instruments} aspects.

• \textit{Implementation and monitorization costs}.

As a result, a value tree with the selected criteria divided by areas of concern and clusters was created and is illustrated in Figure 4.14. The clinical complications has two subcriteria: \textit{complications between the admissions day and the discharge day}, and \textit{complications after the discharge day}. This last subcriteria maintains the idea of the \textit{Readmissions} criteria. However, the later one was reformulated, since we can assume that a readmission is a clinical complication. As such, we opted by cluster these two subcriteria into one single criteria, as they just differ in the time at which the patient suffered the clinical complication. Additionally, \textit{clinical team commitment level} (Commitment of the clinical team involved in the cycle of treatments of the pathology in Delphi survey) and \textit{clinical team training level} (Human resources preparation for VBH implementation in Delphi survey), were grouped into one single criteria: \textit{clinical team suitability}.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{value_tree.png}
\caption{Value tree created using the M-MACBETH software.}
\end{figure}

\footnote{The terms in the value tree were simplified comparing to the original names of the aspects in order to achieve a more appellative visual representation. However, they were kept intuitive to avoid misunderstandings regarding the original names.}
Chapter 5

5. Discussion

The overall objective of this master thesis was to involve and support VBH stakeholders in identifying a set of evaluation aspects that will later allow building a multicriteria model to guide a prioritisation process of pathologies to be covered by a VBH plan. The CVM framework was selected with the objective of involving a multidisciplinary group of stakeholders in a collaborative environment, aiming that the identified set of criteria reflects the broad perspective of VBH stakeholders in Portugal. This chapter aims to interpret the main findings and contributes of this study, present the major strengths and limitations of the developed methodology, and provide suggestions for the future work to be developed under this topic.

5.1 Interpretation of the main findings and contributions for the VBH context in Portugal

- The multidisciplinarity 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—healthcare professionals, policy-makers, health technology industry, patient associations members, hospital managers/administrators, insurance companies members, clinical information managers, academics and researchers and health law experts—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

In this study, the level of agreement was used rather than consensus to reject or approve an aspect, based on the decision rules adopted. Since there is no unanimity on what percentage of participant responses constitutes an acceptable level of agreement, these rules were decided by the facilitation team according to this study context and objectives. 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 has 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. Within this study context, 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. It is our understanding that, the greater the extent of the set of final evaluation criteria, the greater the implementation complexity of the future model. Still, conducting a final DC would also be 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 between individuals. In aspects that did not reach agreement- on which the opinions naturally varied the most- we have verified that these variance also occurred due to a significant variance of opinion between members of a single stakeholder group (intra-group variance), and not due to inter-group variance. Indeed, 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. This may happen due to the novelty of the VBH model, particularly on what regards to implementation strategies. However, regardless the level of agreement achieve, it is worth to highlight the influence that VBH delivery model can potentially have in the current healthcare market, with 46% of the respondents stating that the model will have some influence, 32% answered it would have quite influence, and 18% answered that the influence would 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, particularly to what concerns to implementation strategies.

- **Stakeholders opinion change**

The main characteristic of a Delphi process is to allow participants to change their opinion after considering the perspectives of the remaining participants. As such, it is important to analyse 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. This happened on the following aspects: human resources requirements (from 69% Agree+Totally Agree in round 2 to 80% in round 3); lack of solid clinical guidelines for the pathology (68% to 75%); and expected number of years that the patient will live with the condition (68% to 80%). However, we could not find a 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, albeit its status- Agreement/No agreement- was not modified with this change of opinions) 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 may assume that this Delphi process was successful as it enabled the change of opinions of participants between rounds, but we did not find a significant indication that the existence of an open space to justify the responses was an efficient method to improve agreement. However, despite we have searched for a possible influence between the existence of an open space and an agreement, it is important to mention that we did not designed any study to analyze it and go further into this topic.
• Final set of criteria

The final set of criteria has a total of 14 evaluation criteria split by five areas of concern: prevalence, burden, quality and efficiency of care, implementation complexities and implementation and monitorization costs. It was observed a substantial agreement in what regards to criteria belonging to burden and prevalence areas of concern (starting on 85% of agreement) which may indicate that what stakeholders valued the most was the burden of the disease and in what extent does the disease currently affects the population. Other aspects, for example, the ones concerning the complexity of the implementation, were not so valued by the stakeholders.

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 do not seem to imply a very complex implementation. Comparing our final set with the one from Rodrigues [16] work, ours is slightly more extensive, as it has 14 criteria instead of the 10 of the previous work. Furthermore, we have included some other areas of concern. For example, it is now considered some important social impacts of the pathology beyond the clinical burden, and implementation complexities such as the clinical team commitment and training level or the existence of data registering platforms are also considered in our final set. On the other hand, some aspects present in the prior work were considered not sufficiently important to be present in the final set, such as the availability of ICHOM standard set or the burden of PROM instruments. Overall, we consider that the development of a more inclusive work has given rise to a more complete- yet equally credible and enforceable- set of criteria to prioritize pathologies to integrate a VBH program in a hospital context.

5.2 Strengths and Limitations

The present study aimed to be an initial exploratory step to form a solid basis for the construction of a multicriteria model. Being an innovative study, some difficulties were faced as there is no extensive literature available on this thematic. As far as we know, this is the first study in which a participatory approach was employed as part of the selection process to set up a comprehensive list of aspects relevant to prioritize pathologies to integrate a VBH program in a hospital context.

Across the Web Delphi process, the response rate achieved over three rounds exceeded our expectations. 30% of the invited stakeholders accepted to take part in our study and has participated in the first round. From the first round to the second one, the drop-out was approximately 24%, whereas from the second to the third round, the drop-out decreased to 9%. 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. It allowed the participants to answer the survey whenever- and wherever- they wanted to, which has probability increased the response rate and the continuity of participants in the process along the three rounds. Additionally, the use of reminders and personal contacts has proven to be a very
efficient method to increase the response rate. Indeed, we have verified a substantial increase in the responses immediately after reminders, and personal contacts were sent.

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 precisely 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, it is worth to mention that the final value tree only contains criteria that obey to the following conditions: 1) was not rejected after the whole Web-Delphi process; 2) when an agreement was not achieved, it was considered by the expert that it should be present in the final set; 3) obey to a set of properties needed for an aspect of being suitable for application in a multicriteria model. There were aspects that gathered very interesting points of view but were excluded by the facilitation team because they were very difficult to apply in the model (for example, because they were hardly measurable). Ideally, the analysis of the aspects that did not reach agreement should have been done by a group of experts in the DC rather by a single expert.

Indeed, the biggest limitation of this study is the lack of the final decision conferencing. This final step could have made a very important validation of all the steps performed. For example, the facilitation team has eliminated some aspects from the final list because it find them too difficult to measure to be implemented in a multicriteria model. In this particular case, the decision conferencing could have been useful as the members could have been find a solution to overcome this difficulty, and the aspects could have remained in the final list.

5.3 Conclusions and Future Work

This work was successful in providing a set of suitable criteria to be applied in a future multicriteria model. Indeed, we consider that the final set of evaluation criteria is concise and credible to prioritize pathologies to integrate a VBH program in a hospital context, 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. Furthermore, it has also reaffirmed the usefulness of web-based platforms in the use of Delphi process and its monitoring.

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.

References

15. José de Mello Saúde (2018) Relatório da Qualidade e Segurança Clínica
20. Porter, Michael E., Clemens Guth and EMD" The West German Headache Center: Integrated Migraine Care (TN)
24. Kelleher SA, Somers TJ, Locklear T AA Using Patient Reported Outcomes in Oncology Clinical Practice


40. Belton V, Stewart TJ (2002) Multiple Criteria Decision Analysis


60. Linstone H., Turoff M (1975) The Delphi Method: Techniques and Applications


62. Keeney S, Hasson F, McKenna H The Delphi Technique in Nursing and Health Research


## Appendix A- Examples of Delphi applications in healthcare field

*Table A.1: Some examples of studies which applied the Delphi method application in the healthcare research field*

<table>
<thead>
<tr>
<th>Study</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>McIlfatrick &amp; Keeney [74]</td>
<td>Setting priorities in cancer research.</td>
</tr>
<tr>
<td>Grundy&amp;Ghazi [75]</td>
<td>Setting priorities in haemato-oncology nursing.</td>
</tr>
<tr>
<td>Wynaden et al. [76]</td>
<td>Setting priorities for mental health nursing research.</td>
</tr>
<tr>
<td>Jorm et al. [77]</td>
<td>Reaching consensus regarding self-help strategies for sub-threshold depression.</td>
</tr>
<tr>
<td>Mokkink et al. [78]</td>
<td>Reaching consensus regarding standards for the evaluation of measurement properties of instruments to measure health status</td>
</tr>
</tbody>
</table>
## Appendix B- Review of some MCDA studies in Healthcare

<table>
<thead>
<tr>
<th>Study</th>
<th>Type of decision</th>
<th>Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Madhavan et al. (2012)</td>
<td>Priority setting</td>
<td>Development of a framework to assist and inform vaccine prioritization efforts, both in their development and introduction to the market.</td>
</tr>
<tr>
<td>Youngkong et al. (2012)</td>
<td>Coverage</td>
<td>Include health interventions in the universal health coverage benefit package.</td>
</tr>
<tr>
<td>Glassman et al. (2016)</td>
<td>Priority setting</td>
<td>Development of priority-setting processes for expensive treatments in cardiometabolic diseases.</td>
</tr>
<tr>
<td>Dolan et al. (2012)</td>
<td>Value measurement</td>
<td>Ascertain patient preferences regarding colorectal cancer screening</td>
</tr>
<tr>
<td>Aletha et al. (2010)</td>
<td>Disease classification</td>
<td>Define classification criteria for rheumatoid arthritis</td>
</tr>
<tr>
<td>Radaelli et al. (2014)</td>
<td>HTA</td>
<td>Regulate the introduction of new technologies in Lombardia</td>
</tr>
<tr>
<td>Marsh et al. (2012)</td>
<td>Investment</td>
<td>Prioritizing investments in public health: English NHS case study</td>
</tr>
<tr>
<td>Van Wijk et al. (2012)</td>
<td>Performance measurement</td>
<td>Scoring alternative antihypertensive drugs</td>
</tr>
</tbody>
</table>
## Appendix C- Review of some studies which used participatory methods

*Table C.1: Review of some studies which used a participatory method*

<table>
<thead>
<tr>
<th>Study</th>
<th>Area</th>
<th>Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bana e Costa et al. (2014)</td>
<td>Public administration</td>
<td>Development of a methodology to support the department of social development and human rights of Pernambuco.</td>
</tr>
<tr>
<td>Henderson et al., 2013</td>
<td>Food regulation</td>
<td>Involve the general population in decision making regarding food regulation measures.</td>
</tr>
<tr>
<td>Hamdy et al. (2019)</td>
<td>Healthcare</td>
<td>Explore pediatric nurses’ perceptions of their role in antimicrobial stewardship.</td>
</tr>
<tr>
<td>Krueger et al. (2017)</td>
<td>Environment</td>
<td>Development of a process for evaluating proposed ecosystem restoration projects to improve survival of juvenile salmon in the Columbia River estuary.</td>
</tr>
<tr>
<td>(Vidal et al., 2011)</td>
<td>Project management</td>
<td>Define a measure of project complexity</td>
</tr>
</tbody>
</table>
Appendix D- 1st round invitation e-mail template

Exmo(a) Senhor(a),

O Value-Based Healthcare (VBH) é um conceito relativamente recente, mas já com algumas aplicações em contexto hospitalar em Portugal.

A sua adoção para todas as patologias tem de ser gradual face aos recursos limitados de um hospital. É, pois, necessário priorizar as patologias a integrar num programa de VBH. Não havendo na literatura indicação clara sobre os aspetos a considerar para priorizar patologias, este trabalho tem como objetivo identificar esses aspetos, através de um processo participativo alargado aos diferentes atores-chave na área da saúde em Portugal. Para tal, realizar-se-á um processo Delphi que consiste numa sucessão de rondas de recolha anónima de opiniões individuais dos participantes, através do preenchimento de questionários online. Inicialmente, será proposta uma lista de aspetos para análise pelos participantes, que poderão indicar novos aspetos que entenda dever ser considerados. A lista inicial acrescida das eventuais sugestões será a base para o desenvolvimento do questionário individual sobre a concordância ou discordância com a relevância de cada aspeto. Para que as opiniões vão convergindo, depois de cada ronda os participantes recebem uma estatística da ronda anterior, face à qual cada um pode rever, ou manter, a opinião antes expressa. Estima-se em cerca de 10 minutos o tempo necessário para preencher o questionário em cada ronda e pretende-se realizar três rondas para avaliar a convergência das respostas. O questionário referente à primeira ronda estará disponível pelo período de duas semanas, dando liberdade para responder de acordo com a sua própria disponibilidade. Para iniciar a sua resposta ao primeiro questionário, por favor siga o link: [link do questionário].

Se é a sua primeira participação num questionário Welphi, ser-lhe-á solicitado que crie uma nova senha para que possa aceder a este, ou a quaisquer outros questionários em que seja convidado a participar. Sempre que quiser aceder ao seu questionário deverá seguir o link acima e utilizar o seu endereço de e-mail [endereço do participante] e a senha recém-criada para entrar.


No caso de ter alguma questão relativa a este estudo, pode contactar-me através do endereço: beatrizmlopes@tecnico.ulisboa.pt.

Com os melhores cumprimentos,

Beatriz Lopes
Appendix E- Web-Dephi 1st round screens

Bem-vindo(a)

Bem-vindo(a) à primeira ronda deste processo Delphi que tem como objetivo identificar quais são os aspetos que devem ser considerados na priorização de patologias a integrar um programa de Value-Based Healthcare (VBH) em contexto hospitalar.

Ao clicar em “Continuar”, será direcionado para uma página de instruções sobre como participar neste processo.

Figure E.1: Web-Delphi 1st round welcome screen
Bem-vindo(a)

Instruções


Segue-se um breve questionário em que lhe será pedida informação demográfica e de opinião relativamente ao contexto VBH. Note que a informação aqui recolhida será mantida confidencial e tem apenas como objetivo auxiliar na análise dos dados recolhidos.

Ao clicar em “Guardar e avançar”, será apresentada uma lista com uma proposta de aspetos a considerar na priorização de patologias a integrar um programa de VBH. Ao clicar no botão “Olho” terá acesso a uma breve descrição de cada um dos aspetos.

No mesmo ecrã, ao clicar em “Adicionar aspeto”, poderá acrescentar, à luz da sua experiência e conhecimento, algum aspeto em falta na lista apresentada. Poderá também tecer comentários relativamente a cada um dos aspetos, ao clicar em “Comentar”. Quer opine, ou não, por acrescentar algum aspeto, clique em “Continuar” para terminar o questionário.

Poderá submeter as suas respostas até ao dia 16 de agosto de 2019.

Caso tenha alguma questão, por favor contacte-nos através do e-mail: beatrizmlopes@tecnico.ulisboa.pt.

Table E.2: Web-Delphi 1st round instructions screen.
CONSENTIMENTO INFORMADO

1) Conordo em fazer parte do estudo "Como priorizar patologias a integrar um programa de Value-Based Healthcare?".
2) Compreendo que a participação neste estudo é voluntária e que posso abandonar o mesmo a qualquer momento.
3) Compreendo que os meus dados irão ser utilizados em formato anónimo e que o meu nome não será referenciado em qualquer tese de mestrado ou publicação resultante deste estudo.
4) Compreendo o significado das afirmações anteriores.

Figure E.3: Web-Delphi 1st round consent form screen
Figure E.4: Web-Delphi 1st round personal data screen
Figure E.5: Web-Dephi 1st round main screen

Aspetos VBH

Considere a seguinte lista de aspetos potencialmente relevantes para priorizar patologias a integrar um programa de VBH em contexto hospitalar:

<table>
<thead>
<tr>
<th>Aspeto</th>
<th>Descrição</th>
<th>Comentar</th>
<th>Editar</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Prevalência da patologia a nível nacional</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Prevalência da patologia no hospital</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Peso da patologia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Complicações clínicas associadas à patologia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Readmissões associadas à patologia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Disponibilidade de normas ICHOM para a patologia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Ausência de sólidas normas clínicas para a patologia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Carga dos instrumentos associados à recolha de PROMs da patologia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Carga dos instrumentos associados à recolha de CROs da patologia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Compromisso da equipe clínica envolvida no ciclo de tratamentos de patologia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 Existência de tecnologias de ponta no processo de recolha de evidências da patologia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Requisitos exigidos ao nível de recursos humanos</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 Requisitos exigidos ao nível dos sistemas de informação</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 Possibilidade de enfrentar obstáculos legais</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 Custos associados ao normal ciclo de tratamentos da patologia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 Custos globais de implementação e monitorização</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17 Existência de acordos de partilha de risco</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Agradecemos a sua disponibilidade.

Voltaremos ao seu contacto a partir de 02 de setembro de 2019 para a segunda ronda deste processo Delphi. Ao participar na segunda ronda irá visualizar a lista de aspectos proposta nesta ronda acrescida das eventuais sugestões de todos os participantes. Essa nova lista será a base do questionário da segunda ronda— a primeira ronda fechada deste processo Delphi, onde vamos solicitar o seu nível de concordância, ou discordância, com a relevância de cada aspeto para priorizar patologias a integrar um programa de VBH em contexto hospitalar.

Se tiver alguma questão, por favor contacte-nos através do e-mail: beatrizlopes@tecnico.ulisboa.pt.

Com os melhores cumprimentos,

A equipa responsável pelo estudo

Figure E.6: Web-Delphi 1st round final screen
Appendix F- 2nd round invitation e-mail template

Exmo.(a) Senhor(a),

Encontra-se disponível o questionário referente à segunda ronda Delphi do estudo "Como priorizar patologias para integrar um programa de Value-Based Healthcare?".

Nesta segunda ronda (a primeira ronda fechada do processo), terá acesso à lista de aspetos apresentada na primeira ronda, acrescida das sugestões dadas pelos participantes. Importa realçar que nem todos os aspetos acrescentados na ronda anterior foram inseridos nesta nova lista, uma vez que - apesar da sua pertinência - nem todos são possíveis de ser incluídos dada a fase de investigação em que ainda se encontra o modelo Value-Based Healthcare (VBH).

Face à nova lista de aspetos, ser-lhe-á pedido que especifique o seu nível de concordância, ou discordância, com a relevância de cada aspeto na priorização de patologias a integrar um programa de VBH em contexto hospitalar.

O questionário estará disponível até ao dia 16 de setembro de 2019.

Para iniciar a sua resposta, por favor siga o link abaixo:

Link de acesso: [Link do questionário]

Para aceder ao questionário deverá utilizar o endereço de e-mail [endereço do participante] e a senha por si criada na primeira ronda.

Se não tiver participado na primeira ronda, ser-lhe-á solicitado que crie uma nova senha para que se possa registar e assim aceder a este questionário.

Caso tenha alguma questão, pode contactar-nos através do e-mail: beatrizmlopes@tecnico.ulisboa.pt.

Com os melhores cumprimentos,

A equipa responsável pelo estudo
### Appendix G - 2\textsuperscript{nd} round results

*Table G.1: Quantitative, percentual results after the second Web-Delphi round*

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Totally disagree</th>
<th>Disagree</th>
<th>Neither agree nor disagree</th>
<th>Agree</th>
<th>Totally agree</th>
<th>Don’t know/ don’t want to answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>National prevalence of the pathology</td>
<td></td>
<td></td>
<td></td>
<td>5%</td>
<td>32%</td>
<td>64%</td>
</tr>
<tr>
<td>Prevalence of the pathology in the hospital</td>
<td></td>
<td>9%</td>
<td>9%</td>
<td>45%</td>
<td>36%</td>
<td></td>
</tr>
<tr>
<td>Burden of the pathology</td>
<td></td>
<td></td>
<td></td>
<td>36%</td>
<td>64%</td>
<td></td>
</tr>
<tr>
<td>Social burden of the pathology</td>
<td></td>
<td></td>
<td></td>
<td>14%</td>
<td>27%</td>
<td>59%</td>
</tr>
<tr>
<td>Readmissions associated to the pathology</td>
<td></td>
<td>9%</td>
<td>9%</td>
<td>36%</td>
<td>45%</td>
<td></td>
</tr>
<tr>
<td>Clinical complications associated to the pathology</td>
<td></td>
<td>5%</td>
<td>9%</td>
<td>27%</td>
<td>59%</td>
<td></td>
</tr>
<tr>
<td>Pathology complexity</td>
<td></td>
<td>9%</td>
<td>18%</td>
<td>55%</td>
<td>18%</td>
<td></td>
</tr>
<tr>
<td>Diagnosis age of the pathology</td>
<td></td>
<td>5%</td>
<td>18%</td>
<td>18%</td>
<td>45%</td>
<td>14%</td>
</tr>
<tr>
<td>Percentage of patients considered working population</td>
<td></td>
<td>5%</td>
<td>14%</td>
<td>18%</td>
<td>41%</td>
<td>23%</td>
</tr>
<tr>
<td>Human resources requirements</td>
<td></td>
<td>5%</td>
<td>14%</td>
<td>9%</td>
<td>55%</td>
<td>14%</td>
</tr>
<tr>
<td>Commitment of the clinical team involved in the cycle of treatments of the pathology</td>
<td></td>
<td></td>
<td></td>
<td>14%</td>
<td>9%</td>
<td>41%</td>
</tr>
<tr>
<td>Human resources preparation for VBH implementation</td>
<td></td>
<td>5%</td>
<td>5%</td>
<td>14%</td>
<td>41%</td>
<td>36%</td>
</tr>
<tr>
<td>National involvement capacity for comparative pathology data collection</td>
<td></td>
<td>5%</td>
<td>5%</td>
<td>32%</td>
<td>23%</td>
<td>36%</td>
</tr>
<tr>
<td>Availability of ICHOM standard set for the pathology</td>
<td></td>
<td>5%</td>
<td>9%</td>
<td>32%</td>
<td>36%</td>
<td>14%</td>
</tr>
<tr>
<td>Costs associated to the normal cycle of care of the pathology</td>
<td></td>
<td>5%</td>
<td>9%</td>
<td>50%</td>
<td>36%</td>
<td></td>
</tr>
<tr>
<td>Risk Factor</td>
<td>5%</td>
<td>9%</td>
<td>9%</td>
<td>27%</td>
<td>50%</td>
<td>5%</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>Variability in costs associated with the cycle of treatments of the pathology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outcomes variability</td>
<td>9%</td>
<td>23%</td>
<td>14%</td>
<td>50%</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>Degree of attribution of outcomes to clinical care</td>
<td>5%</td>
<td>5%</td>
<td>9%</td>
<td>45%</td>
<td>23%</td>
<td>14%</td>
</tr>
<tr>
<td>Burden of PROMs Instruments associated with the pathology</td>
<td>5%</td>
<td>18%</td>
<td>23%</td>
<td>41%</td>
<td>9%</td>
<td>5%</td>
</tr>
<tr>
<td>Burden of CROs Instruments associated with the pathology</td>
<td>5%</td>
<td>18%</td>
<td>14%</td>
<td>45%</td>
<td>14%</td>
<td>5%</td>
</tr>
<tr>
<td>Existence of risk-sharing agreements</td>
<td>5%</td>
<td>36%</td>
<td>36%</td>
<td>18%</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Implementation and monitorization costs</td>
<td>5%</td>
<td>18%</td>
<td>55%</td>
<td>23%</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Information systems requirements</td>
<td>5%</td>
<td>27%</td>
<td>45%</td>
<td>18%</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Possibility to face legal barriers</td>
<td>5%</td>
<td>14%</td>
<td>23%</td>
<td>45%</td>
<td>5%</td>
<td>9%</td>
</tr>
<tr>
<td>Availability of state-of-the-art technologies to gather evidence associated with the pathology</td>
<td>5%</td>
<td>25%</td>
<td>25%</td>
<td>25%</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>Lack of solid clinical guidelines for the pathology</td>
<td>9%</td>
<td>9%</td>
<td>9%</td>
<td>50%</td>
<td>18%</td>
<td>5%</td>
</tr>
<tr>
<td>Health impact associated with pathology treatments</td>
<td>5%</td>
<td>5%</td>
<td>27%</td>
<td>55%</td>
<td>9%</td>
<td></td>
</tr>
<tr>
<td>Expected number of years the patient will live with the condition</td>
<td>14%</td>
<td>14%</td>
<td>32%</td>
<td>36%</td>
<td>5%</td>
<td></td>
</tr>
</tbody>
</table>
Appendix H- 3rd round invitation e-mail template

Exmo(a) Senhor(a),
Encontra-se disponível o questionário referente à terceira ronda Delphi do estudo “Como priorizar patologias para integrar um programa de VBH em contexto hospitalar?”.
Nesta terceira ronda terá acesso à mesma lista de aspetos apresentada na segunda ronda, acompanhada de uma estatística dos resultados da ronda anterior (com as suas respostas destacadas a cinzento), face à qual poderá rever, ou manter, a opinião antes expressa.
O questionário estará disponível até ao dia 29 de setembro de 2019.
Para iniciar a sua resposta, por favor siga o link abaixo:
Link de acesso: [link do questionário]
Para aceder ao questionário deverá utilizar o seu endereço de e-mail @ [e-mail do participante] e a senha por si criada na primeira ronda.
Caso tenha alguma questão, pode contactar-nos através do e-mail: beatrizmlopes@tecnico.ulisboa.pt
Com os melhores cumprimentos,
A equipa responsável pelo estudo
# Appendix I - Web-Delphi 3\textsuperscript{rd} round screens

![Web-Delphi 3\textsuperscript{rd} round main screen](image)

Figure I.1: Web-Delphi 3\textsuperscript{rd} round main screen


**Appendix J- Final results**

*Table J.1.* Results considering the application of the decision rules. TD&D: Percentage of the sum of the Totally disagree and Disagree answers; TA&A: Percentage of the sum of the Totally agree and Agree answers. The last column represents the decision- approved, rejected or No agreement- after the application of the decision rules.

<table>
<thead>
<tr>
<th>Aspect</th>
<th>TD&amp;D</th>
<th>Neither agree nor disagree</th>
<th>TA&amp;A</th>
<th>Don’t know/don’t want to answer</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>National prevalence of the pathology</td>
<td>5%</td>
<td>95%</td>
<td>95%</td>
<td>Approved</td>
<td></td>
</tr>
<tr>
<td>Prevalence of the pathology in the hospital</td>
<td>5%</td>
<td>10%</td>
<td>85%</td>
<td>Approved</td>
<td></td>
</tr>
<tr>
<td>Burden of the pathology</td>
<td>10%</td>
<td>100%</td>
<td></td>
<td>Approved</td>
<td></td>
</tr>
<tr>
<td>Social burden of the pathology</td>
<td>10%</td>
<td>90%</td>
<td></td>
<td>Approved</td>
<td></td>
</tr>
<tr>
<td>Readmissions associated to the pathology</td>
<td>10%</td>
<td>90%</td>
<td></td>
<td>Approved</td>
<td></td>
</tr>
<tr>
<td>Clinical complications associated to the pathology</td>
<td>5%</td>
<td>5%</td>
<td>90%</td>
<td>Approved</td>
<td></td>
</tr>
<tr>
<td>Pathology complexity</td>
<td>5%</td>
<td>5%</td>
<td>90%</td>
<td>Approved</td>
<td></td>
</tr>
<tr>
<td>Diagnosis age of the pathology</td>
<td>25%</td>
<td>15%</td>
<td>60%</td>
<td>No agreement</td>
<td></td>
</tr>
<tr>
<td>Percentage of patients considered working population</td>
<td>15%</td>
<td>15%</td>
<td>70%</td>
<td>No agreement</td>
<td></td>
</tr>
<tr>
<td>Human resources requirements</td>
<td>10%</td>
<td>5%</td>
<td>80%</td>
<td>5%</td>
<td>Approved</td>
</tr>
<tr>
<td>Commitment of the clinical team involved in the cycle of treatments</td>
<td>10%</td>
<td>10%</td>
<td>80%</td>
<td>Approved</td>
<td></td>
</tr>
<tr>
<td>Human resources preparation for VBH implementation</td>
<td>10%</td>
<td>10%</td>
<td>80%</td>
<td>Approved</td>
<td></td>
</tr>
<tr>
<td>National involvement capacity for comparative pathology data collection</td>
<td>10%</td>
<td>35%</td>
<td>55%</td>
<td>No agreement</td>
<td></td>
</tr>
<tr>
<td>Availability of ICHOM standard set for the pathology</td>
<td>15%</td>
<td>25%</td>
<td>60%</td>
<td>5%</td>
<td>No agreement</td>
</tr>
<tr>
<td>Costs associated to the normal cycle of care of the pathology</td>
<td>5%</td>
<td>10%</td>
<td>85%</td>
<td></td>
<td>Approved</td>
</tr>
<tr>
<td>Variability in costs associated with the cycle of treatments of the pathology</td>
<td>15%</td>
<td>10%</td>
<td>75%</td>
<td></td>
<td>Approved</td>
</tr>
<tr>
<td>Outcomes variability</td>
<td>10%</td>
<td>25%</td>
<td>65%</td>
<td></td>
<td>No agreement</td>
</tr>
<tr>
<td>Degree of attribution of outcomes to clinical care</td>
<td>10%</td>
<td>10%</td>
<td>80%</td>
<td></td>
<td>Approved</td>
</tr>
<tr>
<td>Burden of PROMs Instruments associated with the pathology</td>
<td>25%</td>
<td>15%</td>
<td>60%</td>
<td></td>
<td>No agreement</td>
</tr>
<tr>
<td>Burden of CROs Instruments associated with the pathology</td>
<td>25%</td>
<td></td>
<td>75%</td>
<td></td>
<td>Approved</td>
</tr>
<tr>
<td>Existence of risk-sharing agreements</td>
<td>5%</td>
<td>35%</td>
<td>60%</td>
<td></td>
<td>No agreement</td>
</tr>
<tr>
<td>Implementation and monitorization costs</td>
<td></td>
<td>15%</td>
<td>85%</td>
<td></td>
<td>Approved</td>
</tr>
<tr>
<td>Information systems requirements</td>
<td>5%</td>
<td>30%</td>
<td>65%</td>
<td></td>
<td>No agreement</td>
</tr>
<tr>
<td>Possibility to face legal barriers</td>
<td>20%</td>
<td>25%</td>
<td>50%</td>
<td>5%</td>
<td>No agreement</td>
</tr>
<tr>
<td>Availability of state-of-the-art technologies to gather evidence associated with the pathology</td>
<td>30%</td>
<td>25%</td>
<td>45%</td>
<td></td>
<td>Rejected</td>
</tr>
<tr>
<td>Lack of solid clinical guidelines for the pathology</td>
<td>15%</td>
<td>10%</td>
<td>75%</td>
<td></td>
<td>Approved</td>
</tr>
<tr>
<td>Health impact associated with pathology treatments</td>
<td>5%</td>
<td>5%</td>
<td>90%</td>
<td></td>
<td>Approved</td>
</tr>
<tr>
<td>Expected number of years the patient will live with the condition</td>
<td>15%</td>
<td>5%</td>
<td>80%</td>
<td></td>
<td>Approved</td>
</tr>
</tbody>
</table>
## Appendix K - Comments provided by the participants

*Table K-1: Comments provided by the participants and associated classifications and actions*

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Time of generation</th>
<th>Stakeholder group</th>
<th>Round</th>
<th>Judgement</th>
<th>Comment</th>
<th>Classification</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevalence of the pathology in the hospital</td>
<td>Proposed</td>
<td>Insurers</td>
<td>2</td>
<td>Agree</td>
<td>Yes, as long as it is a relevant condition or an alternative with a significant impact on quality of life or cost-effectiveness. This may be very important for referral centers</td>
<td>Classification</td>
<td>No actions resulted from this comment</td>
</tr>
<tr>
<td>Burden of the pathology</td>
<td>Proposed</td>
<td>Academics</td>
<td>2</td>
<td>Totally agree</td>
<td>Redundancy with national prevalence of the pathology</td>
<td>Redundancy</td>
<td>After analysis, it was considered non-redundant with no actions being taken</td>
</tr>
<tr>
<td>Social burden of the pathology</td>
<td>New</td>
<td>Patient Associations</td>
<td>2</td>
<td>Totally agree</td>
<td>This heading should include the costs of sick leave, absence from work, absence from school (non-productivity measurement), incapacity for work and consequent disability or disability benefit.</td>
<td>Clarification</td>
<td>The description of the aspect “social burden of the pathology” was refined based on this suggestion</td>
</tr>
<tr>
<td>Complications associated to the pathology</td>
<td>Proposed</td>
<td>Academics</td>
<td>2</td>
<td>Neither agree nor disagree</td>
<td>I think the clinical complexity of the pathology is already captured in the ‘burden of the pathology’ and / or the costs associated with the pathology</td>
<td>Redundancy</td>
<td>Given the provided descriptions, the facilitation team did not find any redundancy between the aspect, “complexity of the pathology” and the aspect 1) “burden of the pathology” and 2) costs associated with the pathology. However, considering the participants’ concern, the aspect description was refined and it was included in the “value</td>
</tr>
<tr>
<td>Complications associated to the pathology</td>
<td>Proposed</td>
<td>Academics</td>
<td>2</td>
<td>Neither agree nor disagree</td>
<td>I believe that complications and complexity if they are really important in terms of consequences will already be captured in the burden of the pathology. Complexity also tends to be associated with higher cost, but this will also be reflected in the cost criterion.</td>
<td>Redundancy</td>
<td></td>
</tr>
<tr>
<td>Complexity of the pathology</td>
<td>Proposed</td>
<td>Academics</td>
<td>2</td>
<td>Neither agree nor disagree</td>
<td>I think the impact of pathology complexity is already captured on the 'burden of pathology' and on the costs associated with the pathology.</td>
<td>Redundancy</td>
<td>Given the provided descriptions, the facilitation team did not find any redundancy between the aspect, “complexity of the pathology” and the aspect 1) “burden of the pathology” and 2) costs associated with the pathology. However, considering the participants’ concern, the aspect description was refined, and it was included in the “value measurement complexity” aspect</td>
</tr>
<tr>
<td>Complexity of the pathology</td>
<td>Proposed</td>
<td>Patient Associations</td>
<td>2</td>
<td>Disagree</td>
<td>It matters if profit is high for this complexity, not the complexity per se</td>
<td>Justification</td>
<td>No action resulted from this comment</td>
</tr>
<tr>
<td>Complexity of the pathology</td>
<td>Proposed</td>
<td>Healthcare professionals</td>
<td>2</td>
<td>Totally agree</td>
<td>Greater complexity should lead to higher prioritization</td>
<td>Justification</td>
<td>No action resulted from this comment</td>
</tr>
<tr>
<td>Complexity of the pathology</td>
<td>Proposed</td>
<td>Healthcare professionals</td>
<td>2</td>
<td>Disagree</td>
<td>At an early stage of implementing a VBH program it will be important to get quick wins that galvanize stakeholders and broaden the adherent base. Complex pathologies, whose value attributed to health obtained through treatment is...</td>
<td>Justification</td>
<td>No action resulted from this comment</td>
</tr>
<tr>
<td>Table</td>
<td>Column 1</td>
<td>Column 2</td>
<td>Column 3</td>
<td>Column 4</td>
<td>Column 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagnostic age of the pathology</td>
<td>New Academics</td>
<td>2</td>
<td>Disagree</td>
<td>Given aspects such as “social burden of the pathology”, the age of diagnosis does not bring added value.</td>
<td>Redundancy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagnostic age of the pathology</td>
<td>New Academics</td>
<td>2</td>
<td>Agree</td>
<td>priority for younger ages (fair innings)</td>
<td>Justification</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagnostic age of the pathology</td>
<td>New Patient Associations</td>
<td>2</td>
<td>Totally agree</td>
<td>the pathologies with earlier diagnosis age (children and young people) should be more valued.</td>
<td>Justification</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagnostic age of the pathology</td>
<td>New Healthcare professionals</td>
<td>3</td>
<td>Neither agree nor disagree</td>
<td>Age is not an important factor, although VBH programs make more sense in aging-related pathologies as they are a major cost burden.</td>
<td>Redundancy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage of patients considered active population</td>
<td>New Academics</td>
<td>2</td>
<td>Agree</td>
<td>Even though this suggests some discrimination against older / younger people, the financial sustainability of social status (and hence support for younger and older people) depends on the weight of the working population</td>
<td>Justification</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human resources requirements</td>
<td>Proposed Academics</td>
<td>2</td>
<td>Disagree</td>
<td>In theory, the VBH plan will consider care that is already provided or should be provided and does not require new human resources or specialized human resources beyond what is required as good clinical practice.</td>
<td>Justification</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commitment of the clinical team</td>
<td>Proposed Academics</td>
<td>2</td>
<td>Disagree</td>
<td>From an effectiveness versus efficacy perspective, this aspect is important because it reflects current clinical practice but on the other hand it is an actionable aspect without necessarily involving the use of more resources.</td>
<td>Justification</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The aspect was considered redundant with “social burden of the pathology” and eliminated.

No action resulted from this comment.

No action resulted from this comment.

This aspect was considered redundant with “social burden of the pathology” and eliminated.
<p>| Human resources preparation for the implementation of the VBH plan in the pathology | New | Academics | 2 | Neither agree nor disagree | In a short-term perspective, it is relevant but, once again, it is something that can be changed - different from other structural criteria such as the age of the patients. | Justification | No action resulted from this comment |
| National involvement for the collection of comparative data | New | Academics | 2 | Disagree | This is a not absolutely, especially at an early / implementation stage. | Justification | No action resulted from this comment |
| Availability of ICHOM standard set for the pathology | Proposed | Academics | 2 | Neither agree nor disagree | If these tools did not exist, how would one measure the burden of disease for example? Is it possible to have the first criterion without having this? | Preferential dependence | No action resulted from this comment |
| Availability of ICHOM standard set for the pathology | Proposed | Healthcare professionals | 2 | Disagree | The absence of pathology specific ICHOM standards should not invalidate the introduction of VBH principles. Results based on value to the person go far beyond ICHOM standards and can be created. | Justification | No action resulted from this comment |
| Outcomes variability | New | Healthcare professionals | 2 | Totally agree | The large variability in outcomes underpins the need to understand the process indicators leading to such disparate results, with direct and large impact on citizens' lives. | Justification | No action resulted from this comment |
| Level of attribution of the outcomes to the clinical care | New | Healthcare professionals | 2 | Don’t know/don’t want to answer | This issue of “pathologies whose outcomes are poorly attributable to clinical care as those whose outcomes depend largely on the patient and primary care” is unclear to me. Clinical care goes beyond specific technical procedures to include health education and literacy actions that are critical to results based on value to the person. The value-based outcome equation must | Non understandability | The description of the aspect was refined |</p>
<table>
<thead>
<tr>
<th>Level of attribution of the outcomes to the clinical care</th>
<th>New</th>
<th>Policymakers</th>
<th>2</th>
<th>Don’t know/don’t want to answer</th>
<th>I don’t understand this aspect</th>
<th>Non understandability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burden of the instruments associated to PROMs collection</td>
<td>Proposed</td>
<td>Academics</td>
<td>2</td>
<td>Totally agree</td>
<td>There is redundancy between this indicator and some of the other indicators</td>
<td>Redundancy</td>
</tr>
<tr>
<td>Existence of risk sharing agreements</td>
<td>Proposed</td>
<td>Academics</td>
<td>2</td>
<td>Disagree</td>
<td>It is an interesting aspect and can ‘break’ the choice between pathologies but should not be decisive.</td>
<td>Justification</td>
</tr>
<tr>
<td>Existence of risk sharing agreements</td>
<td>Proposed</td>
<td>Academics</td>
<td>2</td>
<td>Neither agree nor disagree</td>
<td>This seems to me to be more related to the stage at which a pathology should be included in a VBH program. If there is no evidence to be able to adopt the other criteria, then it is not worth considering these pathologies in prioritization exercises</td>
<td>Justification</td>
</tr>
<tr>
<td>Implementation and monitorization costs</td>
<td>Proposed</td>
<td>Academics</td>
<td>2</td>
<td>Neither agree nor disagree</td>
<td>What seems most relevant to me is the weight of these costs in the total costs</td>
<td>Justification</td>
</tr>
<tr>
<td>Information systems requirements</td>
<td>Proposed</td>
<td>Academics</td>
<td>2</td>
<td>Neither agree nor disagree</td>
<td>This is a question of whether or not it is possible to integrate the pathology and what the weight of the total costs is - but I don't see it as a prioritization criterion.</td>
<td>Justification</td>
</tr>
<tr>
<td>Possibility of facing legal barriers</td>
<td>Proposed</td>
<td>Healthcare professionals</td>
<td>2</td>
<td>Don’t know/don’t want to answer</td>
<td>This question seems unclear to me. The legal issues related to the protection of especially sensitive personal data are clearly determined, no different for a VBH system.</td>
<td>Non understandability</td>
</tr>
<tr>
<td>Existence of state-of-the-art technologies in the evidence collection process</td>
<td>Proposed</td>
<td>Academics</td>
<td>2</td>
<td>Disagree</td>
<td>Demand for state-of-the-art technology may delay implementation or make comparability between units difficult.</td>
<td>Justification</td>
</tr>
<tr>
<td>Lack of solid clinical guidelines for the pathology</td>
<td>Proposed</td>
<td>Academics</td>
<td>2</td>
<td>Neither agree nor disagree</td>
<td>In my answer I assumed the outcomes were already known and implicitly implied the adoption of evidence-based medicine.</td>
<td>Justification</td>
</tr>
<tr>
<td>Predicted number of years the patient will live with the condition</td>
<td>New</td>
<td>Academics</td>
<td>2</td>
<td>Neither agree nor disagree</td>
<td>The expected number of years the patient will live with the condition does not add value given other aspects like the “burden of the pathology”.</td>
<td>Preferential dependence</td>
</tr>
</tbody>
</table>