Review

AN INTEGRATED CONCEPTUAL FRAMEWORK FOR DECISION REGRET AMONG PATIENTS WITH NON-COMMUNICABLE DISEASES: TOWARD PATIENT-CENTERED DECISION SUPPORT INFORMED BY BIBLIOMETRIC ANALYSIS

Rosario Caruso[1], Cristina Arrigoni[2], Alice Silvia Brera[3,4,*]

[1] Department of Biomedical Sciences for Health, University of Milan, 20122 Milan, Italy; ORCID: 0000-0002-7736-6209
[2] Department of Public Health, Experimental and Forensic Medicine, Section of Hygiene, University of Pavia, 27100 Pavia, Italy
[3] First Department of Internal Medicine, Fondazione IRCCS Policlinico San Matteo, 27100 Pavia, Italy; ORCID: 0000-0003-1107-768X
[4] Department of Biomedicine and Prevention, University of Rome Tor Vergata, 00133 Rome, Italy

Author for corespodence: Alice Silvia Brera alicesilvia.brera01@universitadipavia.it

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ABSTRACT

Background: Decision regret is a critical patient-centered outcome, particularly relevant for individuals with non-communicable diseases who face multiple therapeutic options with equivalent benefits. This study aimed to develop an integrated conceptual framework to clarify the determinants and pathways leading to decision regret and support patient-centered decision-making.

Methods: This study developed an integrated conceptual framework by combining a recent scoping review with bibliometric and lexicometric analyses. Titles, abstracts, and keywords from 28 full-text studies included in the scoping review were extracted and compiled into a RIS file. A preliminary lexicometric analysis quantified lexical diversity, while a keyword co-occurrence analysis was performed using VOSviewer to identify major thematic clusters. The findings were then integrated with a thematic synthesis to develop a comprehensive conceptual framework.

Results: The lexicometric analysis revealed a high degree of lexical diversity, as indicated by the Type-Token Ratio (0.7158) and Hapax Token Ratio (0.5736), suggesting thematic richness within the source data. Bibliometric mapping identified seven distinct conceptual clusters: psychological and emotional determinants, decision processes and patient involvement strategies, patient-reported outcomes and quality of life, attitudinal and motivational drivers, family-centered and developmental contexts, demographic characteristics, and analytical and context-specific factors. These clusters, synthesized with thematic findings, informed a structured conceptual framework that illustrates the relationships among predictors, mediators, and outcomes, all of which are modulated by an overarching cultural sphere.

Conclusions: The resulting framework offers a comprehensive and actionable model for understanding and potentially predicting decision regret among patients with non-communicable diseases. By integrating psychological, demographic, clinical, and contextual factors, it lays the foundation for developing tailored decision support interventions aimed at reducing regret and enhancing patient-centered care. Future empirical validation and application of this framework can inform personalized strategies to strengthen shared decision-making and improve patient outcomes.

Keywords: *Treatment-related distress, chronic conditions, supportive strategies, bibliometric analysis, shared decision-making, patient-centered care.*

INTRODUCTION

Patients should be at the center of healthcare and actively engaged as the main actors in designing and implementing care plans. However, their voices are often under-recognized or overlooked when critical decisions are made regarding their health, treatment options, and associated costs. This disconnect is further compounded by clinicians' frequent reluctance to involve patients meaningfully in research and education initiatives (1,2).

For many years, it has been recognized that patients themselves, not clinicians, should report their symptoms and other patient-reported outcomes (1,3,4). When clinicians interpret and report patients' experiences on their behalf, it neglects the unique experiential knowledge patients gain through living with their condition, observing treatment effects, and navigating ongoing trial-and-error processes (1,3,4). This perspective is particularly important in clinical situations where multiple effective therapeutic options exist (5). In these cases, the patient should guide the decision-making process, acting as a "compass" to select the most suitable option (6). Without active and early patient involvement, individuals may later experience regret over the chosen treatment, even years after the decision, which can undermine follow-up adherence and overall treatment safety (6).

Patients with non-communicable diseases (NCDs) frequently face complex treatment choices involving multiple options for managing their condition. These decisions are influenced by personal preferences, health literacy, and the quality of information and support provided by healthcare professionals (7).

In healthcare, Decision Regret (DR) refers to a sense of remorse or distress about a healthcare choice. It is a significant indicator of decision-making efficacy and can arise when patients feel they might have achieved a better outcome had they chosen differently (7,8). DR may manifest as regret about the outcome (outcome regret), the chosen option itself (chosen option regret), or the decision-making process (process regret), each reflecting distinct aspects of the decision journey (6). Thus, a robust and supportive decision-making process is crucial to mitigate modifiable risks related to clinical deterioration, unstable health conditions, or poor health-related quality of life (9). Experiencing DR could also exacerbate financial burdens, particularly for patients from socioeconomically disadvantaged backgrounds, and may harm the patient-provider relationship, leading to distrust and lower satisfaction with healthcare services (8,10).

Evidence suggests that implementing strategies such as Shared Decision-Making (SDM) can reduce DR, as SDM engages patients from the earliest stages of their clinical journey and fosters a sense of ownership over treatment choices (11,12).

Understanding what happens to patients with NCDs who must choose among multiple options is essential for developing predictive models using retrospective data to prevent and mitigate DR (13). Additionally, having a valid and reliable tool to identify individuals at risk of experiencing DR is crucial (14). Therefore, by advancing a unified conceptual framework, we aim to support the development of a theoretical framework model that mitigates the risk of DR when multiple equivalent therapeutic strategies are available for patients with NCDs.

METHODS

DESIGN

The design of this secondary study is based on the analysis of the results from a recent scoping review (14), combined with bibliometric mapping to construct and corroborate a comprehensive conceptual framework. First, findings from the scoping review were used to identify key themes and determinants associated with DR among patients with NCDs. Next, a bibliometric analysis was performed to map the conceptual structure of the literature on decision-making and DR, providing empirical evidence on the thematic clusters and interconnections among psychological, clinical, demographic, process-related, and outcome-related factors. We systematically synthesized predictors, mediators, and outcomes, and highlighted contextual and cultural modifiers that influence decision-making processes by integrating these two sources. The conceptual framework thus derived is intended to support the development of predictive models aimed at mitigating the risk of DR when multiple therapeutic options are available to patients with NCDs.

PROCEDURE

The articles included in the scoping review were exported by extracting their titles, abstracts, and full texts (PDFs), and then compiled into a RIS file format. This comprehensive dataset served as the foundation for subsequent bibliometric analysis.

The RIS file was imported into VOSviewer, a specialized software for constructing and visualizing bibliometric networks (15). Using this tool, a keyword co-occurrence analysis was performed to identify clusters and map conceptual relationships within the literature on decision-making and DR among patients with NCDs.

The analysis allowed for the identification of major thematic

areas and the examination of how psychological, clinical, demographic, process-related, and outcome-related factors are interconnected. The bibliometric findings were then integrated with the thematic synthesis from the scoping review to refine and corroborate the conceptual framework. This integrative approach ensured that the framework was grounded both in qualitative thematic evidence and quantitative mapping of the literature, providing a robust foundation for future predictive modeling of DR.

SOURCE DATA

The source data for this secondary analysis consisted of 28 full-text studies included in a comprehensive scoping review focused on DR among patients with NCDs (14). These studies were published between 2005 and 2023, with the majority (89.3%) published after 2015. They originated primarily from North America (46.4%) and Europe (39.3%). The dataset comprised various study designs, including observational studies (60.7%), qualitative studies (14.3%), experimental studies (14.3%), and literature reviews (10.7%).

The scoping review systematically mapped the determinants, mediators, outcomes, and contextual factors influencing DR, highlighting a wide range of key themes. These included the central role of patient-clinician communication quality, shared decision-making processes, and the importance of fostering patient autonomy and trust. It emphasized psychological and emotional determinants such as anxiety, fear of poor outcomes, moral conflict, and anticipated regret, which can significantly shape patients' decision experiences. Furthermore, the review underscored the importance of informed consent practices and transparent information exchange in empowering patients to actively participate in their care decisions. Patient expectations, both realistic and idealized, emerged as critical factors affecting satisfaction with chosen treatments and long-term perceptions of care quality. Finally, the review detailed the consequences of DR on patient-reported outcomes, including health-related quality of life, treatment satisfaction, emotional well-being, and adherence to follow-up care and prescribed treatment regimens.

DATA ANALYSIS

The data analysis was conducted in two complementary phases: a bibliometric analysis followed by a thematic synthesis. Before the bibliometric mapping, a preliminary lexicometric analysis was performed on the textual data (titles and abstracts) extracted from the scoping review corpus. This analysis focused on quantifying the overall lexical diversity and structure of the dataset. After preprocessing and removing common stopwords, total token counts, vocabulary size, and the number of hapax legomena (words occurring only once) were calculated. The Type-Token Ratio (TTR) and Hapax Token Ratio (HTR) were also computed to evaluate lexical richness and the prevalence of unique terms. This descriptive analysis provided a foundational quantitative overview of the corpus, confirming its thematic complexity and supporting the subsequent bibliometric and thematic synthesis phases.

The RIS file containing the titles, abstracts, and keywords of the articles included in the scoping review was imported into VOSviewer (version 1.6.20). A keyword co-occurrence analysis was performed using a binary counting method, which considers the presence or absence of a keyword in each document, thereby reducing bias from document length or keyword repetition.

A minimum occurrence threshold was set to filter out infrequent terms and enhance the clarity of the conceptual map. The normalization method chosen was association strength, and additionally, LinLog/modularity normalization was applied to emphasize the separation of conceptual clusters (16). The resulting network visualization allowed for the identification of distinct thematic clusters, which reflect the core conceptual domains related to decision-making and DR among patients with NCDs.

Following the network visualization, a thematic analysis was conducted based on the extracted data from the scoping review (17). Articles were systematically coded to identify recurring themes, determinants, mediators, outcomes, and contextual factors influencing DR (18). The coding framework was iteratively refined through constant comparison, integrating insights from both the narrative synthesis and bibliometric cluster outputs.

The findings from both analyses were then integrated to develop a comprehensive conceptual framework. This integration ensured that each construct was grounded in empirical evidence, supported by quantitative bibliometric mapping and qualitative thematic synthesis. The resulting framework depicts the relationships among psychological, attitudinal, clinical, demographic, and contextual factors, the decision-making process, and patient-centered outcomes such as DR, quality of life, satisfaction, and adherence.

RESULTS

DESCRIPTIVE LEXICOMETRIC ANALYSIS OF SOURCE DATA

A descriptive lexicometric analysis was conducted on the textual corpus derived from the titles and abstracts of the 28 articles included in the scoping review. After preprocessing and removing common stopwords, the corpus consisted of

Panel A: Network visualization using LinLog/modularity normalization.

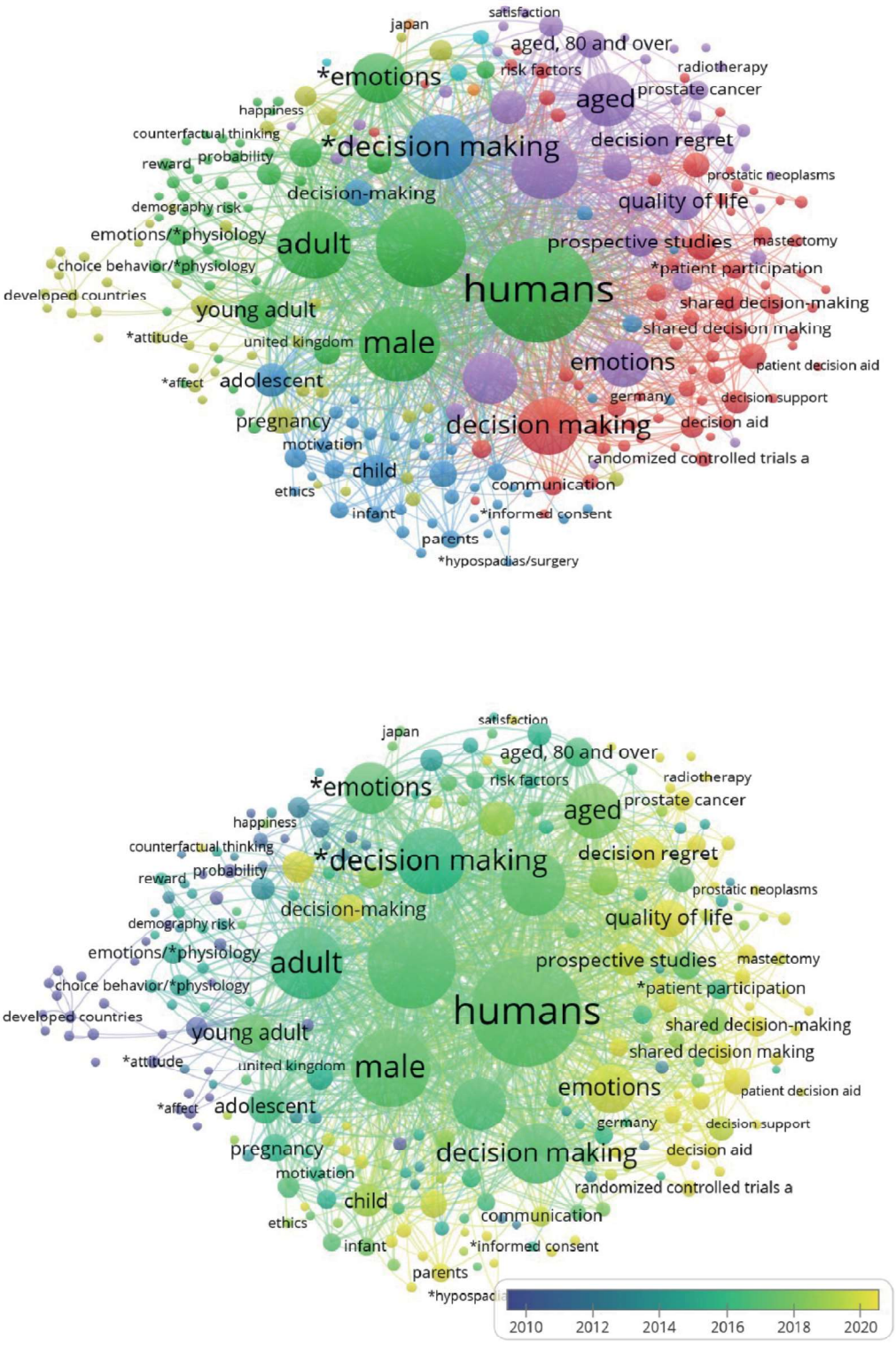

Figure 1. Bibliometric mapping and conceptual clustering

387 total tokens, with a vocabulary size of 277 unique words. Notably, 222 of these words were hapax legomena, indicating words that appeared only once within the corpus.

The resulting TTR was 0.7158, suggesting a high level of lexical diversity, while the HTR was 0.5736, highlighting a substantial proportion of unique or low-frequency terms. These results suggest that the source data exhibited rich lexical variability and thematic nuance, supporting the subsequent steps of bibliometric mapping and thematic synthesis aimed at developing a comprehensive conceptual framework on DR among patients with NCDs.

BIBLIOMETRIC MAPPING AND CONCEPTUAL CLUSTERING

A bibliometric mapping analysis was performed to visualize the conceptual structure of the literature included in the scoping review (Figure 1). Keyword co-occurrence networks were generated to identify the most frequent and thematically linked terms across the corpus. Two normalization approaches were applied. Panel A shows the network visualization using LinLog/modularity normalization, which emphasizes the conceptual separation among clusters. Panel B displays the same network using association strength normalization, which highlights the strength of co-occurrence relationships and results in a denser, more compact layout.

Across both visualizations, seven distinct and stable conceptual clusters emerged. The first cluster, colored yellow, captures psychological and emotional determinants, including terms such as emotions, moral conflict, affect, and anticipated regret. The second cluster, in red, encompasses decision processes and patient involvement strategies, characterized by keywords related to shared decision-making, decision support, patient participation, informed consent, and communication quality. The third cluster, in purple, reflects patient-reported outcomes and quality of life, including DR, treatment satisfaction, and perceived well-being. The fourth cluster, shown in light green, focuses on attitudinal and motivational drivers, incorporating constructs such as behavioral intention, motivation, and treatment acceptance. The fifth cluster, in blue, highlights family-centered and developmental contexts, with frequent references to parents, children, adolescents, and developmental stages relevant to healthcare decisions. The sixth cluster, in green, groups demographic characteristics, particularly age and gender-related terms, distinguishing between young, adult, and elderly populations. Finally, the seventh cluster, depicted in gray and brown, includes analytical and context-specific factors, encompassing terms associated with healthcare settings, socioeconomic conditions, study designs, and methodological descriptors.

These clusters, summarized in Table 1, provide a rich and coherent conceptual foundation that integrates psychological, clinical, demographic, and contextual elements, offering a comprehensive understanding of the phenomenon. The stability and thematic clarity of the clusters support their use as the basis for developing a conceptual framework to better understand and mitigate DR in patients with NCDs.

Table 1. Summary of cluster characteristics

Cluster	Label	Key concepts (examples)
Cluster 1 (Red)	Decision processes and patient involvement strategies	Shared decision making, consent, participation
Cluster 2 (Yellow)	Psychological and emotional determinants	Emotions, regret, moral judgment, choice behavior
Cluster 3 (Blue)	Family-centered and developmental contexts	Parents, pediatrics, caregivers
Cluster 4 (Light green)	Attitudinal and motivational drivers	Attitude, intention, motivation
Cluster 5 (Purple)	Patient-reported outcomes and quality of life	Quality of life, satisfaction, treatment outcomes, self-report
Cluster 6 (Gray)	Analytical and study design considerations	Cohort studies, logistic models, odds ratios
Cluster 7 (Brown)	Context-specific and geographic modifiers	Japan, postoperative period

THEMATIC ANALYSIS AND EMERGING THEORETICAL FRAMEWORK

The resulting synthesis from the thematic analysis confirmed and enriched key domains, including psychological determinants (such as emotions, moral conflict, and anticipated regret), clinical and demographic factors, and the central role of decision support processes (notably shared decision-making and communication quality).

Contextual factors, such as behavioral intentions, socioeconomic status, and healthcare setting, emerged as crucial modifiers that shape the patient experience and influence downstream outcomes. These outcomes include DR, treatment satisfaction, quality of life, and behavioral adherence.

The final conceptual framework (Figure 2) visually integrates these relationships, presenting a structured path from predictors to processes and outcomes, all influenced by the overarching cultural sphere. This framework serves as a foundation for developing predictive models and targeted interventions aimed at reducing DR and improving patient-centered outcomes in individuals with non-communicable diseases.

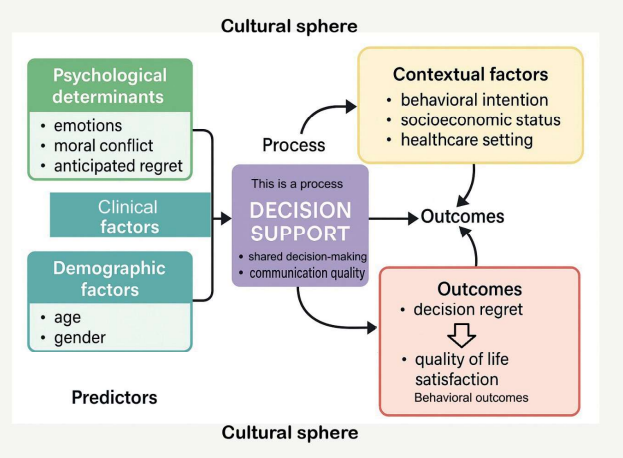

Figure 2. Conceptual framework

DISCUSSION

The present study integrates bibliometric mapping and thematic analysis to develop a comprehensive conceptual framework that elucidates the multifaceted factors contributing to DR among patients with NCDs. This framework highlights the central role of decision support processes and reveals how these interconnected elements influence patient-centered outcomes such as regret, quality of life, satisfaction, and adherence (19–23).

The determinants identified in this framework align closely with those described in the scoping review (14), which highlighted the influence of psychological factors, such as fear, anxiety, and moral conflict, on the emergence of DR. Prior studies have consistently shown that negative emotional responses and unmet expectations can intensify DR and negatively impact treatment satisfaction and adherence (24–29). The current framework further extends these observations by explicitly integrating demographic and contextual modifiers, such as age, socioeconomic status, and healthcare setting, factors that have often been underexplored or treated as confounders rather than central elements in previous models (24–29). The prominent inclusion of shared decision-making and communication quality as mediating process factors also reinforces evidence from earlier work demonstrating that active patient involvement reduces regret and improves long-term outcomes (22,23,30,31). This framework offers a more comprehensive perspective that complements and advances previous conceptualizations of decision-making in NCD contexts by integrating these diverse determinants and highlighting their interrelationships.

Future research should focus on empirically validating this conceptual framework across diverse patient populations and healthcare settings to confirm its generalizability and practical relevance. Developing and testing predictive models based on this framework could help identify individuals at higher risk of experiencing DR, enabling more targeted and proactive interventions. Furthermore, additional qualitative studies are necessary to delve deeper into patient perspectives, particularly to understand cultural nuances, individual value systems, and lived experiences that may influence decision-making processes and outcomes. Integrating these insights could refine the framework further and support the design of personalized decision support strategies that enhance patient autonomy and reduce regret in real-world clinical practice.

Several limitations should be acknowledged when interpreting these findings. First, the scoping review that served as the source data included only studies published in English, potentially introducing language bias and limiting the capture of culturally specific determinants of DR. Second, while bibliometric mapping offers valuable structural insights, it may oversimplify complex conceptual relationships and overlook nuanced contextual meanings present in full-text narratives. Third, the integration of lexicometric and bibliometric approaches, though methodologically robust, cannot fully account for individual patient experiences or the dynamic nature of decision-making in clinical settings. Finally, the proposed conceptual framework, although grounded in empirical evidence, has not yet been prospectively validated and should be tested in future studies to confirm its applicability and predictive accuracy across different patient groups and healthcare systems.

CONCLUSION

This study proposes a comprehensive conceptual framework that elucidates the complex pathways leading to DR among patients with non-communicable diseases. The framework provides a solid foundation for developing actionable predictive tools and tailored decision support interventions by integrating psychological, demographic, clinical, and contextual factors. Future implementation of this framework in clinical practice has the potential to strengthen shared decision-making, enhance patient satisfaction, and ultimately reduce DR in diverse healthcare settings.

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