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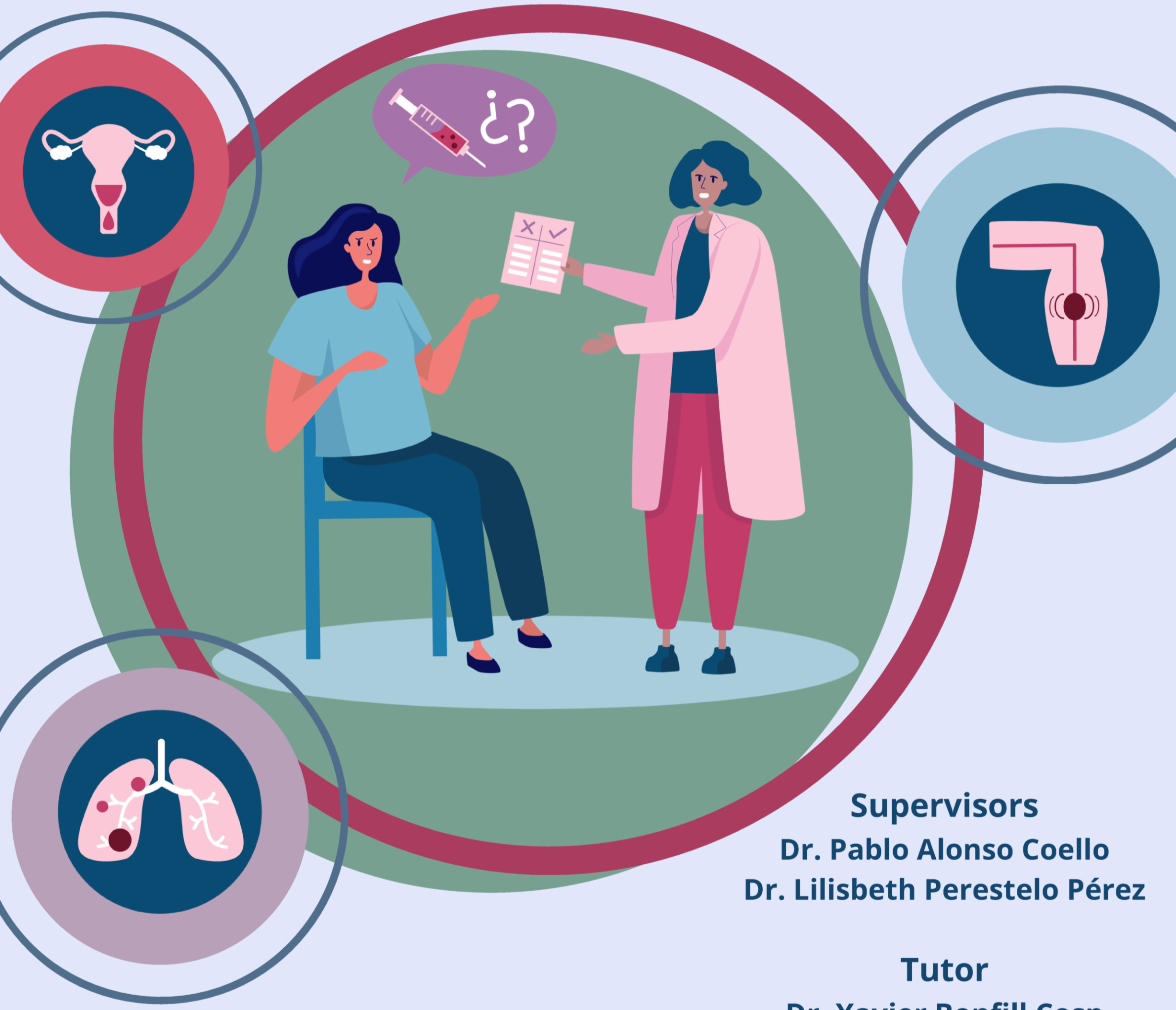
# Shared Decision-Making in health care:
## Thromboprophylaxis during pregnancy

### Doctoral Thesis


**Montserrat León García**



**Supervisors**

**Dr. Pablo Alonso Coello**

**Dr. Lilisbeth Perestelo Pérez**

**Tutor**

**Dr. Xavier Bonfill Cosp**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UAB
Universitat Autònoma de Barcelona

Faculty of Medicine

Department of Paediatrics, Obstetrics, Gynaecology and Preventative Medicine and Public Health

PhD programme in Methodology of Biomedical Research and Public Health

# ABSTRACT

## Background

Venous thromboembolism (VTE) is a leading cause of maternal morbidity and mortality during pregnancy. Low-molecular-weight heparin (LMWH) is commonly recommended for thromboprophylaxis, but its use is associated with significant patient burden. Understanding women's values and preferences (VPs) regarding LMWH is crucial for optimizing shared decision-making (SDM) in clinical practice. Despite the widespread recommendation of LMWH, limited research exists on integrating patient VPs into the decision-making process for thromboprophylaxis during pregnancy.

## Objectives

This thesis aims to: (1) identify and assess the VPs of women regarding LMWH use during pregnancy, and (2) evaluate the effectiveness of a multi-component SDM intervention—the DASH-TOP tool—in facilitating informed decision-making and improving the SDM process for thromboprophylaxis during pregnancy. The goal is to integrate patient VPs into clinical practice, involve patients in an informed decision-making process, and improve decision quality in the SDM encounter.

## Methodology

The research adopts a mixed-methods approach, organized into three studies. The first is a mixed-methods systematic review (SR) of women's VPs on LMWH use during pregnancy. The second study conducts a convergent mixed-methods analysis of data from the DASH-TOP project, focusing on VPs elicitation and the integration of quantitative and qualitative data. The third study, through a convergent parallel mixed-methods design, assesses healthcare professionals' perspectives on the effectiveness of the DASH-TOP intervention using the Decisional Conflict Scale and interviews. This design allows for a comprehensive analysis, integrating qualitative thematic analysis and quantitative measures to capture the complexities of VPs influence in decision-making process, within this context.

## Results

The SR found that women generally perceive the benefits of LMWH prophylaxis to outweigh the inconvenience of daily injections. However, there is significant variability in how women value risks and benefits, particularly among those with higher perceived risk (prior VTE, hormonal-associated factors, or thrombophilia) who are more willing to use LMWH. The analysis of the DASH-TOP tool revealed that incorporating VPs elicitation significantly reduced decisional conflict, with many participants feeling more informed and confident about their choices. The added value of standardized qualitative frameworks to capture context-specific VPs was key to understanding broader patient contexts affecting their preferences. Healthcare professionals reported that the DASH-TOP tool enhanced communication and supported a more patient-centered care process. Challenges remained in fully integrating patient VPs, particularly in conveying complex information about VTE risks and health state evaluations with contextual factors, in both clinical practice and research.

## Conclusions

This research underscores the importance of incorporating patient VPs into the decision-making process for VTE prevention during pregnancy. The mixed-methods SR provided valuable insights into patient VPs, while the DASH-TOP intervention showed potential to enhance decision-making involvement and improve SDM process quality. By aligning clinical recommendations with patient VPs, this research supports the broader integration of SDM tools like DASH-TOP in clinical practice, offering a framework for improving care for pregnant women at risk of VTE. Fostering conversations that enable patients and clinicians to collaboratively solve problematic situations, considering evidence-based information and a comprehensive understanding of VPs affecting patients' ability to carry out the treatment plan, is crucial. Further research is recommended to refine SDM tools and address barriers to their adoption.

# RESUM

## Rerefons

La tromboembòlia venosa (TEV) és una de les principals causes de morbiditat i mortalitat materna durant l'embaràs. L'heparina de baix pes molecular (HBPM) es recomana comunament per a la tromboprofilaxi, però el seu ús comporta una càrrega significativa per a les pacients. Comprendre els valors i preferències (VP) de les dones pel que fa a la HBPM és crucial per optimitzar la presa de decisions compartida (PDC) en la pràctica clínica. Tot i la recomanació generalitzada de la HBPM, hi ha poca investigació sobre com integrar els VP de les pacients en la presa de decisions per a la tromboprofilaxi durant l'embaràs.

## Objectius

Aquesta tesi té com a objectiu: (1) identificar i avaluar els VP de les dones respecte a l'ús de HBPM durant l'embaràs, i (2) avaluar l'efectivitat d'una intervenció de PDC multicomponent—l'eina DASH-TOP—per facilitar la presa de decisions informada i millorar el procés de PDC en la tromboprofilaxi durant l'embaràs. L'objectiu és integrar els VP en la pràctica clínica, involucrar les pacients en decisions informades i millorar la qualitat de les decisions en la trobada de PDC.

## Mètodes

La investigació adopta un enfocament de mètodes mixtos, organitzat en tres estudis. El primer és una revisió sistemàtica (RS) de mètodes mixtos sobre els VP de les dones respecte a l'ús de HBPM durant l'embaràs. El segon realitza un anàlisi convergent de mètodes mixtos de les dades del projecte DASH-TOP, centrant-se en l'elicitació de VP i la integració de dades quantitatives i qualitatives. El tercer estudi, mitjançant un disseny paral·lel de mètodes mixtos convergents, avalua les perspectives dels professionals de la salut sobre l'efectivitat de la intervenció DASH-TOP utilitzant l'Escala de Conflicte Decisional i entrevistes. Aquest disseny permet una anàlisi exhaustiva, integrant anàlisis temàtiques qualitatives i mesures quantitatives per captar les complexitats dels VP en el procés de presa de decisions.

## Resultats

La RS va trobar que, en general, les dones perceben que els beneficis de la profilaxi amb HBPM superen la molèstia de les injeccions diàries. Tanmateix, hi ha una variabilitat significativa en com les dones valoren els riscos i beneficis, especialment entre aquelles amb major risc percebut (TEV previ, factors hormonals o trombofília), més disposades a usar HBPM. L'anàlisi de l'eina DASH-TOP va revelar que la incorporació de VP va reduir el conflicte decisional, amb participants més informades i segures de les seves decisions. Els marcs qualitatius estandarditzats per capturar VP específics del context van ser clau per entendre millor els contextos que afecten les preferències. Els professionals van informar que l'eina va millorar la comunicació i el procés d'atenció centrada en el pacient. Persistien reptes en la integració completa dels VP de les pacients, especialment en la transmissió d'informació complexa sobre riscos de TEV i avaluació de l'estat de salut amb factors contextuals.

## Conclusions

Aquesta investigació subratlla la importància d'incorporar els VP en el procés de presa de decisions per a la prevenció de TEV durant l'embaràs. La RS de mètodes mixtos va proporcionar valuoses perspectives sobre els VP de les pacients, mentre que la intervenció DASH-TOP va mostrar potencial per millorar la participació en la presa de decisions i la qualitat del procés de PDC. Alineant les recomanacions clíniques amb els VP, aquesta investigació recolza la integració d'eines de PDC com DASH-TOP en la pràctica clínica, oferint un marc per millorar l'atenció de les dones en risc de TEV. Fomentar converses que permetin resoldre situacions problemàtiques col·laborativament, considerant evidències i una comprensió integral dels VP que afecten la capacitat per seguir el pla de tractament, és crucial. Es recomana continuar investigant per perfeccionar les eines de PDC i superar les barreres d'adopció.

outcomes, crucial when balancing desirable and undesirable effects. The other is whether patients (or other stakeholders) find acceptable the intervention (or the alternative considered)[50,51].

There are various methods to capture people's views on the importance of outcomes.

### *Quantitative instruments*

Quantitative methods, primary developed from decision theory within the economic field, have provided several instruments on how to obtain patients' relative importance of outcomes:

Outcomes can be operationalized as health state utility values, which can be obtained using direct or indirect techniques[51–54].

A. Direct techniques: In the direct approach, respondents are asked to value health states; the respondent directly "assesses" and "evaluates" a health state on a scale of 0.00 (death) to 1.00 (perfect health)[55]. The health states evaluated in the direct approach may be hypothetical health states or the respondents subjectively defined current health state (here the respondent reflects on their own state of health and then values it). The eligible measurement techniques are standard gamble (SG), time trade-off (TTO), visual analogue scale (VAS).
B. Indirect techniques: This includes multi-attribute instruments in which respondents complete a questionnaire based on a health-status classification system that is a component of a multi-attribute system. The relative importance is obtained by regression analysis from quality of life questionnaires, such as the EQ-5D (EuroQol), the SF-6 health survey, or the Health Utility Index[56].

People's views on the importance of outcomes can also be gathered through non-utility quantitative measures:

A. Some instruments include surveys or questionnaires, including validated questionnaires such as the beliefs about medicines questionnaires[57], or self-developed questionnaires[51].
B. Other non-utility measures include direct choice methods, such as those used in decision support tools, which can offer insights into the relative disutility of outcomes. Direct choice exercises examine patients' choice when they are presented with a description of hypothetical states or during decision making for their own actual health states (i.e., forced choice when presented with a decision aid, probabilistic trade off techniques, discrete choice, willingness to pay, etc.)[51,58].

### *Role of decision analysis*

Decision analysis is a systematic approach to decision-making that involves structuring decisions using analytical frameworks[59,60]. These frameworks incorporate all possible outcomes, their

probabilities, and the VPs of the decision-maker. Decision analysis uses quantitative methods to evaluate complex decision problems, often under conditions of uncertainty. It often utilizes tools like[61]: decision trees (a visual representation of the decision-making process that includes decision nodes (choices), chance nodes (possible outcomes), and terminal nodes (final outcomes). Each path through the tree represents a potential course of action and its consequences); Markov models (used for decision problems involving events that occur over time. These models represent transitions between health states and are useful for long-term or recurrent outcomes); and multi-criteria decision analysis (assesses how the results of the decision analysis change with variations in the input values, helping to identify the most critical variables affecting the decision); to organize and assess complex decisions systematically.

Main characteristics of decision analysis involve[59]:

1. Analytical framework: Structures the decision-making process by identifying all potential outcomes and their associated probabilities.
2. Probabilities and VPs: Integrates clinical evidence and patient VPs to calculate the expected value of each treatment option (e.g., QALYs).
3. Expected value calculation: Determines the treatment option with the highest expected value, balancing risks and benefits according to both clinical evidence and patient VPs.

Benefits of decision analysis in SDM:

1. Facilitates patient engagement: By providing a clear, structured approach, decision analysis helps patients understand the trade-offs between different treatment options, enhancing their ability to participate actively in the decision-making process.
2. Incorporates patient VPs: Decision analysis explicitly includes patient VPs, ensuring that the chosen option aligns with the patient's values and desired health outcomes.
3. Supports healthcare professional-patient discussions: The structured framework can serve as a tool for healthcare professionals to discuss the pros and cons of different options with patients, fostering a more collaborative decision-making process.
4. Reduces cognitive burden: For patients, weighing the risks and benefits of various options can be cognitively challenging. Decision analysis simplifies this process by quantifying the expected outcomes based on evidence and patient VPs. This helps patients and healthcare professionals discuss the options more effectively and reach a shared decision.
5. Broad acceptability: Studies suggest that decision analysis interventions are generally acceptable to patients and can lead to improved decision quality and satisfaction.

Despite its potential, decision analysis is not widely implemented in clinical practice due to various challenges: i) Complexity of models: the complexity of some decision analytic models can make them difficult to implement and understand in a clinical setting; ii) Quality of data: high-quality clinical data and realistic model inputs are essential for accurate decision analysis, which are sometimes lacking; and, iii) Implementation issues: there is limited information on the practical

implementation of decision analysis in routine clinical practice, and further research is needed to address these challenges and improve feasibility.

Decision analysis offers a robust framework for making well-informed clinical decisions, especially under uncertainty. By integrating evidence-based data with patient VPs, decision analysis enhances the decision-making process, supports SDM, and ultimately leads to better healthcare outcomes.

## *Qualitative instruments*

Qualitative methods can provide information on VPs, opinions, perceptions, and attitudes both towards the desirability and undesirability of outcomes and acceptability of the decision[24,40,43,51,62]. Qualitative instruments to retrieve VPs include interviews (structured, semi-structured, unstructured, or in-depth) or discussion groups such as focus groups. Data from these instruments is then analyzed. There are numerous approaches for analyzing qualitative data. Content analysis, a systematic and objective research method, is widely used to describe and quantify phenomena, including in studies on patient VPs[63,64]. This method enables researchers to test theoretical issues and deepen their understanding of the data. By using content analysis, researchers can condense words into fewer content-related categories or themes, operating on the assumption that words and phrases classified into the same categories/themes share the same meaning[63].

Despite, the literature lacks of standardized frameworks that can more readily indicate the relative desirability or acceptability (i.e., VPs) of various attributes of treatment alternatives. One such framework is Kenneth Burke's Pentad of Motives theory[65], which categorizes preferences or attributes that influence a decision-making process[66,67]. Burke's Pentad considers five motives: i) Act (what needs to be done); ii) Scene (the context in which it is done); iii) Agent (who was involved in the decision); iv) Agency (aspects of the medication itself); and v) Purpose ('the why' referring to individual's goals). For detailed descriptions of each motive, refer to Box 1.

Burke's pentad of motives categories.

Kenneth Burke's Pentad of Motives[65] is a highly influential rhetorical heuristic used to understand the motivations behind a person's actions or discourse. An analysis using Burke's Pentad considers how actions or words answer five key questions: what was done (act), when or where it was done (scene), who did it (agent), how it was done (agency), and why it was done (purpose). Justifications for why a plan made sense are categorized according to these five elements:

1. Agent: The individuals involved, whether a co-agent (friend) or counter-agent (enemy), including their values, preferences, or relationships.
2. Agency: The tools, instruments, or means employed, such as a specific treatment option, a SDM tool, or an intervention.
3. Act: The actions taken or being taken, such as conversations, deliberations, or general treatment programs.

with healthcare professionals[73]. These themes (e.g., trust and collaboration between professional and patient) are then converted into items to be quantitatively evaluated using Likert scales.

### 1.2.5. Systematic reviews (SRs) and CPGs role on informing on VPs

SRs and CPGs play a crucial role in informing healthcare decisions by integrating evidence on VPs into healthcare decision-making. SRs synthesize the best available evidence, while CPGs provide actionable recommendations tailored to specific clinical scenarios.

#### *Systematic reviews*

SRs are comprehensive summaries of research on a specific topic, utilizing rigorous methods to identify, evaluate, and synthesize the results of relevant studies. The SR process involves rigorous literature searches, screening, and data abstraction to ensure comprehensive coverage of relevant studies. SRs are essential for identifying and summarizing evidence on patient VPs. These reviews encompass various study designs, including qualitative research, utility and non-utility measures, and preference elicitation methods[44].

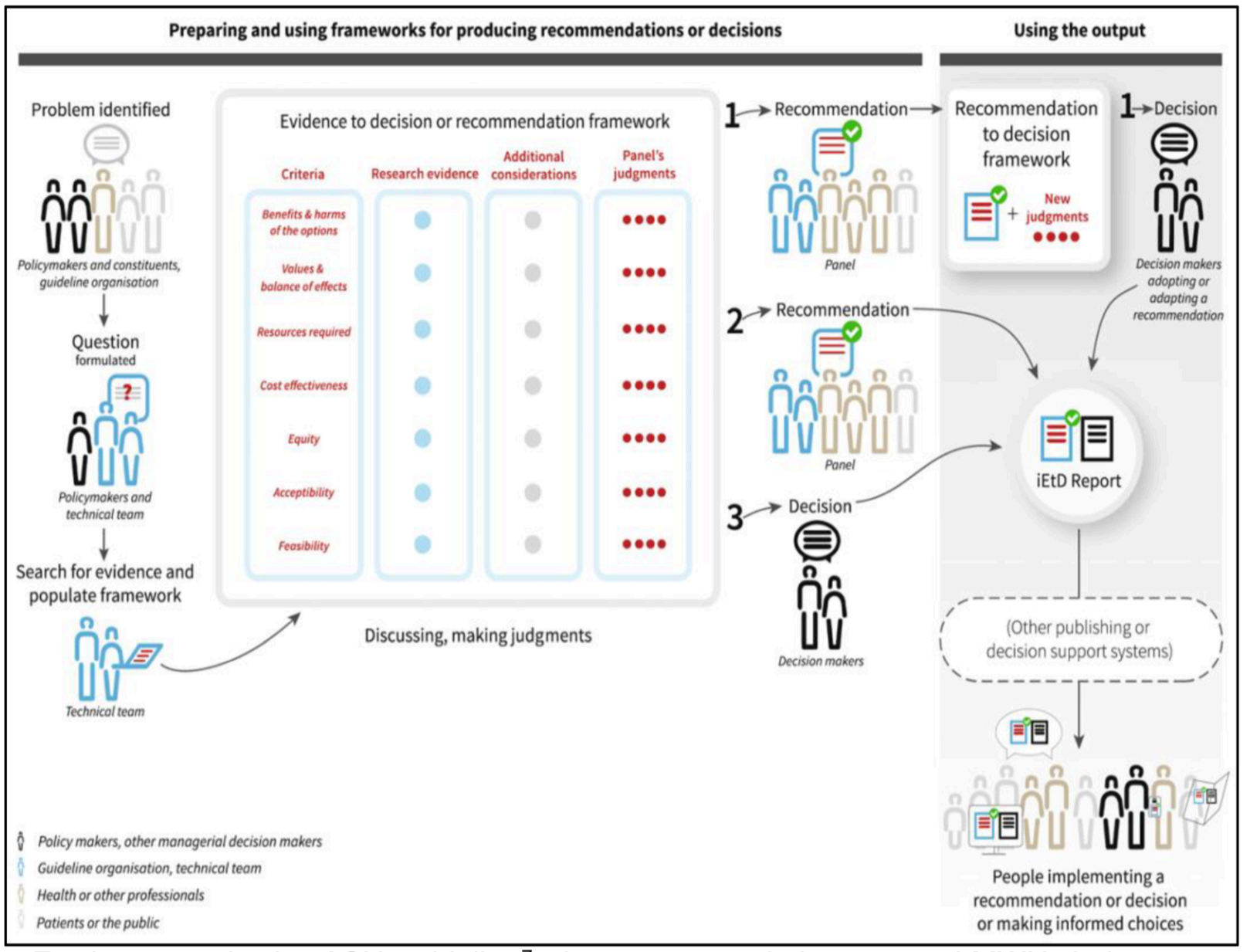
While SRs have effectively captured patient VPs, a gap remains in the integration of quantitative and qualitative data[82]. Often, SRs present quantitative and qualitative VPs separately, without combining both sets of results[83]. Applying a mixed-methods approach in SRs offers a robust solution to this challenge, providing a more comprehensive understanding of the VPs that influence patient decision-making.

In SRs, a key step is assessing the quality of the evidence. While the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) working group provides guidance on evaluating VPs in quantitative study designs[84,85], the GRADE-CERQual (Confidence in the Evidence from Reviews of Qualitative research) approach offers guidance for assessing confidence in findings from SRs of qualitative research[86].
However, a notable challenge in mixed-methods research is the lack of guidance on determining the overall certainty of the evidence. While the GRADE-CERQual working group has made progress in assessing confidence in integrated evidence[87], no clear recommendations have been made regarding the use of both approaches in mixed-methods research.

The Mixed Methodologies Appraisal Tool (MMAT) is a critical appraisal tool for evaluating the quality of mixed-method studies[88]. The MMAT offers several advantages:

- It is a comprehensive tool that evaluates mixed-method research using a wide range of criteria.

Figure 3. Evidence to Decision (EtD) conceptual map workflow. Image developed by Moberg et al.[90]




For instance, in the ASH guideline[7], the recommendation to use LMWH during pregnancy in women with prior unprovoked, hormone-associated, or provoked (non-hormonal temporary risk factors such as surgery, trauma, immobilization, bed rest, or active cancer) VTE was based on several considerations contained in their EtD. Clinical evidence indicated that in women with a history of VTE who received LMWH or UFH prophylaxis, the risk of antepartum VTE was 0.9% (95% CI, 0.5%-1.8%), compared to 4.2% in women where antepartum prophylaxis was not provided (95% CI, 0.3%-6.0%), suggesting that prophylaxis reduces the risk of recurrent VTE by approximately 75%. However, the need for daily injections throughout pregnancy and the associated costs may pose significant burdens for some women. This issue was highlighted in a cross-sectional international multicenter study[92] of 123 women, which found that although the majority of women with a history of VTE who were pregnant or planning pregnancy would opt for LMWH prophylaxis during pregnancy (79%), a substantial minority (40%) of low-risk women (those with a prior VTE event associated with a transient non-hormonal risk factor and no known thrombophilia, with an estimated risk of antepartum recurrence of less than 5%) would choose not to.

This underscores that healthcare decisions require not only evidence about the effects of interventions—such as the absolute risk reduction or increase in a particular outcome within a specific population when comparing one intervention to an alternative—but also an understanding

of the relative importance of the outcomes that these interventions either prevent or cause. This outcome significance is captured in EtDs dimension around VPs and are crucial for aligning medical decisions with the priorities and expectations of patients[44,49,84,85].

By using the EtD framework, panels can systematically and transparently incorporate evidence into their decision-making process when formulating recommendations. The EtD framework aids panels by providing a clear overview of the relative advantages and disadvantages of the interventions or options being considered, ensuring that all critical factors are accounted for in the decision-making process. It also offers panel members a concise summary of the best available evidence for each criterion, guiding their judgments, structuring and documenting discussions, identifying reasons for disagreements, and enhancing the transparency of the decision-making process.

It is not only important to consider evidence based on patient VPs when developing and formulating recommendations, but also during the actual development of CPGs. Ensuring that the patient's voice is represented throughout the CPGs development process is crucial. In this regard, the AGREE II (Appraisal of Guidelines for Research and Evaluation) instrument exists to support this objective. The AGREE II instrument is a widely recognized tool designed to assess the quality and reporting of CPGs[93]. It consists of 23 items organized into six domains: scope and purpose, stakeholder involvement, rigor of development, clarity of presentation, applicability, and editorial independence. Including patient VPs and involvement in CPGs development is crucial, as it ensures that the recommendations are patient-centered and more likely to be accepted and adhered to. The AGREE II instrument emphasizes the importance of seeking the views and VPs of the target population to enhance the relevance and effectiveness of the CPGs. For example: a SR of CPGs published between 2009 and 2018[94], utilized the AGREE II framework[93] to critically evaluate various aspects of CPGs on pregnancy-associated VTE. The review, specifically looks for how well CPGs account for patient VPs. ACOG (American College of Obstetricians and Gynecologists) guideline highlights the importance of involving pregnant women in the decision-making process, especially regarding the use of anticoagulants like LMWH, where patient VPs regarding administration and potential side effects are significant. RCOG (Royal College of Obstetricians and Gynecologists) guideline provide pathways for SDM, especially in scenarios involving the choice between continuing with prophylactic anticoagulation postpartum or adjusting the treatment based on patient lifestyle and risk factors. ASH guideline recommends patient-centered approaches, especially in determining the intensity and duration of anticoagulation therapy, with detailed discussions on the balance of benefits and risks which should be tailored according to individual patient circumstances and VPs.

In conclusion, SRs and CPGs are essential for incorporating evidence-based patient VPs into healthcare decision-making, thereby promoting more informed and patient-centered decision-making processes[39].

certainty of the evidence, however value elicitation exercises showed to have the potential to reduce the uncertainty of the process.

### *Effect of the SDM intervention components on DCS*

Evidence-based information reduced conflict in the decision-making process. However, when the information is based on low quality evidence, uncertainty increases. A similar study conducted in Spain [34], assessing a decision aid for breast cancer screening also noted the importance of providing evidence-based information to improve decision-making: women positively value receiving information regarding the benefits and harms of breast cancer screening. As in previous studies [35, 36], we found that graphical representation of risks and benefits using pictograms showing the number of people experiencing an event with and without medication, reduces decisional conflict by clarifying the numerical information provided. Participants in our study also noted that patients' health literacy should be assessed to ensure adequate understanding of the information. As shown by several authors who explored the relationship between health literacy and DCS, a better understanding of health information can significantly decrease decisional conflict [37].

Value elicitation exercises were useful to understand what is most important (risks or benefits) in a decision, thus supporting and facilitating the weighing activity (pros and cons) in the decision-making process. These exercises also reduced uncertainty in the decision-making process by helping participants better clarify ('what choice is best for me') their decision. This finding is consistent with IPDAS recommendations [11, 15]. Furthermore, exploring patients' values and preferences contributes to patient engagement in the decision-making process, improving self-efficacy. Supportive of these findings, a recent cross-sectional study [37] assessing factors contributing to a lower decisional conflict found that respondents, who reported higher ability to actively engage and participate in the decision-making process, had lower decisional conflict.

The provision of a decision analysis recommendation decreased uncertainty (lowest level of decisional conflict for the uncertainty subscale) and improved self-efficacy with the decision process. It helped tip the balance of pros and cons, helping participants to be more confident with their decision. In addition, participants noted the need for health professionals when implementing the decision analysis technique in the clinical encounter, to support the cognitively-demanding activity of integrating the evidence with their preferences [38–40]. On this regard, Dumont and colleagues [41] have referred to the use of decision analysis, as a decision support technique that promotes a meaningful dialogue between providers and patients on preferences, options, concerns, risks and benefits, leading to an informed and more satisfactory decision for both parties.

### *Decisional conflict scale as an instrument to assess the SDM process*

In the context of SDM, decisional conflict is one of the most frequently reported outcomes in studies assessing decision support interventions [10, 18, 21, 32], and the DCS appears to be an optimal instrument to measure the quality of the process [33]. All the subscale items are in line with other instruments used to measure the quality of SDM interventions, such as the widely used SDM-Q-9, MAPPIN'SDM, and OPTION [17]. However, a review assessing the quality of the SDM process highlighted that their common usage does not imply that these measures have adequate congruence with the conceptualization of SDM used to develop the intervention, as they do not necessarily capture the effect of the interactions among the decision-makers (i.e. patients, clinicians, family) [23]. As seen in our study, the support subscale (how supported do patients feel in the decision-making process) needs further attention, especially the role of health professionals to support the process. For example, the CollaboRATE scale [42] further explores the support from clinicians in decision-making with items like 'how much the provider listened to them about their health issue'. The need for health professionals as decisional partners was also highlighted by Legaré and colleagues [32] when developing a modified decisional conflict scale (D-DCS) with the aim of evaluating the decision-making process in SDM encounters, concluding that the patient-clinician relationship affects the quality of the decision. Furthermore, there is a need to understand the impact of peer pressure on decision-making. For example, in our decision context, some authors [8, 43] have reported that the opinions and support from the husband of a pregnant woman going through this decision, as well as experiences from other women who went through this same condition may be important to support them.

The different DCS subscales have normally been compared in relation to usual care [9, 10, 21, 44], less frequently when comparing SDM interventions [22, 23], or for decision analysis as an intervention for SDM [13]. In a study [44] evaluating the DCS for measuring the quality of end-of-life decisions, authors found significant differences in DCS scores between usual care (higher DCS scores) and the intervention (containing an evidence-based component and value elicitation exercises), and these were due to factors contributing to uncertainty and the efficacy of their decisions. They highlight some of the factors contributing to high uncertainty; feeling

uninformed, feeling unclear about personal values, and feeling unsupported. Our study also showed that the subscale showing high conflict between groups was the uncertainty subscale (how clear and sure do patients feel about what to choose) and was attributed to the low certainty of the evidence and the support from others (specially clinicians) in the decision-making process. Despite this, value elicitation exercises did help clarify personal values. Other authors [13, 38–40] have also reported on the contribution of decision analysis to support SDM and improve the uncertainty and effectiveness of the process; as Robinson and colleagues [39] explain: decision analysis was of value as it seeks to create a rational framework for evaluating complex medical decisions and to provide a systematic way of integrating potential outcomes with probabilistic information. However, our findings, as well as a scoping review on SDM containing decision analysis [13] highlighted the difficulties on how to implement decision analysis recommendations in clinical decision-making. Our results reveal that some of these challenges are related to how to present recommendations in the clinical encounter, and to deliver the information in a timely manner.

### Limitations and strengths

Our sample consisted of students enrolled in a master program and, therefore, we cannot extrapolate our results to the target population of women with a previous VTE event. This limitation was partly due to the COVID-pandemic, which hindered the recruitment of participants [45]. Therefore, we conducted this study in parallel to a study our team was developing with the target population [12, 16]. However, our focus was to understand the quality of the decision-making process (i.e., how decisional conflict increased or decreased) with respect to each SDM intervention component. To this end, because our participants were active health professionals, they had helpful insights to understand the potential sources of conflict that may arise when implementing SDM interventions in a clinical context. The randomization method we used (sort alphabetically by last name) did not ensure having symmetrical groups and it would have been useful to have assessed the baseline knowledge on gynecology and obstetrics of our participants to ensure the comparability of the three groups [46, 47]. However, participants were invited to self-report to what extent their knowledge or experiences influenced their decision-making, and provided reflections about similar examples in their clinical practice where they deal with preference sensitive decisions. In addition, we acknowledge the small sample size of our study as well as the different specialties of the health professionals included in our study and not having target clinicians such as gynecologists, obstetricians or hematologists for the decision assessed. Despite this limitation, we observed trends that were consistent with the qualitative findings.

Using a mixed method approach, and presenting the data in a joint manner, are some of the main strengths of our study. As other authors [25, 26, 48] have also reported, mixed-methods designs facilitate the understanding of complex phenomena and overcome the limitation that quantitative data have in understanding complex decision-making processes.

### Implications for practice and research

We highlight four main implications of our study that should be addressed in future research and clinical practice:

First, high certainty of the evidence is needed to construct decision aids that aim to improve informed decision-making. This is especially important and challenging when there is equipoise regarding the efficacy of alternative treatments. Hence, more studies with larger sample sizes are needed to assess women's values and preferences for the use of LMWH in pregnancy, thus providing high quality evidence to develop SDM interventions.

Second, we highlight the importance of including components that specifically explore patients' values and preferences, such as value elicitation exercises, to reduce decisional conflict. Simple exercises exploring factors such as their previous experience with the condition or treatment, should be included in the development of SDM interventions.

Third, decision analysis has the potential to add value by reducing uncertainty and improving the efficacy and satisfaction with the SDM process. The cognitive reasoning activity of balancing pros and cons could be eased by an algorithm (decision analysis) that combines preferences with evidence. More implementation research is needed on how to deliver the decision analysis recommendation in clinical practice.

Fourth, it is essential to assess the interaction between patient and health professional, as well as include health professionals in the development of SDM tools [49] to better understand the feasibility when implementing them in the clinical encounter [50].

## Conclusion

All three components of the DASH-TOP intervention (evidence-based information, value elicitation exercises and decision analysis) can reduce decisional conflict and improve the quality in the decision-making

process. The presentation of patient-tailored decision analytic results helped subjects better understand tradeoffs between risks and benefits of treatment alternatives, and provided an added value to the decision-making process. However, presenting results in real-world clinical settings remains a challenge.

## Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12911-023-02349-3.

**Additional file 1: Table S1.** Open-ended questionnaire script for qualitative data collection.

**Additional file 2: Table 1.S2.** Participant Characteristics. **Table 2.S2.** Quantitative Data Collection. **Table 3.S2.** Quantitative Data Analysis. **Table 4.S2.** Qualitative Data Collection. **Table 5.S2.** Qualitative Data Analysis.

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### Authors' contributions

CrediT authorship contribution statement. ML-G: Conceptualization, Methodology, Formal analysis, Data curation, Investigation, Writing – original draft, Visualization, Project administration. BH: Conceptualization, Methodology, Formal analysis, Writing – review & editing. PR-M: Formal analysis, Writing – review & editing. DG: Methodology, Writing – review & editing. MHE: Methodology, Writing – review & editing. SB: Methodology, Writing – review & editing. NE: Methodology, Visualization, Writing – review & editing. FX: Methodology, Formal analysis, Visualization, Writing – review & editing, Supervision, Project administration. LP-P: Conceptualization, Methodology, Data curation, Writing – review & editing, Supervision. PA-C: Conceptualization, Methodology, Data curation, Writing – review & editing, Supervision, Project administration, Funding acquisition. The author(s) read and approved the final manuscript.

### Authors' information

Montserrat León- García is a doctoral candidate for the Ph.D. in Methodology of Biomedical Research and Public Health, Universitat Autónoma de Barcelona, Barcelona, Spain.

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### Availability of data and materials

The datasets supporting the conclusions of this article are included within the article (and its additional file(s)).

## Declarations

### Ethics approval and consent to participate

This study was approved by the clinical research ethics committee of the Hospital de la Santa Creu i Sant Pau (IIBSP-TDC-2018-02). All participants gave written informed consent to participate.

### Consent for publication

All participants gave written informed consent for publication.

### Competing interests

The authors declare no competing interests.

**Author details**
[1]Iberoamerican Cochrane Center, Biomedical Research Institute Sant Pau (IIB Sant Pau), Barcelona, Spain. [2]Department of Pediatrics, Obstetrics, Gynaecology and Preventive Medicine, Universidad Autónoma de Barcelona, Barcelona, Spain. [3]Knowledge and Evaluation Research Unit, Department of Medicine, Mayo Clinic, Rochester, MN, USA. [4]Department of Health Research Methods, Evidence and Impact, McMaster University, Hamilton, ON, Canada. [5]Faculty of Health Sciences, Universidad Villanueva, Madrid, Spain. [6]School of Health Sciences, Valencian International University, Valencia, Spain. [7]Division of General Internal Medicine and Center for Clinical Effectiveness, University of Cincinnati College of Medicine, Cincinnati, OH, USA. [8]Department of Medicine, McMaster University, Hamilton, ON, Canada. [9]VITAM Research Center for Sustainable Health, Quebec City, Canada. [10]Faculty of Medicine, Université Laval, Quebec City, Canada. [11]Centre for Health Economics and Policy Analysis, McMaster University, Hamilton, ON, Canada. [12]Evaluation Unit (SESCS), Canary Islands Health Service (SCS), Tenerife, Spain. [13]Network for Research On Chronicity, Primary Care, and Health Promotion (RICAPPS), Tenerife, Spain. [14]CIBER of Epidemiology and Public Health, CIBERESP, Madrid, Spain.

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Refused ☐

## Previous VTE Experience

**5. How many separate episodes of blood clots have you had in the past?** (Number of events)

1 ☐ 2 ☐ 3 or more ☐ Unsure ☐

**6a. Where did you have your (last) blood clot, in the leg or lung? (Type of event)**

Leg ☐ Lung ☐ Both ☐ Other ☐ Unsure ☐

**6b. If Other, where?**

*(Please specify)* _____

**7a. Was this blood clot treated with a blood thinner?**

Yes ☐ No ☐

**7b. If yes, for how long?**

*(Please specify)* _____

**8. If you think back to your last blood clot, do you recall any of the follow events occurring in the three months prior to your blood clot** (Presence or absence of precipitating clinical risk factors within 3 months prior to most recent blood clot*; if more than one apply, check all that apply*)

Major transient (i.e. now resolved) risk factors (if 1 or more -> low risk of recurrence)

a) Casting of your leg? (Leg casting)

Yes ☐ No ☐

b) Major surgery (over 30 minutes; general or spinal anesthesia)

Yes ☐ No ☐

c) Admission to the hospital for any medical illness for 3 days or longer

Yes ☐ No ☐

d) Immobilization 3 days or longer (in bed except to go to washroom)

Yes ☐ No ☐

e) Cancer that has since been cured (other than skin cancer)

Yes ☐ No ☐ or treatment for a previously diagnosed cancer?

Minor transient (i.e. now resolved) risk factors

f) Were you pregnant?

Yes ☐ No ☐

g) Were you taking a birth control pill or patch or needle?

Yes ☐ No ☐

h) Had you gone on an airplane trip that lasted longer than 6 hours?

Yes ☐ No ☐

**9. Do you know if you have any abnormalities in your blood that predispose you to clotting? (e.g. factor V Leiden; prothrombin gene mutation; a deficiency of antithrombin, protein C, or protein S; an anticardiolipin antibody or a lupus anticoagulant/nonspecific inhibitor)?** (Known thrombophilia)

Yes ☐ No ☐ Unsure ☐

**10. Is there a history of clotting in the veins in your parents or siblings?** (1st degree family history of VTE)

Yes ☐ No ☐ Unsure ☐

**11. Using the definitions below, please identify if the patient is considered to be at low risk of recurrence or high risk of recurrence:**

Low risk ☐ Patients with a "major transient risk factor" AND no thrombophilia

High risk ☐ All patients with thrombophilia AND/OR without a "major transient risk factor"

**12. Type of treatment during most recent VTE** *(check all that apply and if checked, please provide duration):*

**12a. Were you admitted to hospital?**

Yes ☐ No ☐ Unsure ☐

**If yes for how long?** (Length of admission)

1 week or less ☐

2-3 weeks ☐

More than 2 weeks ☐

Unsure ☐

**12b. Did you need clot-busting drugs or thrombolytic therapy for example t-PA**

Yes ☐ No ☐ Unsure ☐

**12c. Did your doctors have to put an umbrella or filter in your veins to keep clot from going to your lungs?**

Yes ☐ No ☐ Unsure ☐

**13. Do you feel you have recovered completely from your blood clot?** (Completeness of recovery from VTE event)

**13a. Do you have any left-over leg pain?** Yes ☐ No ☐

**13b. Leg swelling?** Yes ☐ No ☐

**13c. Change in leg color?** Yes ☐ No ☐

**13d. Any chest pain or discomfort that keeps you from doing what you want to do?**

Yes ☐ No ☐

**13e. Shortness of breath that keeps you from doing what you want to do?**

Yes ☐ No ☐

## Previous Experience using LMWH

**14. Were there any complications to your treatment?** (Adverse treatment effects; *check all that apply)*

**14a. Did you have any bleeding problems? Did you need transfusions? Did you need an operation or procedure because of your bleeding? Did you bleed into one of your organs? For any of these options, please answer:**

Yes ☐ *(Categorize below)* No ☐ *(Go to 15b)* Unsure ☐

Major bleed ☐

*(Overt bleeding that meets one or more of the following criteria: (a) drop in hemoglobin of 2 g/dL or greater, (b) requires a transfusion of at least 2 units of packed red blood cells, (c) involves a critical organ [intracranial, intraspinal, intraocular resulting in vision changes, retroperitoneal, pericardial, intramuscular with compartment syndrome, or placental abruption] or (d) requires operation or invasive intervention)*

Minor bleed ☐

*(Overt bleeding that does not meet the criteria for major bleeding)*

**14b. Did you have problems with bruising?**

Yes ☐ No ☐

**14c. Did you develop an allergic reaction to your intravenous or injection blood thinners called heparin-induced thrombocytopenia or HIT?**

**16b. Were you afraid of needles?**

Yes ☐ No ☐

**16c. Were the injections painful?** (Painful)

Yes ☐ No ☐

**16d. Did you have a planned delivery or induction?**

Yes ☐ *(Specify below)* No ☐ Unsure ☐

**16e.Did you dislike having a planned delivery?**

Yes ☐ No ☐

**16f. Did the low molecular weight heparin prevent you from having an epidural or delay your epidural?**

Yes ☐ No ☐ Unsure ☐

## II. Semi-Structured Interview Guide

| Interview Questions | |
|---|---|
| **1.0 Decision-Making Process** | **As part of this study you were asked to make a decision about taking heparin during your current/future pregnancy to prevent blood clots.**<br><br>1.1 What is your preferred level of engagement when it comes to making a clinical decision?<br><br>1.2 Please describe to me the process you used to make your decision about low molecular weight heparin, which in your case was to take low molecular weight heparin?<br>1.3 What types of information did you use to make your decision? [Try to discover previous knowledge/experience or personal research conducted on own]<br>a) Which information was most helpful in informing the decision you made?<br>b) Which information was the least helpful in informing the decision you made?<br><br>[If no reaction from the woman, we could provide an example (e.g. "for example, the decision aid had descriptions of relevant health outcomes" or "do you ask the doctor questions, review pamphlets, look up information online")]<br><br>1.4 What factors do you think that influenced your final decision?<br>a) Are there any personal factors that influenced your decision? These can include your values, preferences, concerns, or previous experiences with treatment.<br>b) Are there factors related to your health care provider that influenced your decision?<br>c) Are there other factors prior to completing the direct choice/ personalized decision analysis exercise today that influenced your decision?<br>1.5 What was the experience of being asked to make this decision like for you? [For all responses, follow up with a "why?" question]<br>a) At any point in time, did you experience feelings of confusion during the decision-making process? [if yes, have them describe when they experienced confusion] |

Table S1. Open-ended questionnaire script for qualitative data collection

| Individual interviews | | | |
|---|---|---|---|
| Question | Participants in **Group 1** responded to this question (Yes/No) | Participants in **Group 2** responded to this question (Yes/No) | Participants in **Group 3** responded to this question (Yes/No) |
| 1. What do you think this women would like to do to manage the risk of VTE during pregnancy, would you:<br><br>- Take low molecular weight heparin<br>- Without taking low molecular weight heparin<br>- Insecure about what to decide | Yes | Yes | Yes |
| 2. Why do you think this women have this preference? *(What factors have influenced the decision)* | Yes | Yes | Yes |
| 3. What type of information did you use to make your decision?<br><br>a) What information was most useful to you when taking the decision you made?<br><br>b) What information was least useful to you when taking the decision you made? | Yes | Yes | Yes |
| 4. Was the amount of information provided in the direct choice exercise appropriate? Why? | Yes | Yes | Yes |
| 5.Did you clearly understand the risks and benefits of heparin after completing the direct choice exercise? | Yes | Yes | Yes |
| 6. How do you think this women would balance the different aspects of the information presented(for example, the risks of having another blood clot compared to their personal experiences?<br>a) Could you explain your reasoning? | Yes | Yes | Yes |
| 7. Describe your experience with the rating scale and feeling thermometer | No | Yes | Yes |
| 8. Did these exercises help clarify your personal preferences for different health outcomes (for example, experiencing a blood clot)? | No | Yes | Yes |
| 9. Do you think these exercises reflected this women's personal preferences? | No | Yes | Yes |
| 10. Was it helpful to have the results of the decision analysis model to make this decision? | No | No | Yes |
| 11. Do you think this women would only rely on the personalized decision analysis exercise to make a decision? | No | No | Yes |

# Supplementary Material 3

Table S1. Risk of Bias (GRADE instrument)

| Study | RoB for sampling (Was an appropriate study sample selected from the sampling frame?) | Comment | RoB for Attrition (Was the attrition sufficiently low to minimize the risk of bias?) | Comment | Choice of instrument (Was the instrument used for eliciting relative importance of outcomes valid and reliable?) | Comment | Administration of the instrument (Was the instrument administered in the intended way?) | Comment | Outcome presentation (Was a valid representation of the outcome (health state) utilized?) | Comment | Understanding of the instrument (Did the researchers check the understanding of the instrument?) | Comment | RoB for data analysis (Were the results analyzed appropriately to avoid influence of bias and confounding?) | Comment | Overall Quality assessment |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bates 2015 and Eckman 2015 | Moderate risk of bias | The study included pregnant women with a history of lower extremity DVT or PE who were considering thromboprophylaxis to prevent recurrent antepartum VTE. However, there was a higher proportion of women with a high education level. | Low risk of bias | From the 123 recruited, all completed the interview | Low risk of bias | The techniques used are probability trade off exercises, direct choice exercises and feeling thermometer | Low risk of bias | The deliberation of the three techniques was administered correctly | Low risk of bias | The outcomes for each of the three techniques was represented accordingly to the method. Health states were used to represent the outcomes | Low risk of bias | After presenting the descriptions and recording patient responses, interviewers reviewed participant responses to the various exercises to check for consistency in participants' choice. When interviewers identified inconsistencies, they offered participants a chance to review and change their responses, avoiding any suggestion that responses should be changed. The reasons for any apparent inconsistencies were determined and recorded. Following this consistency check, interviewers asked participants two standardized questions to evaluate their understanding of the information provided during the interview. Interviewers also provided a rating of the extent to which they believed the respondents had a clear understanding of the questions and their confidence in this assessment. | Low risk of bias | Analytical methods were correct | ⊕⊕⊕◯ Moderate risk of bias |
| Guimichéva 2019 | Moderate risk of bias | Unclear sampling strategy. Unclear how many were approached and how many agreed to participate. | Serious risk of bias | Attrition rate >30% | Low risk of bias | The BMQ was considered an appropriate tool to utilize for this study, as it has previously been used in the gravid setting with enoxaparin, exploring whether women's beliefs relate to their adherence to enoxaparin | Low risk of bias | Women were asked to return the completed questionnaire pack at one of their follow up appointments, and were reminded to bring completed questionnaires back by phone prior to their follow-up appointments. | Low risk of bias | The outcomes harm, overuse, necessity and concerns were presented through specific questions and valid to assess the beliefs towards the medication-heparin | Moderate risk of bias | The questionnaire was given to the women but it was not reported if researchers checked the understanding of the questionnaire; although the questionnaire is designed for self-administration | Low risk of bias | Analytical methods were correct | ⊕⊕◯◯ Serious risk of bias |
| Patel 2012 | Moderate risk of bias | Unclear sampling strategy. Unclear how many were approached and | Low risk of bias | Attrition rate <10% | Low risk of bias | Validated questionnaire: BMQ was tested | Low risk of bias | The questionnaire was given to | Low risk of bias | The outcomes harm, overuse, necessity and | Moderate risk of bias | The questionnaire was given to the women but it was not reported if researchers checked the | Low risk of bias | Analytical methods were correct | ⊕⊕⊕◯ Moderate risk of bias |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | how many agreed to participate. Participants were recruited in a larger study "*The study was part of a larger parent study, evaluating the impact of mode of delivery and thromboprophylaxis*" | | | | for these four subscales using Cronbach s alpha, which revealed good internal consistency | | women at the time they consented to join the study (during the antenatal period) and women were asked to bring the completed questionnaire to one of their subsequent hematology clinic appointments. | | concerns were presented through specific questions and valid to assess the beliefs towards the medication-heparin | | understanding of the questionnaire; although the questionnaire is designed for self-administration | | | |
| Hordern 2015 | Moderate risk of bias | Unclear sampling strategy. Unclear how many were approached and how many agreed to participate. | Serious risk of bias | Only completed surveys were used in the analysis; hence we can't tell if those that didn't answer had systematic differences to those that did complete the survey. | Moderate risk of bias | They don't report the consistency of the instrument as it is a questionnaire developed by researchers; they don't mention other potential studies assessing the same which could serve as useful source of validity | Low risk of bias | Yes, it was a structured interview delivered accordingly to the method | Moderate risk of bias | There was not a presentation of outcome, rather complications and discomfort of using heparin were elicited by patients in an organic way. | Low risk of bias | As it was a synchronous structured interview with women, there is no reason to think that the researchers couldn't have clarified any questions the women had. | Low risk of bias | Analytical methods were correct | ⊕⊕◯◯ Serious risk of bias |
| Anderson, 1993 | Moderate risk of bias | Unclear sampling strategy. Unclear how many were approached and how many agreed to participate. | Serious risk of bias | Attrition rate <20% | Moderate risk of bias | Patients completed a questionnaire designed to determine which method of heparin administration they preferred and which method caused the most severe side effects. They don't report the consistency of the instrument as it is a questionnaire developed by researcher; they don't mention other potential studies assessing the same which could serve as useful source of validity | Low risk of bias | Because of the nature of this study, it was not possible to use a double-blind design. To avoid influencing the patient's questionnaire responses, physicians and nurses directly involved in the care of these patients were specifically instructed to present the study in an unbiased fashion and avoid expressing an opinion about whether they thought one of the routes of heparin administration was superior to the other. | Low risk of bias | Preference for administration route was presented | Low risk of bias | The questionnaire was given face to face to the patient and although they don't report any procedure to check understanding, there is no reason to think that the researchers couldn't have clarified any questions the women had. | Low risk of bias | Analytical methods were correct | ⊕⊕⊕◯ Moderate risk of bias |

| Table S2. Certainty of evidence in the importance of values and preferences | | | |
|---|---|---|---|
| Domain | Signaling questions | Outcomes | |
| | | Utilities (Direct techniques): Health State “Pregnancy with LMWH prophylaxis” in VAS scale (0 to 100) Note: Minimal important difference of the relative importance of outcomes such as 0.05 to 0.07 on a 0 to 1 visual analogue scale for making such judgements. Informed by one study with a population: **N = 123 (Bates 2015 and Eckman 2015)** | |
| | | VAS scale: 81(15) [78,32-83,68] | Note |
| Overall Risk of Bias | Table 1. Supplementary material | Moderate risk of bias | |
| 1.Indirectness due to PICO elements | Was the population studied matching the population of interest | Very serious | Half of the sample were neither pregnant nor planning. |
| | Were the outcomes matching the outcomes of interest | Not serious | |
| | Were the options studied matching the alternative options of interest | Not serious | |
| 2.Indirectness due to methodological elements | Were the participants answering questions directly valuing the relative importance of outcomes?<br>- Were direct methodologies for outcomes utilities used rather than indirect methodologies?<br>-Was the utility directly estimated from an instrument to elicit rather than mapped from an instrument whose purpose was not eliciting utility? | Not serious | |
| Overall Indirectness | | Serious | |
| Inconsistency | | | |
| Assessment of four items<br>1. Similarity in point estimates<br>2. Overlap in confidence intervals<br>3. P value of the heterogeneity test (if any)<br>4. I (2) of the metanalysis (if any) | Are the results consistent across included studies? | Not applicable | |
| Explore the source of inconsistency<br>- Consistent PICO (population, compared treatment options, outcomes)?<br>-Consistent methodology (study design, measurement methodologies, description of disease severity and outcomes)? | Source of Inconsistency explained | Not applicable | |
| Subgroup estimates credibility assessment<br>1. Is the subgroup variable a characteristic specified at baseline?<br>2. Is the subgroup difference suggested by comparisons within rather than between studies?<br>3. Does statistical analysis suggest that chance is an unlikely explanation for the subgroup difference?<br>4. Did the hypothesis precede rather than follow the analysis, and include a hypothesized direction that was subsequently confirmed?<br>5. Was the subgroup hypothesis one of a small number tested?<br>6. Is the subgroup difference consistent across studies and across important outcomes?<br>7. Does external evidence (biological or sociological rationale) support the hypothesized subgroup difference? | Source of Inconsistency explained | Not applicable | |
| Overall Inconsistency | | Not applicable | |
| Imprecision | | | |
| Inspection of sample size | Is the sample size large enough to meet the review information size? | Serious | Considering it’s a continuous variable we downgraded for small sample size. GRADE guidelines recommend above 800 participants; although, due to the comprehensive process involved with collecting values and preferences, we considered an adequate sample size to be 200 participants. |
| Inspection of confidence interval | Is the confidence interval narrow enough? | | |
| Overall Imprecision | | Serious | |
| OVERALL CERTAINTY OF THE EVIDENCE | | ⊕◯◯◯<br>Very low certainty due to moderate RoB, indirectness and imprecision | |

*Continue* Table S2. Certainty of evidence in the importance of values and preferences

| Domain | Signaling questions | Outcomes | |
|---|---|---|---|
| | | Non-utility measure: Beliefs towards medication [Mean Necessity-Concerns Differential] Informed by 2 studies with a total population of **N= 158 (n= 67[Guimicheva 2019] + n= 95 [Patel 2012])** | |
| | | Necessity-Concerns Differential mean= 1.18 and 2.20 | Note |
| Risk of Bias | Table 1. Supplementary material | Serious risk of bias | |
| 1.Indirectness due to PICO elements | Was the population studied matching the population of interest | Not serious | |
| | Were the outcomes matching the outcomes of interest | Not serious | |
| | Were the options studied matching the alternative options of interest | Not serious | |
| 2.Indirectness due to methodological elements | Were the participants answering questions directly valuing the relative importance of outcomes?<br>- Were direct methodologies for outcomes utilities used rather than indirect methodologies?<br>-Was the utility directly estimated from an instrument to elicit rather than mapped from an instrument whose purpose was not eliciting utility? | Serious | The instrument purpose was not to elicit utility |
| Overall Indirectness | | Serious | |
| Assessment of four items<br>1. Similarity in point estimates<br>2. Overlap in confidence intervals<br>3. P value of the heterogeneity test (if any)<br>4. I (2) of the metanalysis (if any) | Are the results consistent across included studies? | Not serious | |
| Explore the source of inconsistency<br>- Consistent PICO (population, compared treatment options, outcomes)?<br>-Consistent methodology (study design, measurement methodologies, description of disease severity and outcomes)? | Source of Inconsistency explained | Serious | There could be systematic differences due to one study including a population of both peripartum and postpartum coagulation while the other only included postpartum coagulation |
| Subgroup estimates credibility assessment<br>1. Is the subgroup variable a characteristic specified at baseline?<br>2. Is the subgroup difference suggested by comparisons within rather than between studies?<br>3. Does statistical analysis suggest that chance is an unlikely explanation for the subgroup difference?<br>4. Did the hypothesis precede rather than follow the analysis, and include a hypothesized direction that was subsequently confirmed?<br>5. Was the subgroup hypothesis one of a small number tested?<br>6. Is the subgroup difference consistent across studies and across important outcomes?<br>7. Does external evidence (biological o sociological rationale) support the hypothesized subgroup difference? | Source of Inconsistency explained | Not serious | |
| Overall Inconsistency | | Serious | |
| Inspection of sample size | Is the sample size large enough to meet the review information size? | Serious | Considering it's a continuous variable we downgraded for small sample size. GRADE guidelines recommend above 800 participants; although, due to the comprehensive process involved with collecting values and preferences, we considered an adequate sample size to be 200 participants. |
| Inspection of confidence interval | Is the confidence interval narrow enough? | | |
| Overall Imprecision | | Serious | |
| OVERALL CERTAINTY OF THE EVIDENCE | | ⊕◯◯◯<br>Very low certainty due to serious RoB, indirectness, inconsistency and imprecision | |

*Continue* Table S2. Certainty of evidence in the importance of values and preferences

| Domain | Signaling questions | Outcomes | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Non-utility measure: Willingness to use LMWH direct choice. Informed by one study with a population: **N = 123 (Bates 2015 and BATES2015)** | | | | | | | |
| | | Hypothetical scenario (low; baseline risk of recurrence = 4%). % of women willing to take LMWH = 63,525 | Note | Hypothetical scenario (medium; baseline risk of recurrence = 10%). % of women willing to take LMWH = 76,33. | Note | Hypothetical scenario (high; baseline risk of recurrence = 16%. % of women willing to take LMWH = 86,315 | Note | Real-life scenario. % of women willing to take LMWH =73,18 | Note |
| Risk of Bias | Table 1. Supplementary material | Moderate risk of bias | | Moderate risk of bias | | Moderate risk of bias | | Moderate risk of bias | |
| Indirectness | | | | | | | | | |
| 1.Indirectness due to PICO elements | Was the population studied matching the population of interest | Not serious | | Not serious | | Not serious | | Not serious | |
| | Were the outcomes matching the outcomes of interest | Not serious | | Not serious | | Not serious | | Not serious | |
| | Were the options studied matching the alternative options of interest | Not serious | | Not serious | | Not serious | | Not serious | |
| 2.Indirectness due to methodological elements | Were the participants answering questions directly valuing the relative importance of outcomes?<br>- Were direct methodologies for outcomes utilities used rather than indirect methodologies?<br>-Was the utility directly estimated from an instrument to elicit rather than mapped from an instrument whose purpose was not eliciting utility? | Serious | The instrument purpose was not to elicit utility | Serious | The instrument purpose was not to elicit utility | Serious | The instrument purpose was not to elicit utility | Serious | The instrument purpose was not to elicit utility |
| Overall Indirectness | | Serious | | Serious | | Serious | | Serious | |
| Inconsistency | | | | | | | | | |
| Assessment of four items<br>1. Similarity in point estimates<br>2. Overlap in confidence intervals<br>3. P value of the heterogeneity test (if any)<br>4. I (2) of the metanalysis (if any) | Are the results consistent across included studies? | Not applicable | | Not applicable | | Not applicable | | Not applicable | |
| Explore the source of inconsistency<br>- Consistent PICO (population, compared treatment options, outcomes)?<br>-Consistent methodology (study design, measurement methodologies, description of disease severity and outcomes)? | Source of Inconsistency explained | Not applicable | | Not applicable | | Not applicable | | Not applicable | |
| Subgroup estimates credibility assessment<br>1. Is the subgroup variable a characteristic specified at baseline?<br>2. Is the subgroup difference suggested by comparisons within rather than between studies?<br>3. Does statistical analysis suggest that chance is an unlikely explanation for the subgroup difference?<br>4. Did the hypothesis precede rather than follow the analysis, and include a hypothesized direction that was subsequently confirmed?<br>5. Was the subgroup hypothesis one of a small number tested?<br>6. Is the subgroup difference consistent across studies and across important outcomes?<br>7. Does external evidence (biological o sociological rationale) support the hypothesized subgroup difference? | Source of Inconsistency explained | Not applicable | | Not applicable | | Not applicable | | Not applicable | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Overall Inconsistency | | Not applicable | | Not applicable | | Not applicable | | Not applicable | |
| Imprecision | | | | | | | | | |
| Inspection of sample size | Is the sample size large enough to meet the review information size? | Serious | Considering it's a continuous variable we downgraded for small sample size. GRADE guidelines recommend above 800 participants; although, due to the comprehensive process involved with collecting values and preferences, we considered an adequate sample size to be 200 participants. | Serious | Considering it's a continuous variable we downgraded for small sample size. GRADE guidelines recommend above 800 participants; although, due to the comprehensive process involved with collecting values and preferences, we considered an adequate sample size to be 200 participants. | Serious | Considering it's a continuous variable we downgraded for small sample size. GRADE guidelines recommend above 800 participants; although, due to the comprehensive process involved with collecting values and preferences, we considered an adequate sample size to be 200 participants. | Serious | Considering it's a continuous variable we downgraded for small sample size. GRADE guidelines recommend above 800 participants; although, due to the comprehensive process involved with collecting values and preferences, we considered an adequate sample size to be 200 participants. |
| Inspection of confidence interval | Is the confidence interval narrow enough? | | | | | | | | |
| Overall Imprecision | | Serious | | Serious | | Serious | | Serious | |
| OVERALL CERTAINTY OF THE EVIDENCE | | ⊕◯◯◯ Very low certainty due to moderate RoB, indirectness and imprecision | | | | | | | |

*Continue* Table S2. Certainty of evidence in the importance of values and preferences

| Domain | Signaling questions | Outcomes | |
|---|---|---|---|
| | | Non-utilities: Threshold reduction in VTE risk at which women were willing to accept use of LMWH. Informed by one study with a population **N = 123 (BATES2015 and Eckman 2015)** | |
| | | Given a fixed 16% risk Median (%) of risk reduction [IQR] = 3 [1 to 6] | Note |
| Risk of Bias | Table 1. Supplementary material | Moderate risk of bias | |
| 1.Indirectness due to PICO elements | Was the population studied matching the population of interest | Not serious | |
| | Were the outcomes matching the outcomes of interest | Not serious | |
| | Were the options studied matching the alternative options of interest | Not serious | |
| 2.Indirectness due to methodological elements | Were the participants answering questions directly valuing the relative importance of outcomes?<br>- Were direct methodologies for outcomes utilities used rather than indirect methodologies?<br>-Was the utility directly estimated from an instrument to elicit rather than mapped from an instrument whose purpose was not eliciting utility? | Serious | The instrument purpose was not to elicit utility |
| Overall Indirectness | | Serious | |
| Inconsistency | | | |
| Assessment of four items<br>1. Similarity in point estimates<br>2. Overlap in confidence intervals<br>3. P value of the heterogeneity test (if any)<br>4. I (2) of the metanalysis (if any) | Are the results consistent across included studies? | Not applicable | |
| Explore the source of inconsistency<br>- Consistent PICO (population, compared treatment options, outcomes)?<br>-Consistent methodology (study design, measurement methodologies, description of disease severity and outcomes)? | Source of Inconsistency explained | Not applicable | |
| Subgroup estimates credibility assessment<br>1. Is the subgroup variable a characteristic specified at baseline?<br>2. Is the subgroup difference suggested by comparisons within rather than between studies?<br>3. Does statistical analysis suggest that chance is an unlikely explanation for the subgroup difference?<br>4. Did the hypothesis precede rather than follow the analysis, and include a hypothesized direction that was subsequently confirmed?<br>5. Was the subgroup hypothesis one of a small number tested?<br>6. Is the subgroup difference consistent across studies and across important outcomes?<br>7. Does external evidence (biological o sociological rationale) support the hypothesized subgroup difference? | Source of Inconsistency explained | Not applicable | |