

Healthcare professionals' perceptions and experiences of fertility preservation in cancer patients: a meta-synthesis

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Abstract

Background: The growing global cancer burden impacts young individuals as early-onset rates rise. Advances in treatment improve survival but often harm reproductive function. Fertility preservation (FP) techniques are crucial, yet research mainly emphasizes patients' views.

Objective: This study explores the roles of healthcare professionals (HCPs), barriers, and facilitators in FP decision-making.

Methods: PubMed, Cochrane, Embase, APA PsycINFO, CNKI, and WANFANG were searched for eligible qualitative and mixed methods studies up to September 2024. The included studies were evaluated using the qualitative research quality assessment criteria from the Joanna Briggs Institute (JBI) in Australia. A framework synthesis of barriers and facilitators to implementation was conducted using the Consolidated Framework for Implementation Research (CFIR). The synthesized results were assessed using the Confidence in the Qualitative Evidence (ConQual) approach.

Results: Overall, 19 studies were included in the qualitative synthesis. Barriers and facilitators to implementation were identified in all 5 CFIR domains: fertility preservation decisions domain, outer setting domain, inner setting domain, individuals domain, and implementation process domain.

Conclusions: To address barriers and better meet patient needs, it is essential to develop practice guidelines, provide policy and legal support, ensure adequate human and financial resources, offer targeted education and training for HCPs, and establish standardized follow-up procedures for cancer patients to facilitate access to FP. Clinical Trial: The protocol was registered with PROSPERO (CRD42024600847).

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Original Manuscript

Healthcare professionals' perceptions and experiences of fertility preservation in cancer patients: a meta-synthesis

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Background:

The growing global cancer burden impacts young individuals as early-onset rates rise. Advances in treatment improve survival but often harm reproductive function. Fertility preservation (FP) techniques are crucial, yet research mainly emphasizes patients' views.

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implementation were identified in all 5 CFIR domains: fertility preservation decisions domain, outer setting domain, inner setting domain, individuals domain, and implementation process domain.

Conclusions:

To address barriers and better meet patient needs, it is essential to develop practice guidelines, provide policy and legal support, ensure adequate human and financial resources, offer targeted education and training for HCPs, and establish standardized follow-up procedures for cancer patients to facilitate access to FP.

Trial registration:

The protocol was registered with PROSPERO (CRD42024600847).

Keywords:

healthcare professionals; cancer patients; fertility preservation; barriers and facilitators; meta-synthesis.

1. Introduction

Although cancer incidence generally increases with age and peaks after 50, thousands of young individuals are diagnosed with cancer each year[1]. According to the latest national cancer report published by the China National Cancer Center in the Journal of National Cancer Center (JNCC), the incidence of cancer in the 35-39 age group has risen sharply, reaching 125.24 per 100,000 people[2]. Cancer survival rates have significantly improved with advancements in early screening, diagnostics, and treatment technologies[3, 4]. Data from China (2019–2021) show that the five-year survival rate exceeds 60% for eight types of cancer: thyroid (92.9%), breast (80.9%), testis (80.7%), bladder (71.5%), prostate (71.1%), uterus (68.1%), cervix (66.9%), and kidney (65.2%)[5]. However, with the growing population of young cancer survivors, a critical challenge emerges: both cancer and its treatments can cause irreversible damage to fertility, leaving infertility as one of the most distressing and long-lasting consequences for some survivors[6, 7].

Surgery, radiotherapy, and chemotherapy, while essential in cancer treatment, can significantly

impact fertility, with specific treatments posing varying degrees of risk to reproductive capacity. The surgical management of testicular cancer through orchiectomy and endometrial cancer through hysterectomy directly results in infertility by removing critical reproductive organs[8]. In female patients, chemotherapy - particularly regimens involving alkylating agents - carries a substantial risk of inducing premature ovarian failure, which dramatically diminishes ovarian reserve and consequently reduces the likelihood of natural conception[9]. Similarly, male cancer patients face fertility challenges through multiple treatment modalities, including chemotherapy, abdominal or pelvic radiation, and surgical interventions that may compromise reproductive organs or disrupt hormonal balance, potentially leading to impaired fertility or complete infertility[10, 11]. For young cancer patients, the prospect of fertility loss represents not only a medical concern but also a profound emotional and psychological burden, frequently manifesting as fertility-related distress and long-term regret[12]. In a study of 100 young breast cancer patients interested in future fertility, 59% were very concerned about infertility after treatment[13], and another cross-sectional survey of 112 patients showed that 55.4% of young breast cancer patients expressed a desire to become parents[14].

To address these concerns, FP has emerged as a critical strategy in cancer care. FP refers to medical and surgical interventions aimed at safeguarding reproductive potential before or during cancer treatment. This includes fertility-sparing surgeries, cryopreservation of gametes or reproductive tissues, and hormonal protection strategies[15]. However, a significant gap remains between the high intention for FP and its low utilization among cancer patients worldwide. A multicenter prospective cohort study in Europe found that while 54% of young breast cancer patients desired future childbearing before diagnosis, 71% maintained this desire post-diagnosis, yet only 27% underwent FP treatment[16]. Similarly, a cross-sectional study in the United States showed that 74% of young adult male cancer survivors wanted to have children, but only 12% received fertility counseling and were more likely to use FP[17]. These findings underscore the urgent need to identify

factors influencing FP decisions and improve access to FP options for cancer patients.

Existing systematic reviews and meta-analyses primarily focus on the perspectives of patients, particularly FP for adult male cancer patients[18], breast cancer patients[19], and adolescents with cancer[20]. However, these studies have tended to focus on FPs in specific cancer types, limiting their generalizability and focusing only on feelings at the individual level and not on what the healthcare organizations should be doing at a more macro level. Some systematic reviews and meta-analyses have examined FP decisions from the perspective of HCPs[21, 22], but the available analyses have limited perspectives, focusing on factors and barriers related to FP decision-making, and need to be updated. This systematic review aims to explore HCPs' perspectives on FP. The research questions addressed were: Do HCPs consider fertility an important issue for cancer patients? Do they discuss fertility issues in their daily clinical practice? What factors promote or hinder HCPs' involvement in FP decision-making for cancer patients?

2. Methods

This review is registered at PROSPERO (CRD42024600847) and follows the JBI [23] and Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) reporting standards[24]. All steps of the review process were conducted independently by two researchers (ZZB and ZY), and differences in evaluation results were resolved through discussion. When a consensus could not be reached, a third researcher (JX) was consulted. Throughout the study, the validated tools were systematically applied to improve the transparency and reproducibility of the results.

2.1 Search Strategy

The eligibility criteria for study inclusion were developed using the acronym PICO_S (see Error: Reference source not found). The electronic databases PubMed, Cochrane, Embase, APA PsycINFO, CNKI, and WANFANG were searched to seek all available studies up to September 2024. The complete search strategy can be found in Multimedia Additional file 1. Reference lists of included

reviews were also searched for any additional eligible articles.

Table 1. Inclusion and exclusion criteria.

Inclusion criteria
● P: Participants: HCPs (including but not limited to doctors, nurses, oncologists, oncology consultants, genetic counselors, and reproductive specialists). ● I: Phenomenon of Interest: Cancer patients aged 15-49 of childbearing age may encounter various facilitating or obstructive factors in the decision-making process of FP. No restriction on cancer type; studies including patients with any type of cancer will be considered. ● Co: Context: Involves FP decisions before, during, or after cancer treatment involving physicians, nurses, or other service providers in a health care setting; includes decision-making processes in different types of health care settings (e.g., hospitals, specialty clinics) or in different cultural and social contexts. ● S: Study type: qualitative and mixed methods designs; full text is available.
Exclusion criteria
● P: Participants: HCPs who are not involved in decision-making regarding the preservation of the patient's fertility. ● I: Phenomenon of Interest: Factors not directly affecting FP decisions, such as studies focusing solely on cancer treatment outcomes, general mental health, or non-reproductive health concerns. ● Co: Context: Studies that focus solely on post-treatment fertility outcomes without examining decision-making processes. ● S: Study type: Duplicate publications; articles designed using mixed methods in which qualitative data cannot be separated.

2.2 Study Selection

The web-based screening tool EndNote20 was utilized to select studies. A total of two reviewers (ZZB, GYH) independently assessed the eligibility of articles based on their titles and abstracts. For articles deemed potentially eligible, full-text copies were obtained and reviewed independently by

both reviewers. Any disagreements regarding an article's eligibility were resolved through discussion until consensus was achieved. If consensus could not be reached, a third reviewer (ZY) was consulted.

2.3 Assessment of Methodological Quality

The included studies were independently assessed by two researchers (ZZB, LYY), trained in evidence-based practice methodology, using the Australian JBI Centre's quality assessment criteria for qualitative research[23]. Evaluation criteria included the study's methodology, purpose, data collection and analysis methods, result interpretation, researcher influence, subject typicality, and ethical norms. Each item was rated as "yes," "no," "unclear," or "not applicable." The article quality was assessed independently by two researchers. Disagreements were resolved through discussion or arbitration by a third party (ZY) before deciding inclusion.

2.4 Data Extraction and Management

Data were extracted in two steps. The first round of data extraction was based on the PRISMA checklist[24]. The extracted data included the first author, country, year of publication, study design, data collection methods, analysis techniques, participants, phenomena of interest, context, and key findings. A second round of extraction involved verbatim and non-verbatim statements regarding facilitators and barriers influencing HCPs' decision-making support for patient FP. These data were crucial for conducting thematic analyses both within and across studies.

2.5 Data Synthesis

This study is based on the CFIR framework and primarily uses a deductive approach, with Excel as a supplementary tool. Influencing factors were extracted from the included articles and mapped to the relevant domains and constructs of the CFIR framework through deductive coding, guided by the established framework and an adapted codebook from the CFIR website[25]. The synthesis was verified by a second reviewer, and in case of disagreements, a third reviewer was consulted to reach a consensus.

2.6 Evaluation of Data Confidence

Assessment is critical to the continued credibility and transferability of qualitative evidence, so we evaluated the body of evidence for quality. The synthesized findings were evaluated via the ConQual method to ensure confidence in qualitative research synthesis output[26]. Each finding was summarized, and the associated ConQual score was developed based on dependability. The dependability score was based on the critical appraisal criteria of the included studies, assessing whether the research was conducted appropriately in line with its aims and objectives. This included factors such as Research methodology and objectives congruity. Methodology and data collection congruity? Methodology and data analysis congruity? The researcher's cultural/theoretical location stated? Researcher's influence on research addressed? These five factors were derived from JBI's article quality assessment tool. The grade for each article was adjusted according to the dependability score: 4-5 "yes" responses: the article remains unchanged with a high grade; 2-3 "yes" responses: downgraded by one level, graded as moderate; 0-1 "yes" responses: downgraded by two levels, graded as low or very low. Four levels of reliability were distinguished: (1) high confidence level demands the construct gets consistent backing from over 1 medium quality study and 1 high quality one, or a minimum of 2 high quality studies as per the JBI. (2) for moderate confidence, the construct requires support from more than 1 moderate good study or identification via at least 1 high quality JBI-based study. (3) low confidence occurs when the construct is only supported by low-quality studies or solitary moderately good ones in line with the JBI; and (4) for very low confidence, the construct is either supported by no more than one study of low quality or there is no study at all based on the JBI. Since our results were synthesized into the CFIR framework using a deductive approach, a process that inherently ensures credibility, the evidence was not separately assessed for credibility in the ConQual score.

3. Results

3.1 Study Selection

The article search resulted in a total of 686 articles found in the PubMed, Cochrane, Embase, APA PsycINFO, CNKI, and WANFANG databases. After removing duplicates, 444 articles were screened based on title and abstract. This resulted in 39 studies that were screened full text, after which studies were excluded on no FP-specific question (n=2, 5%), Meeting/conference abstract (n=3, 8%), Systematic evaluation (n=7, 18%), Full text not available (n=1, 3%), and Wrong domain (n=7, 18%). Finally, 19 studies were included in the qualitative synthesis[27-45]. The study selection procedure is presented in Figure 1.

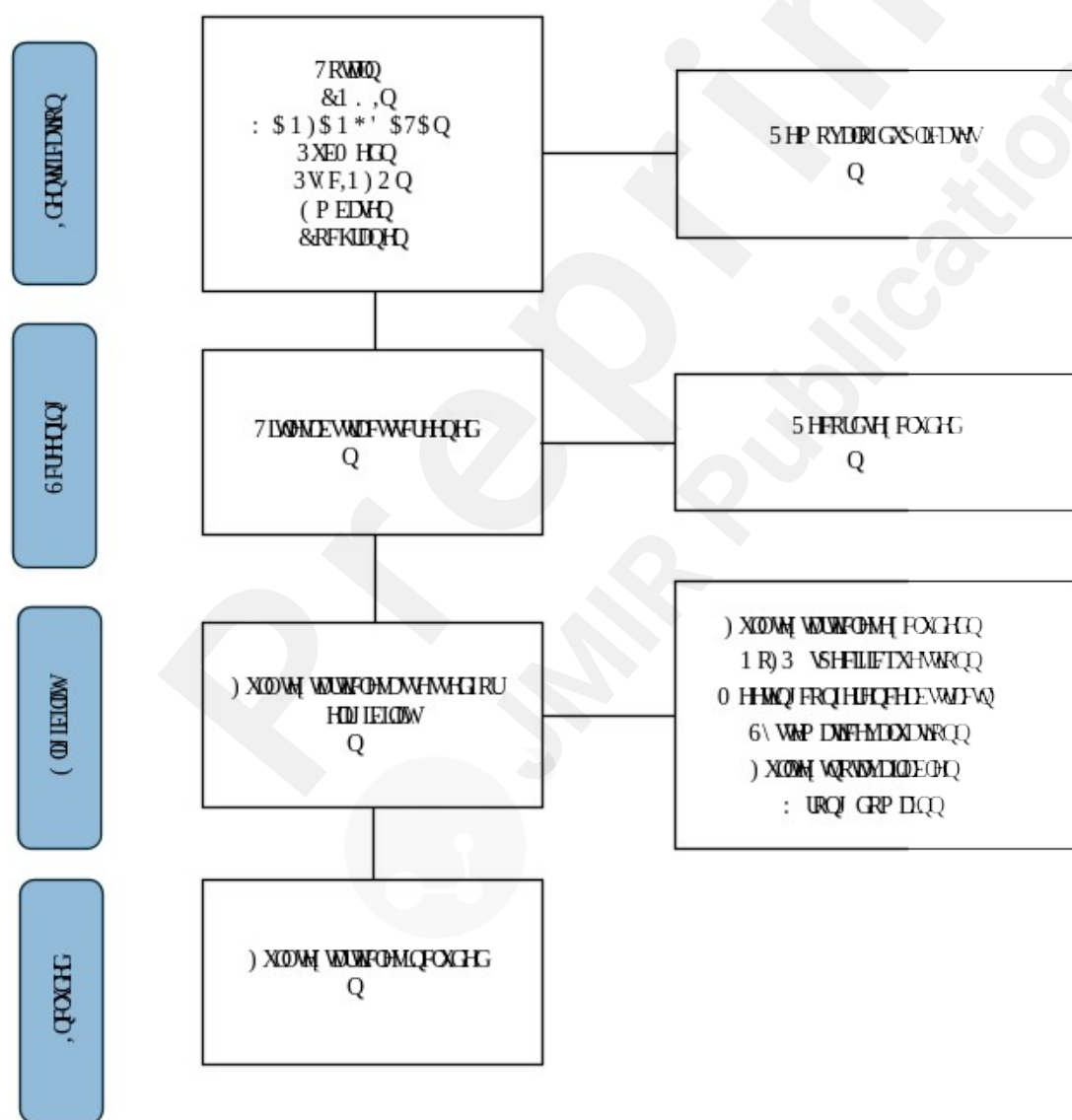


Figure 1. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses).
3.2 Assessment of Methodological Quality

The results of the quality assessment of the 19 included articles are presented in Error: Reference source not found. The methodology of articles[27-29] consistent with the research object's typicality and the applied methods of data analysis are consistent, these studies are qualitative, and the data analysis of the research object is used in a qualitative was rated as yes and the remaining 16 articles were rated as no. Articles [30-33]described the researcher's own situation in terms of cultural background and values, with a quality rating of yes, while the remaining 15 articles did not and were rated as no.

Table 2 Methodological quality of the included studies.

	1	2	3	4	5	6	7	8	9	10
Schioppo et al[27],2024	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Covelli et al[34],2019	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes
Hammarberg et al[30],2017	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Quinn et al[35],2007	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes
Lien et al[36],2021	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes
Xiao et al[28],2024	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Sparidaens et al[31],2022	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Reumkens et al[37],2019	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes
Peddie et al[29],2012	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Brown et al[38],2022	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes
Williams et al[39],2023	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes
Huang et al[40],2022	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes
King et al[32],2008	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Zhang et al[41],2023	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes
Dason et al[33],2022	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Ussher et al[42],2016	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes
Agyemang et al[43],2021	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes
Dornisch et al[44],2021	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes

Stalls et al[45],2024	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
1. Philosophical perspective and methodology congruity?										
2. Research methodology and objectives congruity?										
3. Methodology and data collection congruity?										
4. Methodology and data analysis congruity?										
5. Methodology and results interpretation congruity?										
6. Researcher's cultural/theoretical location stated?										
7. Researcher's influence on research addressed?										
8. Are Participants' voices adequately represented?										
9. Ethical standards and approval met?										
10. Conclusions supported by data analysis?										

3.3 Study Characteristics

Table 3 lists the characteristics of the included studies. Please see [Additional file 2] for more information. All included articles were published between 2007 and 2024. A total of five articles were from the United States[27, 32, 35, 44, 45]; four from China[28, 36, 40, 41]; three from New Zealand[31, 37, 39]; two from Australia[30, 42]; two from Canada[33, 34]; two from the United Kingdom[29, 38]; and one from Ghana[43]. Almost all of the studies focused on cancer patients of reproductive age, with one study examining potential cancer patients and another addressing FP decisions for adult survivors of cancer who were diagnosed during childhood or adolescence. We therefore considered that the study met the inclusion criteria. The majority of these studies used qualitative data collection methods (n=16), followed by mixed methods (n=3).

3.4 Evaluation of Data Confidence

A summary of the results and an overview of CFIR constructs or subconstructs that influence HCPs' decisions to implement FP for cancer patients, with the sources and dependability rating is presented in Table 4. Please see [Additional file 3] for more information. An overview of the data synthesis supported by illustrative quotes, is presented in Table 5. Please see [Additional file 4] for more information. The evidence base for structural characteristics, relational connections, recipient-centred culture, innovation deliverers, innovation recipients, and reflecting & evaluating is classified as high. The evidence base for local attitudes, policies & laws, and relative priority is classified as moderate. The evidence base for complexity is classified as low. The downgrade in article quality

ratings is due to the methodology either being inconsistent with the typicality of the study object and data analysis method or failing to account for the researcher's cultural background and values.

Table 4 Data confidence evaluation.

Table 5 Overview of the data synthesis supported by illustrative quotes.

3.5 Data Synthesis

Barriers and Facilitators by CFIR

3.5.1 Domain 1: Digital Health Service Characteristics

Complexity (Low Confidence): The complexity of the decision-making process may be an impediment to FP decision-making. According to HCPs, the complexity of decisions affecting FP is mainly related to the cancer treatment process. The reproductive decision-making process is complex and dynamic, and the optimal timing for examining decision aids varies from patient to patient[37].

3.5.2 Domain 2: Outer Setting

Local Attitudes (Moderate Confidence): Local sociocultural values may influence the FP decisions. In some traditional cultures, people tend to be shy or reserved about talking about sex[28], which may be barriers to adherence or participation and therefore to the implementation of decision-making in FP.

Policies & Laws (Moderate Confidence): HCPs stressed the significance of setting up protocols, systems, and databases. These are essential as they enable research and the monitoring and evaluation of clinical practice, medical procedure results, and patient outcomes[30]. Therefore, policy support may be an important facilitator of implementation.

3.5.3 Domain 3: Inner Setting

Structural Characteristics (High Confidence): Human, financial, and material resources can be both facilitators and barriers to FP decision-making. From a human resource perspective, the inconsistent professional division of labor among HCPs can be a barrier because it detracts from the focus[43]. If healthcare organizations are adequately equipped with human resources, this would be a

facilitating factor[27]. On the economic side, the geographical location of the patients relative to the fertility clinic had a negative impact[34]. In such cases, they may have to travel long distances to reach them, which often means additional transport costs in addition to those associated with FP. It can be seen that traveling costs due to geographic location can be a huge financial burden and will be a barrier factor. In terms of physical resources, hospital system databases and referral pathways have had mixed results. The initial database was essentially a list of patients' names along with some background information, but all of it was stored in a general "notes" field, making it ineffective for its intended purpose[30]. The efficient electronic order referral system, by contrast, was a positive factor[27].

Relational Connections (High Confidence): Multidisciplinary communication may be a barrier as well as a facilitator to implementation. The decision-making process for patient FP can be difficult if there is not a strong multidisciplinary link[40], but if there is a willingness to actively communicate and co-operate between the multi-disciplines, then this will help to support decision-making for the patient[30].

Recipient-centred culture (High Confidence): Caring for, supporting and addressing patients' needs facilitates the advancement of reproductive decision-making. Respect the patient's fertility wishes, and meet patient needs, may be an important facilitator to implementation[28, 33]. However, the judgement of HCPs is too subjective and can ignore the fertility wishes of patients, which will be an impediment to implementation[38].

Relative Priority (Moderate Confidence): Regarding the prioritisation of fertility and survival, physicians often view survival as the top concern. As some HCPs have pointed out, fertility may interfere with or delay treatment[34]. However, some oncologists, recognise that fertility is part of a normal life post-cure[38]. This duality reflects the complex balance between the two aspects in clinical practice.

3.5.4 Domain 4: Individual

Innovation Deliverers (High Confidence): HCPs' self-efficacy, communication skills, empathy, and education and training can be both facilitators and barriers to FP decision-making. Lack of self-efficacy is a clear barrier, and this hesitancy to answer fertility-related questions due to limited knowledge may result in unaddressed patient concerns[34]. In terms of communication, when patients are unable to ask questions and doctors provide insufficient information, misinformation fills the gaps, potentially leading to patient attrition[43], whereas when doctors translate complex medical concepts into the patient's own thinking, effective communication enhances understanding and reduces fear[28]. The ability to empathize is a powerful facilitator. The ability of HCPs to empathize with a patient's situation may increase patient trust and compliance[36]. Inadequate education and training was a major barrier[41], as FP education is lacking in both formal schooling and continuing education, leaving HCPs unprepared.

Innovation Recipients (High Confidence): Religious beliefs can have a profound impact on patients' decisions regarding FP[42]. Traditional cultural concepts of passing on the family legacy also play a crucial role[41], emphasizing the importance of FP. Family influence is a double-edged sword. While some patients face family breakdowns such as divorce upon diagnosis and lose the motivation for FP [28], others benefit from strong family support, especially from spouses, which is essential for patients to consider and pursue FP options[28].

3.5.5 Domain 5: Process

Implementation process- Reflecting & Evaluating (High Confidence): Follow-up may be both a barrier and a facilitator to implementation. This can be a barrier to implementation when healthcare organizations are unable to provide cancer patients with fellow-sufferers to support the patient's decision[33]. However, when healthcare organizations are able to achieve continuous follow-up of patients after treatment, this will be an enabler for implementation[30].

4. Discussion

This study explored the various barriers and facilitators influencing cancer patients' access to FP care, highlighting the complex interplay of innovation, outer setting, inner setting, individuals, and implementation

process factors. By applying the CFIR, we identified key determinants that impact HCPs' ability to provide FP services. This analysis provides a comprehensive understanding of the challenges and opportunities stakeholders, such as clinicians, nurses, and fertility specialists, must consider when developing effective implementation strategies.

In the fertility preservation decisions domain, the research by Panagiotopoulou[46], Linnane[22], and Daly[21] focus on the complexity of FP, which aligns with our study. FP decisions are multifaceted, shaped by factors across pre-treatment, treatment, and post-treatment stages. In the pre-treatment phase, cancer type, stage, age, and baseline fertility status influence the urgency of treatment and preservation options[29], with younger patients often having more choices[28]. Preservation methods, such as egg, embryo, or ovarian tissue freezing, are further constrained by availability, cost, and success rates[34]. During treatment, fertility-impacting regimens may require adjustment, while post-treatment decisions focus on recovery and the risk of cancer recurrence affecting future pregnancies[45].

In the outer setting domain, Panagiotopoulou's[46] research focuses on policies and laws, and suggests that the lack of healthcare policies can discourage patients from making high-cost FP decisions, which aligns with our study. Policies that offer financial assistance and facilitate research initiatives can reduce the financial burden on patients and improve clinical decision-making. In addition, in the outer setting domain, our research also identified another factor: local attitudes. Local attitudes play a significant role in influencing patients' decisions regarding FP. In the case of China, for example, the prevalent discomfort or taboo surrounding sexual topics creates a challenging environment for both HCPs and patients[28].

In the inner setting domain, resource availability—encompassing human, financial, and material resources—is foundational. Our findings align with Tennyson[47], Panagiotopoulou[46], and Daly[21], who identified understaffing as a barrier to FP services. A robust technological infrastructure, including efficient referral systems[34] and secure data management[30], is also crucial. Tennyson[47] and Panagiotopoulou[46] emphasize the importance of well-established FP facilities. In terms of relational connections, effective communication among HCPs, including oncologists, fertility specialists, and nurses, is vital[30]. This is supported by Barlevy[48], Panagiotopoulou[46], and Daly[21], who highlight that poor communication can impede patients'

understanding of cancer-related information, hindering personalized recommendations. A recipient-centered culture, which respects individual fertility wishes, fosters trust[28]. Taylor underscores the importance of preserving patients' autonomy, while Barlevy stresses respecting patients' right to informed decision-making[48], aligning with our study[49]. Regarding relative priority, the balance between FP and survival is critical. Tennyson[47], Panagiotopoulou[46], Linnane[22], and Taylor[49] argue that fertility issues are often deprioritized, aligning with our study's findings. Some, however, suggest FP should be prioritized, as seen in Salvo's research[50]. A balanced, individualized approach is essential for optimal care and effective FP, requiring professional guidance to ensure personalized support[33].

In the individuals domain, systematic reviews by Daly[21], Panagiotopoulou[46], and Tennyson[47] highlight that insufficient knowledge and training among HCPs can hinder FP discussions and contribute to low self-efficacy. Our research supports this, showing that knowledge gaps from limited training may lead to missed preservation opportunities and errors[33, 41], emphasizing the need for comprehensive training. Lack of self-efficacy often results in hesitancy, incomplete information, and missed patient opportunities[34]. Decisions of FP recipients are influenced by religious beliefs, cultural concepts, and family dynamics. Daly[21] notes that cultural and religious factors can shape FP discussions, with patients in conservative contexts viewing FP as essential for family responsibilities[41, 42]. Family support can facilitate FP[40], while opposition may pose barriers[28]. Tennyson[47], Panagiotopoulou[46], Linnane[22], and Daly[21] similarly highlight these dynamics. HCPs must navigate cultural and familial factors to aid decision-making. Effective communication and empathy are also crucial in the individuals domain. Clear, empathetic interactions build trust and enable informed choices[28], while poor communication can lead to confusion[43]. Empathy allows HCPs to better understand patient concerns, fostering trust and facilitating critical information exchange[36, 38].

In the implementation process domain, this study has not been addressed in other systematic reviews. Follow-

up care is vital in the FP process. Effective follow-up ensures timely interventions and emotional support, promoting patient engagement[30]. However, inadequate or overly intrusive follow-up can disrupt the process, leading to missed opportunities or patient discomfort[33].

4.1 Strengths and limitations

First, this system review is on HCPs' perspectives and experiences regarding FP decisions for cancer patients of reproductive age, a topic that has been relatively underexplored in previous studies. This research serves as a supplement and update to the existing perspectives. Secondly, the CFIR framework was used to conduct a comprehensive macro-level analysis of the factors influencing FP decisions. Thirdly, the ConQual framework was utilized to evaluate the quality of evidence for the study outcomes, enabling more objective and clear conclusions. This study also has several limitations. First, we only searched Chinese and English databases, resulting in a relatively small number of eligible studies. Therefore, the conclusions drawn should be considered preliminary. In addition, the quality of the included studies varies, so the results of these studies should be interpreted with caution. Nevertheless, they represent the best data currently available.

5. Conclusions

In this study, we systematically searched the literature for barriers and facilitators that influence HCPs' implementation of FP decision-making for patients. These barriers and facilitators were deducted into the CFIR framework and the level of evidence for these factors was measured. In order to overcome the barriers to FP and meet the needs of patients, it is necessary to develop and implement practice guidelines, provide policy and legal support, give human and financial support, provide appropriate education and training to HCPs on cancer fertility issues, and establish a standardized procedure for cancer patient follow-up so that cancer patients can enjoy the benefits of FP.

Declarations

Ethics approval and consent to participate

Not applicable.

Clinical trial number

Not applicable.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author (ZY and JX) upon reasonable request. All methods were carried out per the relevant guidelines and regulations.

Competing interests

The authors declare no competing interests.

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Authors' contributions

ZZB, JX, and ZY participated in the conceptualization and design of the study. All authors discussed inclusion and exclusion criteria. ZZB, LYY, GYH, and YAJ searched databases and screened articles, and all authors discussed the inclusion of articles. ZZB was involved in the data collection and data analysis plan, as well as the drafting of the manuscript. JX and ZZB performed the meta-analysis, and ZY supervised the study. All authors were involved in critically reviewing the articles, and writing, drafting, and editing the final publication documents. All authors have read and agreed to the final version of the manuscript.

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1. Siegel, R.L., A.N. Giaquinto, and A. Jemal, Cancer statistics, 2024. CA: A Cancer Journal for Clinicians, 2024. 74(1): p. 12-49.
2. Han, B., R. Zheng, H. Zeng, S. Wang, K. Sun, R. Chen, L. Li, W. Wei, and J. He, Cancer incidence and mortality in China, 2022. Journal of the National Cancer Center, 2024. 4(1): p. 47-53.
3. Miller, K.D., M. Fidler-Benaoudia, T.H. Keegan, H.S. Hipp, A. Jemal, and R.L. Siegel, Cancer statistics for adolescents and young adults, 2020. CA: A Cancer Journal for Clinicians, 2020. 70(6): p. 443-459.
4. Sung, H., J. Ferlay, R.L. Siegel, M. Laversanne, I. Soerjomataram, A. Jemal, and F. Bray, Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. CA Cancer J Clin, 2021. 71(3): p. 209-249.

5. Zeng, H., R. Zheng, K. Sun, M. Zhou, S. Wang, L. Li, R. Chen, B. Han, M. Liu, J. Zhou, M. Xu, L. Wang, P. Yin, B. Wang, J. You, J. Wu, W. Wei, and J. He, Cancer survival statistics in China 2019-2021: a multicenter, population-based study. *J Natl Cancer Cent*, 2024. 4(3): p. 203-213.
6. Wettergren, L., L. Ljungman, C. Micaux Obol, L.E. Eriksson, and C. Lampic, Sexual dysfunction and fertility-related distress in young adults with cancer over 5 years following diagnosis: study protocol of the Fex-Can Cohort study. *BMC Cancer*, 2020. 20(1): p. 722.
7. Cherven, B., R.W. Lewis, M. Pruett, L. Meacham, and J.L. Klosky, Interest in fertility status assessment among young adult survivors of childhood cancer. *Cancer Med*, 2023. 12(1): p. 674-683.
8. Miller, K.D., L. Nogueira, T. Devasia, A.B. Mariotto, K.R. Yabroff, A. Jemal, J. Kramer, and R.L. Siegel, Cancer treatment and survivorship statistics, 2022. *CA Cancer J Clin*, 2022. 72(5): p. 409-436.
9. Mauri, D., I. Gazouli, G. Zarkavelis, A. Papadaki, L. Mavroeidis, S. Gkoura, P. Ntellas, A.L. Amylidi, L. Tsali, and E. Kamplatsas, Chemotherapy Associated Ovarian Failure. *Front Endocrinol (Lausanne)*, 2020. 11: p. 572388.
10. Yumura, Y., T. Takeshima, M. Komeya, S. Kuroda, T. Saito, and J. Karibe, Fertility and sexual dysfunction in young male cancer survivors. *Reprod Med Biol*, 2022. 21(1): p. e12481.
11. Huang, Z. and W.T. Berg, Iatrogenic effects of radical cancer surgery on male fertility. *Fertil Steril*, 2021. 116(3): p. 625-629.
12. Yoshida, K., T. Hashimoto, T. Koizumi, and N. Suzuki, Psychosocial experiences regarding potential fertility loss and pregnancy failure after treatment in cancer survivors of reproductive age to identify psychosocial care needs: a systematic review. *Support Care Cancer*, 2024. 32(6): p. 337.
13. Mannion, S., A. Higgins, N. Larson, E.A. Stewart, Z. Khan, C. Shenoy, H.B. Nichols, H.I. Su, A.H. Partridge, C.L. Loprinzi, F. Couch, J.E. Olson, and K.J. Ruddy, Prevalence and impact of fertility concerns in young women with breast cancer. *Scientific Reports*, 2024. 14(1): p. 4418.
14. Qiu, J., L. Tang, P. Li, and J. Fu, An investigation into the reproductive concerns of young women with breast cancer. *Asia Pac J Oncol Nurs*, 2022. 9(6): p. 100055.
15. Oktay, K., B.E. Harvey, A.H. Partridge, G.P. Quinn, J. Reinecke, H.S. Taylor, W.H. Wallace, E.T. Wang, and A.W. Loren, Fertility Preservation in Patients With Cancer: ASCO Clinical Practice Guideline Update. *Journal of Clinical Oncology*, 2018. 36(19): p. 1994-2001.
16. Ruggeri, M., E. Pagan, V. Bagnardi, N. Bianco, E. Gallerani, K. Buser, M. Giordano, L. Gianni, M. Rabaglio, A. Freschi, E. Cretella, M. Clerico, A. Farolfi, E. Simoncini, M. Ciccarese, D. Rauch, M. Ramello, A. Glaus, R. Berardi, A.F. Pellanda, K. Ribi, S. Gelber, A.H. Partridge, A. Goldhirsch, and O. Pagani, Fertility concerns, preservation strategies and quality of life in young women with breast cancer: Baseline results from an ongoing prospective cohort study in selected European Centers. *Breast*, 2019. 47: p. 85-92.
17. Drizin, J.H., B.W. Whitcomb, T.C. Hsieh, and J.R. Gorman, Higher reproductive concerns associated with fertility consultation: a cross-sectional study of young adult male cancer survivors. *Support Care Cancer*, 2021. 29(2): p. 741-750.
18. Li, Q., Q.Y. Lan, W.B. Zhu, L.Q. Fan, and C. Huang, Fertility preservation in adult male patients with cancer: a systematic review and meta-analysis. *Hum Reprod Open*, 2024. 2024(1): p. hoae006.
19. Chen, C.N., L.T. Chang, C.H. Chen, and K.W. Tam, Fertility preservation for women with breast cancer before chemotherapy: a systematic review and meta-analysis. *Reprod Biomed Online*, 2022. 44(2): p. 357-369.
20. Kuntz, H., J. Santucci, S. Butts, S. Dandekar, G. Smink, L.J. Van Scoy, and P. Rao, Determinants of Decision Regret Regarding Fertility Preservation in Adolescent and Young Adult Cancer Survivors: A Systematic Review. *J Adolesc Young Adult Oncol*, 2024. 13(5): p. 726-737.
21. Daly, C., S. Micic, M. Facey, B. Speller, S. Yee, E.D. Kennedy, A.L. Corter, and N.N. Baxter, A review of factors affecting patient fertility preservation discussions & decision-making from the perspectives of patients and providers. *Eur J Cancer Care (Engl)*, 2019. 28(1): p. e12945.
22. Linnane, S., A. Quinn, A. Riordan, and M. Dowling, Women's fertility decision-making with a diagnosis of breast cancer: A qualitative evidence synthesis. *Int J Nurs Pract*, 2022. 28(4): p. e13036.
23. Lockwood, C., Z. Munn, and K. Porritt, Qualitative research synthesis: methodological guidance for systematic reviewers utilizing meta-aggregation. *JBHI Evidence Implementation*, 2015. 13(3): p. 179-187.
24. Liberati, A., D.G. Altman, J. Tetzlaff, C. Mulrow, P.C. Gøtzsche, J.P.A. Ioannidis, M. Clarke, P.J. Devereaux, J. Kleijnen, and D. Moher, The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: explanation and elaboration. *BMJ*, 2009. 339: p. b2700.
25. Damschroder, L.J., C.M. Reardon, M.A.O. Widerquist, and J. Lowery, The updated Consolidated

- Framework for Implementation Research based on user feedback. *Implementation Science*, 2022. 17(1): p. 75.
26. Munn, Z., K. Porritt, C. Lockwood, E. Aromataris, and A. Pearson, Establishing confidence in the output of qualitative research synthesis: the ConQual approach. *BMC Med Res Methodol*, 2014. 14: p. 108.
 27. Schioppo, D.A., J.P.H. Greenwood, K.A. Miller, and H.S. Vig, A Qualitative Exploration of Oncology Clinician's Needs for PGT-M Discussions in Clinical Practice. *J Adolesc Young Adult Oncol*, 2024. 13(4): p. 646-651.
 28. Xiao, Y., J. Li, J. Lei, J. Chen, X. Li, J. Liu, and L. Han, Experiences of doctors and nurses offering fertility guidance to young breast cancer patients: A qualitative study. *Eur J Oncol Nurs*, 2024. 68: p. 102470.
 29. Peddie, V.L., M.A. Porter, R. Barbour, D. Culligan, G. MacDonald, D. King, J. Horn, and S. Bhattacharya, Factors affecting decision making about fertility preservation after cancer diagnosis: a qualitative study. *Bjog*, 2012. 119(9): p. 1049-57.
 30. Hammarberg, K., M. Kirkman, C. Stern, R.I. McLachlan, D. Gook, L. Rombauts, B. Vollenhoven, and J.R.W. Fisher, Cryopreservation of reproductive material before cancer treatment: a qualitative study of health care professionals' views about ways to enhance clinical care. *BMC Health Serv Res*, 2017. 17(1): p. 343.
 31. Sparidaens, E.M., C.C.M. Beerendonk, K. Fleischer, W. Nelen, D.D.M. Braat, and R. Hermens, Exploration of fertility and early menopause related information needs and development of online information for young breast cancer survivors. *BMC Womens Health*, 2022. 22(1): p. 329.
 32. King, L., G.P. Quinn, S.T. Vadaparampil, C.K. Gwede, C.A. Miree, C. Wilson, H. Clayton, and K. Perrin, Oncology nurses' perceptions of barriers to discussion of fertility preservation with patients with cancer. *Clinical Journal of Oncology Nursing*, 2008. 12(3): p. 467-476.
 33. Dason, E.S., L. Drost, E.M. Greenblatt, A.S. Scheer, J. Han, M. Sobel, L. Allen, M. Jacobson, T. Doshi, E. Wolff, E. McMahon, and C.A. Jones, Providers' perspectives on the reproductive decision-making of BRCA-positive women. *BMC Womens Health*, 2022. 22(1): p. 506.
 34. Covelli, A., M. Facey, E. Kennedy, C. Brezden-Masley, A.A. Gupta, E. Greenblatt, and N.N. Baxter, Clinicians' Perspectives on Barriers to Discussing Infertility and Fertility Preservation with Young Women with Cancer. *JAMA Network Open*, 2019. 2(11).
 35. Quinn, G.P., S.T. Vadaparampil, C.K. Gwede, C. Miree, L.M. King, H.B. Clayton, C. Wilson, and P. Munster, Discussion of fertility preservation with newly diagnosed patients: oncologists' views. *Journal of Cancer Survivorship*, 2007. 1(2): p. 146-155.
 36. Lien, C.T., S.M. Huang, Y. Hua Chen, and W.T. Cheng, Evidenced-based practice of decision-making process in oncofertility care among registered nurses: A qualitative study. *Nursing open*, 2021. 8(2): p. 799-807.
 37. Reumkens, K., C.E.M. de Die-Smulders, and L. van Osch, Exploring the preferences of involved health professionals regarding the implementation of an online decision aid to support couples during reproductive decision-making in hereditary cancer: a mixed methods approach. *Fam Cancer*, 2019. 18(2): p. 285-291.
 38. Brown, K., N. Armstrong, and N. Potdar, Fertility preservation decisions in young women with breast cancer: a qualitative study of health care professionals' views and experiences. *Human Fertility*, 2022. 25(5): p. 903-911.
 39. Williams, L., C. Henry, B. Simcock, and S. Filoche, Increasing incidence of endometrial cancer in Aotearoa New Zealand: Health professionals' perspective. *Aust N Z J Obstet Gynaecol*, 2024. 64(2): p. 114-119.
 40. Huang, S.M., T.S. Kao, P.J. Lien, P.L. Hsieh, P.H. Chen, and L.M. Tseng, Oncofertility care: A qualitative study to understand personal perspectives and barriers in the multidisciplinary breast care team in Taiwan. *Womens Health (Lond)*, 2022. 18: p. 17455057221078480.
 41. Zhang, H.F., Q.H. Jiang, Y.H. Fang, L. Jin, G.Y. Huang, J. Wang, H.F. Bai, and M. Miyashita, Perceptions of Oncology Nurses Regarding Fertility Preservation and Providing Oncofertility Services for Men of Childbearing Age with Cancer. *J Cancer Educ*, 2023. 38(1): p. 16-23.
 42. Ussher, J.M., J. Cummings, A. Dryden, and J. Perz, Talking about fertility in the context of cancer: health care professional perspectives. *Eur J Cancer Care (Engl)*, 2016. 25(1): p. 99-111.
 43. Agyemang, L.S., C. Foster, C. McLean, D. Fenlon, and R. Wagland, The cultural and structural influences that 'hide' information from women diagnosed with breast cancer in Ghana: an ethnography. *BMC Womens Health*, 2021. 21(1): p. 364.
 44. Dornisch, A., E.H. Yang, J. Gruspe, E.R. Roesch, P. Aristizabal, G.A. Aarons, T. Helsten, M.B. Takemoto, S.A.D. Romero, B.N. Kaiser, and H.C.I. Su, Theory-Guided Development of Fertility Care Implementation

- Strategies for Adolescent and Young Adult Cancer Survivors. *Journal of Adolescent and Young Adult Oncology*, 2021. 10(5): p. 512-520.
45. Stalls, J.M., C.S. Dorfman, S. Divakaran, K. Acharya, J. Sperling, J.T. Woodward, J. Plumb Vilardaga, C. Corbett, K. Oeffinger, and R.A. Shelby, Unmet Reproductive Health Care Information Needs of Female Young Adult Survivors of Childhood Cancer: Oncology Providers' Perspectives. *J Adolesc Young Adult Oncol*, 2024.
 46. Panagiotopoulou, N., N. Ghuman, R. Sandher, M. Herbert, and J.A. Stewart, Barriers and facilitators towards fertility preservation care for cancer patients: a meta-synthesis. *Eur J Cancer Care (Engl)*, 2018. 27(1).
 47. Tennyson, R.E. and H.C. Griffiths, A Systematic Review of Professionals' Experiences of Discussing Fertility Issues with Adolescents and Young Adults with Cancer. *J Adolesc Young Adult Oncol*, 2019. 8(4): p. 387-397.
 48. Barlevy, D., T. Wangmo, B.S. Elger, and V. Ravitsky, Attitudes, Beliefs, and Trends Regarding Adolescent Oncofertility Discussions: A Systematic Literature Review. *J Adolesc Young Adult Oncol*, 2016. 5(2): p. 119-34.
 49. Taylor, J.F. and M.A. Ott, Fertility Preservation after a Cancer Diagnosis: A Systematic Review of Adolescents', Parents', and Providers' Perspectives, Experiences, and Preferences. *J Pediatr Adolesc Gynecol*, 2016. 29(6): p. 585-598.
 50. Salvo, G., H. Falconer, and R. Pareja, Beyond oncologic outcomes: fertility and ovarian preservation as key priorities. *Int J Gynecol Cancer*, 2021. 31(3): p. 313.

Abbreviations

CFIR: Consolidated Framework for Implementation Research

ConQual: Confidence in the Qualitative Evidence

FP: fertility preservation

HCPs: healthcare professionals

JB: Joanna Briggs Institute

JNCC: Journal of National Cancer Center

PRISMA: Preferred Reporting Items for Systematic Review and Meta-Analyses

Supplementary Files

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Search strategy.

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Overview of the data synthesis supported by illustrative quotes.

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