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Review

Perceptions of adult patients with cancer towards telemedicine: A qualitative meta-synthesis

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ABSTRACT

Objective: This study aims to systematically identify, evaluate, and synthesize published qualitative research on the views and attitudes of adult cancer patients toward telemedicine and, consequently to better inform the future development of telemedicine technology and interventions.
Methods: A meta-synthesis review was conducted to identify qualitative studies that reported adult cancer patients' perceptions toward telemedicine applications using nine electronic databases, including PubMed, MEDLINE, Web of Science, the Cochrane Library, PsycINFO, CINAHL, Wan Fang, VIP, and CNKI, from inception to November 2022. Quality appraisal was guided by the Joanna Briggs Institute's (JBI) Critical Appraisal Checklist for Qualitative Research. Data were synthesized using "thematic synthesis" to identify themes and concepts.
Results: A total of 3518 articles were retrieved, of which 23 met the inclusion and exclusion criteria. These studies identified three key meta-themes and 11 key sub-themes: (1) Benefits of telemedicine: obtaining information and social support, maintaining the continuity of treatment, receiving professional assistance, having greater flexibility, and promoting physical and mental health; (2) Limitations of telemedicine: interference with normal life, privacy and security issues, auxiliary function issues, and increased psychological burden; (3) Expectations for future telemedicine: more personalized intervention, more specific and diverse information.
Conclusions: The study showed that the benefits and limitations coexisted in the process of telemedicine application among adult cancer patients. It is necessary to develop personalized applications that are better suited to the needs and characteristics of adult cancer patients. Future telemedicine interventions should focus on information diversification and provide patients with more diverse and effective information.
Systematic review registration: PROSPERO, CRD42022324528.

Introduction

According to the World Health Organization (WHO), cancer has become the second leading cause of death worldwide, with approximately 10 million people dying from cancer each year, accounting for one in every six deaths.[1] It is reported that the number of people diagnosed with cancer worldwide continues to rise.[2] Telemedicine, a crucial tool for managing cancer patients that enables continuity of treatment and care, remote consultation, expert-guided physical activity, and emotional and psychological support,[3] can enhance the quality of life and mental health of cancer patients.[4,5] The Coronavirus disease 2019 (COVID-19) pandemic had a severe impact on health care systems globally and impeded cancer patients' access to medical facilities for treatment.[6] Telemedicine provides an ideal medical

platform for cancer patients in this epidemic era, which is not only providing continuous tumor care but also reducing the risk of nosocomial infection.[7] With the emergence of COVID-19, this function has grown in significance since social isolation and quick patient treatment have become essential.

Telemedicine, which means "healing at a distance" and was coined in the 1970s, is defined as the use of telematics to improve the patient's ability to access relevant care and medical information, as well as the patient's treatment outcome or health status.[8,9] According to WHO, telemedicine must meet the following four criteria: (1) Its purpose is to provide clinical support; (2) Its goal is to bridge geographical gaps by connecting physical locations that are not in the same space; (3) It necessitates the use of various information and communication technologies; and d) Its objective is to improve health outcomes.[8] Telemedicine is

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increasingly being used in global health care services.[10] To date, the most commonly used modes of telemedicine include telephone, video conferencing, e-mail, wearable devices, cellular phones, and various mobile applications,[8,11] and the development of telemedicine traditionally focusing on the WHO "big five" diseases: cancer, diabetes mellitus, cardiovascular disease, chronic respiratory diseases, and stroke.[12] Despite telemedicine having made significant progress in many of these areas, it is still considered to be in its infancy.[13]

Telemedicine has shown many unique advantages and is becoming increasingly popular with the public. A systematic review found that telemedicine could improve the quality of life of lung cancer patients compared to traditional care models.[5] The use of video conferencing in the homes of cancer patients has been shown to improve cooperation between medical teams and to be a more efficient approach than traditional care models.[14] Teleconferencing with patients, their families, and health care professionals allows access to clinical data that would otherwise be unavailable.[15] According to a qualitative analysis, 60% of participants thought telemedicine could improve diagnostic speed and access to relevant health care knowledge, and 75% would recommend telemedicine to their families and friends.[16] The qualitative interviews by Zhu[17] revealed that patients who use the Mobile Breast Cancer e-Support Program believe that telemedicine could improve knowledge, confidence, and emotional well-being.

The importance of telemedicine is becoming increasingly acknowledged in health services research, especially in the context of the COVID-19 pandemic,[18] and incorporating user viewpoints into telemedicine interventions is fundamental to providing patient-centered care that is sensitive to patients' perspectives. While a number of qualitative studies[16,17,19,20] have been conducted to provide some insight into how patients with cancer perceive telemedicine technologies, to date, these studies have not been systematically synthesized to fully reveal the user experience of telemedicine use in a rigorous and complete way. Furthermore, the majority of current systematic reviews of telemedicine are based on studies of the effectiveness of intervention[21,22] or user experience[23,24] for patients with chronic diseases, and there is a lack of systematic reviews of in-depth qualitative studies that identify cancer patients' experiences and perspectives on telemedicine. Although one study systematically reviewed the experiences of breast cancer on telemedicine,[25] its perspectives were limited to patients of women with breast cancer, and the findings were biased.

Therefore, the purpose of this study is to: (1) systematically evaluate the experience and perspectives of adult patients with cancer toward telemedicine use to validate their experience with telemedicine; and (2) to discuss how the findings can contribute to the development of future telemedicine technology and related interventions.

Methods

This qualitative meta-synthesis was conducted following the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 checklist (Appendix A). The review protocol was registered with the PROSPERO International Prospective Register of Systematic Reviews (CRD42022324528).

Search strategy

Six English databases (PubMed, Web of Science, MEDLINE, PsycINFO, the Cochrane Library, and the Cumulative Index to Nursing and Allied Health Literature (CINAHL)) and three Chinese databases (the China National Knowledge Infrastructure (CNKI), Weipu (VIP) and Wanfang) were searched from inception until November 2022.

In PubMed, we conduct a systematic search with Medical Subject Headings (MeSH) terms and free terms. The representative search terms were presented in Table 1, and the search terms were adjusted slightly to fit the different search systems. The full-search strategies of all databases are presented in Supplementary Table S1.

Table 1
Search terms.

PICOS	Search terms
P	"Neoplasms" OR "neoplasia*" OR "tumor*" OR "cancer*" OR "neoplasm" OR "onco*" OR "malignant*" OR "carcino*"
I	"Telemedicine" OR "telenursing" OR "telerehabilitation" OR "internet*" OR "multimedia" OR "intelligence*" OR "remote*" OR "mobile health" OR "health, mobile" OR "mHealth" OR "telehealth" OR "eHealth" OR "counseling, distance" OR " e-therap*" OR "e-consultation" OR "telecommunication" OR "virtual" OR "comput*" OR "app*" OR "web*" OR "*phone*" OR "mobile*" OR "digital*" OR "tele*" OR "ipad*" OR "message*" OR "email" OR "WeChat" OR "online"
CO	"perception*" OR "attitude*" OR "feeling*" OR "experience*" OR "perspective*"
S	"Qualitative research" OR "qualitative" OR "interview" OR "audio recording*" OR "focus group" OR "hermeneutics" OR "content analysis" OR "thematic analysis" OR "phenomenon" OR "grounded theory" OR "mixed method study" OR "case report*" OR "action research" OR "descriptive study" OR "narrative" OR "participant observation" OR "hermeneutic philosophy"

P, participants; I, interest in phenomena; CO, context; S, study.

The inclusion and exclusion criteria in this review were developed using a modified PICOS (Population, Intervention, Context, Outcome, and Study) approach. The inclusion and exclusion criteria are presented in Table 2.

Study screening

Initially, 3518 studies relevant to the topic were identified and imported into the reference management software EndNote 20, of which 847 were duplicates. Then, two reviewers (Ren and Chen) performed an initial title and abstract screening to eliminate off-topic studies. Subsequent studies were screened for full-text reading based on inclusion and exclusion criteria. If the two reviewers had any disagreements, the third researcher (Jiang) was contacted to resolve the discrepancies. The remaining articles were then critically assessed using the Joanna Briggs Institute's (JBI) Qualitative Assessment and Review Instrument. The completed PRISMA flow diagram is shown in Fig. 1.

Quality assessment

All studies were independently evaluated by two reviewers (Ren and Chen) using the JBI Critical Appraisal Checklist for Qualitative Research,[26] which consists of 10 questions assessing philosophical foundation, research methodology, data collection method, data analysis, research ethics, and validity of the result. Each item was rated as "yes", "no", "unclear" or "not applicable". Each paper was rated on a 10-point scale, with ≤ 6 representing weak, 7–8 representing moderate, and 9–10 representing high quality.[27] If there is a lack of consensus, a

Table 2
Inclusion and exclusion criteria.

Inclusion criteria	Exclusion criteria
1. Participants (P): patients, aged ≥ 18 years old, are diagnosed with any type of cancer and can be interviewed after obtaining informed consent.	1. Other family members, such as spouses or parents of cancer patients, receive telemedicine, or the interviewees include doctors, nurses, and family members in addition to cancer patients.
2. Interest in phenomena (I): feelings, experiences, views, and perceptions formed by cancer patients in the process of using telemedicine.	2. Any telemedicine designed for the sole purpose of monitoring or screening.
3. Context (Co): telemedicine is carried out by medical staff.	3. Unable to obtain full-text, repeatedly published, or incomplete literature.
4. Study (S): qualitative studies.	4. Any type of review, thesis, dissertation, or conference abstract.
5. Language is limited to English and Chinese.	5. Any other language.

Identification

Records identified through database searching
(*n* = 3,518)

PubMed (*n* = 486)	CINAHL (*n* = 128)	WOS (*n* = 899)	Medline (*n* = 822)	PsycINFO (*n* = 58)	Cochrane (*n* = 897)	CNKI (*n* =103)	VIP (*n* = 50)	Wanfang (*n* = 75)

Screening

Records after duplicates removed
(*n* = 2,671)

Additional records identified from
reference lists
(*n* = 0)

Records screened
(*n* = 2,671) → Records excluded
(*n* = 2,348)

Eligibility

Full-text articles assessed for eligibility
(*n* = 323) → Full-text articles excluded
(*n* = 300)
Not related to phenomena of interest (*n* = 153)
Not a qualitative study (*n* = 32)
Interviewees include doctors, nurses and family members or not cancer patients (*n* = 57)
Duplicates (*n* = 24)
Conference abstracts (*n* = 15)
Incomplete data (n = 19)

Included

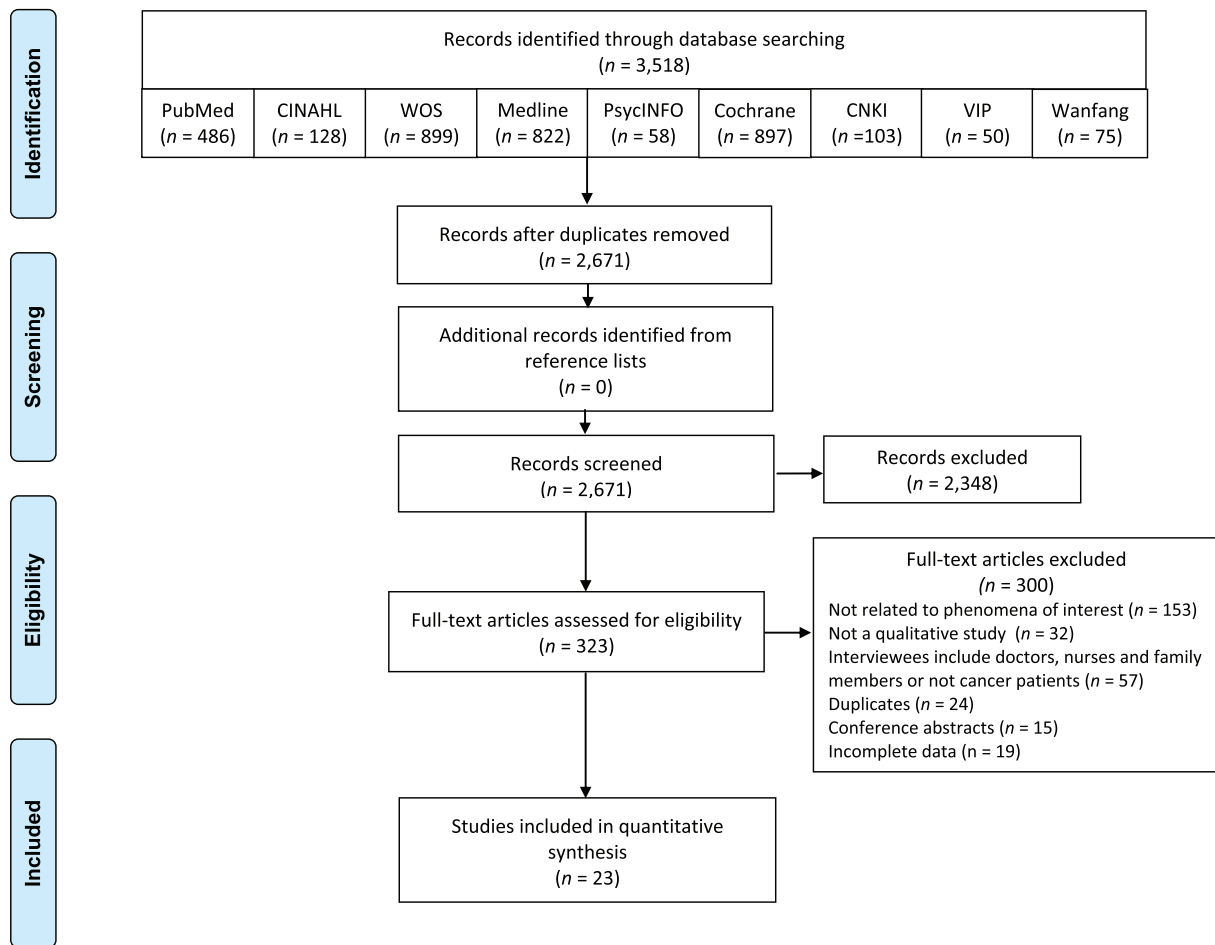Studies included in quantitative
synthesis
(*n* = 23)

Fig. 1. PRISMA search flow diagram. PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

third reviewer (Jiang) will assist in the resolution of any disagreements between reviewers. The methodological assessment of the studies is presented in Table 3.

Data extraction

Qualitative data from the included studies was extracted into an Excel database by two reviewers (Ren and Chen). Data extraction included authors, year of publication, country, objective, participants and sample size, study design and methods, and results were noted. Table 4 shows the main characteristics identified in the articles.

Data synthesis

The "thematic synthesis" was used to identify themes and concepts of the included studies.[28] The synthesis of original research findings to generate a set of statements is a three-step process. Step 1 involved the free line-by-line coding of the findings of primary studies. Step 2 was the organization of these free codes into related areas based on the similarity of meaning to build descriptive themes. Step 3 was the development of analytical themes that can be used as a basis for clinical practice. Two researchers (Ren and Chen) conducted the analysis, and the final synthesized results were agreed upon by all the authors.

Results

Characteristics of the included studies

The 23 included studies were published between 2010 and 2022 (Table 4). Seven of them were conducted in the United States, four in China, four in the United Kingdom, three in Sweden, two in Australia, and the remaining three in Canada, Italy, and Denmark. The sample size (approximately *n* = 561) ranged from 6 to 121 participants. There were more females (*n* = 388) than males (*n* = 171). The majority of participants were diagnosed with breast cancer (*n* = 183), followed by hematologic cancer (*n*116), prostate cancer (*n* = 71), ovarian cancer (*n* = 45), prostate cancer (*n* == 21), and other cancer types (*n* = 31), whereas six studies did not define specific cancer types.[29–34]

Methodological characteristics of the included studies

Most studies were based on individual semi-structured interviews, whereas two studies included focus groups, two studies included a mix of focus groups and structured interviews, and one study used structured interviews to collect information. A variety of data analysis methods were used in the studies, including thematic analysis (9 studies), content analysis (6 studies), repeated inductive analysis (6 studies), and thematic

Table 3
Critical assessment of the included studies.

	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	Score (out of 10)
Cox and Faithfull (2015)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	10
Christiansen et al. (2022)	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	9
Lesley et al. (2021)	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	9
Wang et al. (2020)	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	9
Zilliacus et al. (2010)	U	Y	Y	Y	Y	Y	Y	Y	Y	Y	9
Emard et al. (2021)	U	Y	Y	Y	Y	Y	N	Y	Y	Y	8
Im et al. (2010)	N	Y	Y	Y	Y	N	N	Y	Y	Y	7
Huberty et al. (2018)	U	Y	Y	Y	Y	Y	Y	Y	Y	Y	9
Hu et al. (2018)	U	Y	Y	Y	Y	Y	N	Y	Y	Y	8
Kraus et al. (2022)	U	Y	Y	Y	Y	N	N	Y	Y	Y	7
Li et al. (2020)	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	9
Liptrott et al. (2020)	U	Y	Y	Y	Y	N	N	Y	Y	Y	7
McGrath (2014)	U	Y	Y	Y	Y	Y	N	Y	Y	Y	8
Tasneem et al. (2019)	U	Y	Y	Y	Y	N	N	Y	Y	Y	7
Wang et al. (2021)	U	Y	Y	Y	Y	Y	N	Y	Y	Y	8
McCall et al. (2008)	U	Y	Y	N	Y	Y	N	Y	Y	Y	7
McCann et al. (2009)	U	Y	Y	Y	Y	Y	Y	Y	Y	Y	9
Beaver et al. (2010)	U	Y	Y	N	Y	Y	Y	Y	Y	Y	8
Gorlick et al. (2014)	U	Y	Y	Y	Y	N	Y	Y	Y	Y	8
Zhu et al. (2018)	U	Y	Y	Y	Y	Y	N	Y	Y	Y	8
Hauffman et al. (2020)	U	Y	Y	N	Y	N	Y	Y	Y	Y	7
Igelström et al. (2020)	U	Y	Y	N	Y	N	Y	Y	Y	Y	7
Crafoord et al. (2020)	U	Y	Y	N	Y	Y	Y	Y	Y	Y	8

Note: ① Is there congruity between the stated philosophical perspective and the research methodology? ② Is there congruity between the research methodology and the research question or objectives? ③ Is there congruity between the research methodology and the methods used to collect data? ④ Is there congruity between the research methodology and the representation and analysis of data? ⑤ Is there congruity between the research methodology and the interpretation of results? ⑥ Is there a statement locating the researcher culturally or theoretically? ⑦ Is the influence of the researcher on the research, and vice versa, addressed? ⑧ Are participants and their voices adequately represented? ⑨ Is the research ethical according to current criteria or, for recent studies, and there evidence of ethical approval by an appropriate body? ⑩ Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data?
Y, Yes; N, No; U, Unclear.

content analysis (2 studies). Table 4 summarizes the main findings, including the main themes and sub-themes.

Main findings of the meta-synthesis

The 23 included studies generated 11 key sub-themes. By comparing and contrasting the 11 sub-themes, three themes of cancer patients' experiences and perceptions of telemedicine were identified through meta-synthesis: (1) Benefits of telemedicine; (2) Limitations of telemedicine; and (3) Expectations for future telemedicine. Fig. 2 presents themes identified in the included studies with key exemplary quotations. These themes were further divided into sub-themes to enhance our comprehension of the phenomenon. The main results are detailed below.

Theme 1: benefits of telemedicine

The majority of participants believed that telemedicine could improve their quality of life by providing social and professional support and assistance, as well as ensuring treatment continuity. All of which would benefit and promote the physical and emotional health of cancer patients. The theme is divided into the five major sub-themes as follows:

Obtaining information and social support. Information and social support refers to making friends with other patients, getting information support from health care professionals, and developing trust and friendship with them. This sub-theme was supported by ten studies.[17,20,31,33,35–40] Through patient–peer interaction, patients mentioned that telemedicine enhanced their socialization by alleviating their social isolation and providing social support.

> *"It allows you to havehuman contact with someone who's in the hospital who knows your situation well and can give you indications and advice.[37]"*

Telemedicine has been used as a tool to examine information obtained from various sources, which has aided in learning more about cancer, treatment, and diagnosis.[17,33,40]

> *"The first thing you need is information, a foundation, knowing that this is the correct information that I can trus;, this is how it works. Then you need different tools based on that, like, for example, CBT [cognitive behavioral therapy]. But this thing, the information, is at the core of understanding the disease. It has to start with that in order for you to, like, move on.[40]"*

> *"I was very interested in reading the content in the learning forum. In the past, I never thought about breast cancer. Before the diagnosis, I had no knowledge of anything about breast cancer. But now it has happened to me. I read the knowledge in the learning forum and I really have learned a lot. I felt good when reading the content.[17]"*

In addition, most cancer patients require ongoing treatment and care after being discharged from the hospital. The unknown nature of medical knowledge could place a significant burden on patients. Telemedicine could make patients feel less stressed by providing them with relevant information. And the information supported allowed patients to feel empowered with knowledge.

> *"It wasn't upsetting. More informative for me, I think, it didn't really upset me. There were things that I wanted to hear, you know, and that was it. I found it more informative.[31]"*

> *"It's like a whole new world to me this time, you know … because it's really not about the physical poses; it's really about the mindfulness; the breathing, and the connection to something outside of yourself [20]"*

While communicating with health care professionals, patients could experience empathy, feel the care of the nursing staff, and feel comfortable and at ease when receiving interventions. Relationships with health care professionals were closer to friendships.

> *"You get to know them …. it's more sort of friendly, you know ……That is like talking to a friend, really, and it's not clinical.[35]"*

Maintaining the continuity of treatment. Continuity of treatment is about assisting people who lack support to guide their continuity of care after

Table 4
Characteristics of the included articles.

Author (year)	Country	Purpose	Participants	Study design	Data collection method	Data analysis method	Result
Cox and Faithfull (2015)	United Kingdom	To explore the views and experiences of ovarian cancer patients who got long-term nurse-led telephone follow-up after their therapy	11 patients with ovarian cancer; 100% females; age range 47–79 years old	Interpretative Phenomenological Analysis (IPA)	Semi-structured interview	Thematic analysis	1. *Somebody was looking out for me*: a little bit more personal; there's always somebody there; like talking to a friend. 2. *It's just reassurance*: she will know; your blood test is fine. 3. *Time was never an issue*. 4. *Future provision for survivors of ovarian cancer*.
Christiansen et al. (2022)	Denmark	To explore the patients' perceptions and experiences of the rapid implementation of digital consultations during COVID-19	32 patients with gynecological cancers (Ovary 16, Cervix 11, Vulva 4, Vagina 1); 100% females; average age 53 years old	Descriptive qualitative research	Semi-structured; individual telephone interviews	Thematic analysis	1. Pros and cons of digital consultations. 2. Value of face-to-face consultations. 3. Individual solutions for consultations are favored.
Lesley et al. (2021)	Canada	To explore the benefits and drawbacks of virtual cancer care as viewed and experienced by patients	22 patients (solid cancer 14, hematological cancers 7); 13 females, 9 males; average age 55.5 years old	Descriptive qualitative research	Online focus groups; individual interviews	Thematic analysis	1. Benefits of virtual care. 2. Drawbacks of virtual care. 3. Optimizing virtual cancer care.
Wang et al. (2020)	United States	To explore the perspectives of prostate cancer survivors who participated in a web-based lifestyle intervention	20 prostate cancer survivors; 100% males; age > 70	Grounded theory research	A focus group	Constant comparative	1. *Environment*: Home environment; competing priorities; other lifestyle programs. 2. *Motivation*: accountability; discordance. 3. *Preparedness*: health literacy; tech-literacy; trust; readiness for change. 4. *Program design*: communication; materials; customization (flexibility); customization (tailored feedback). 5. *Program support*: education; ally; community. 6. *Impressions and habits*: impressions and habits.
Zilliacus et al. (2010)	Australia	To explore women's experiences with telegenetics, satisfaction, perceived benefits and drawbacks, and quality of their interaction with genetic professionals	12 patients (unaffected 4, breast cancer only 7, breast & ovarian cancer 1); 100% females; age 36–65 years old	Qualitative research	Semi-structured interview	Content analysis	1. Overall experience and satisfaction. 2. Technical aspects. 3. Expectations and purpose of the consultation. 4. Social presence. 5. Interacting with the genetic clinician. 6. Interacting with the genetic counselor. 7. Advantages of telegenetics. 8. Disadvantages.
Emard et al. (2021)	United States	To explore cancer patients' experiences of the virtual mind-body program	30 patients (breast 11, ovarian 4, lung 3, uterine 2, lymphoma 2, tongue 2, colon 1, bladder 1, liver 1, pancreatic 1, prostate 1, skin 1); 29 females, 1 male; average age 64.5 years old	Grounded theory research	Semi-structured interview	Constant comparative	1. Promotion of positive health behaviors. 2. Enhancement of psychological coping. 3. Fostering social engagement.
Im et al. (2010)	United States	To explore the perspectives of Asian Americans living with cancer who participated in Internet cancer support groups (ICSGs) and the factors influencing their participation in ICSGs	18 cancer patients; 15 females, 3 males; average age 39.89 years old	Qualitative research	A focus group	Thematic analysis	1. *More Than Just My Family*: strong family support; burden from family responsibilities; less than adequate family support. 2. *Part of My Family*: seeking new families; seeking heart. 3. *Anonymous Me*: cancer as a private matter; staying

Table 4 (*continued*)

Author (year)	Country	Purpose	Participants	Study design	Data collection method	Data analysis method	Result
							normal; nobody knows. 4. *Shielded from the Real World*: barriers in life; online versus physical life; wanting to be in the mainstream.
Huberty et al. (2018)	United States	To explore the perspectives of myeloproliferative neoplasms patients on their experience of participating in an online yoga intervention	39 myeloproliferative neoplasms patients; 5 males, 34 females; average age 60 years old	Qualitative research	Structured interview	Reflexive thematic analysis	1. Physical Health Impacts. 2. Mental Health Impacts. 3. Postintervention Yoga Perceptions. 4. Yoga Intervention Likes and Dislikes. 5. Perceptions of Yoga Prescription. 6. Future Yoga Participation. 7. Recommendations for Other MPN Patients.
Hu et al. (2018)	China	To explore the cancer patients' experience of using mobile-health service	15 cancer patients (ovarian 6, endometrial cancer 1, breast cancer 4, cervical 3, colorectal cancer 1); 14 females, 1 male; average age 41.6 years old	Descriptive qualitative research	Face-to-face semi-structured interview	Content analysis	1. *Limited trust in mobile health services*: cancer patients trust medical staff more; cancer patients have low trust in Internet information. 2. *Cancer patients have low trust in Internet information*: limited interaction, information security risks, and barriers to use. 3. *Patients need personalized content*: personal disease information; rehabilitation treatment information; social needs; aesthetic needs; and the need for economic support.
Kraus et al (2022)	United States	To explore the attitudes of gynecologic cancer patients regarding telemedicine for cancer care	15 gynecologic cancer patients (ovaries 8, endometrium 3, primary peritoneal carcinoma 2, cervical 1, vaginal cancer 1); 100% females; average age 58 years old	Qualitative research	Semi-structured telephone interview	Thematic analysis	1. *Advantages of telemedicine for gynecologic cancer care*: convenience; travel and associated costs; health state. 2. *Disadvantages of telemedicine for gynecologic cancer care*: initial visit; technology; patient-physician communication.
Li et al. (2020)	China	To explore the medical and nursing service experience of breast cancer patients receiving mobile health care during the outbreak of COVID-19	17 breast cancer patients; 100% females; average age 44.88 years old	Descriptive phenomenology	Semi-structured interview	Repeated inductive analysis	1. *Excellent experience of mobile medical and nursing services for patients in the COVID-19 epidemic*: reduce the number of patients returning to hospital during the COVID-19; shorten the time for patients to see a doctor during the COVID-19; avoid delay of medication for patients during the COVID-19; reduce caregivers during the COVID-19. 2. *Insufficient experience of mobile medical and nursing services in COVID-19*: insufficient effective publicity of mobile medical use; the usage habit of mobile medical and nursing services is difficult to meet the needs of epidemic diagnosis and treatment; insufficient technology development limits the use rate of mobile medical services; the differentiated

Table 4 (*continued*)

Author (year)	Country	Purpose	Participants	Study design	Data collection method	Data analysis method	Result
							demand in urban and rural areas reduces the use of mobile medical and nursing services.
Liptrott et al. (2020)	Italy	To identify the unmet needs among haemato-oncology patients and their impact on the perceived acceptability and participation in a telephone intervention delivering	20 haemato-oncology patients; 11 males and 9 females; average age 54 years old	Qualitative research	Semi-structured interview	Repeated inductive analysis	1. *Fluctuating Personal Emotional Distress and Coping*: experiences of personal emotional distress; adaptive coping strategies; maladaptive coping strategies. 2. *Potential Deficits in Care*: patient support-unmet psychological and emotional needs; continuity of care; information provision; affective attitude. 3. *Intervention Acceptability*: ethicality and efficacy; opportunity costs and burden; intervention effectiveness and coherence.
McGrath (2014)	Australia	To explore patients' attitudes on routine telephone follow-up as a supportive care strategy for patients with hematologic malignancies	50 adults with hematologic malignancies; 26 males and 24 females; age not mentioned	Qualitative research	Open-ended interviews; focus groups	Thematic analysis	1. *The Perception of Benefit*: support for the Idea; provides personal attention; helpful for people with little support; provides one-on-one contact; particularly useful after treatment; the need for involvement is ongoing; maintains a link with the leukemia foundation of Queensland; provides information; can help support workers know how people are doing. 2. *Rejection of Routine Follow-Up Calls*: lack of support for the idea; does not like focusing on the disease and treatment; has others to provide information, medical advice, and support; would not want regular calls; interferes with the process of getting on with life; not necessary; uses up resources for others who need telephone contact.
Tasneem et al. (2019)	United States	To evaluate patient interest and input on the perceived usability and impact of videoconference telemedicine on health management for palliative care	13 oncology patients; 6 females and 7 males; age > 50 years old	Qualitative research	Semi-structured interview	Thematic content analysis	1. User experience with videoconference technology. 2. Impact on health information management. 3. Impact on the patient–provider relationship. 4. Impact on cost. 5. Impact on travel time and risk. 6. Impact on efficiency and access.
Wang et al (2021)	China	To explore the experience of young cancer patients' utilization of mobile health applications	12 cancer patients (Nasopharyngeal carcinoma 4, colorectal cancer 1, germ cell tumors 1, breast cancer 3, lung cancer 2, mediastinal tumor 1); 7 males, 5 females; aged 15–39 years old	Descriptive phenomenology	Semi-structured interview	Repeated inductive analysis	1. *Differences in use attitude*: used for rehabilitation management to reduce the burden of disease; increase the psychological burden and reduce the frequency of use; lack of initial trust. 2. *Inadequate function development, reducing the*

Table 4 (*continued*)

Author (year)	Country	Purpose	Participants	Study design	Data collection method	Data analysis method	Result
							user experience: lack of autonomy; failing to meet the patient's disease response needs; insufficient intelligent evaluation; and lack of effective feedback. 3. *Desire for a professional operation organization.* 4. *Recognize the development prospects and look forward to further improvement.*
McCall et al. (2008)	United Kingdom	To explore the perceptions of the use of a remote monitoring system in cancer patients receiving palliative care at home	6 patients with advanced cancer (cancer type not mentioned); 4 males, 2 females; aged 40–87 years old	Descriptive phenomenology	Semi-structured interview	Thematic analysis	1. Benefits of use. 2. Pain management is inadequate. 3. Useful information suggestions. 4. Benefits of monitoring.
McCann et al. (2009)	United Kingdom	To evaluate the cancer patients' perceptions and experiences of ASyMS	12 cancer patients (breast cancer, lung cancer, and colorectal cancer, exact amount not mentioned); gender not mentioned; age not mentioned	Qualitative research	Semi-structured interview	Thematic content analysis	1. Personal feeling. 2. Training and familiarization of the handset. 3. Length of data collection. 4. Daily routine. 5. Symptoms. 6. The alerting facility. 7. Reassurance. 8. Positive overall experiences. 9. Future use and development of system.
Beaver et al. (2010)	United Kingdom	To explore the views of breast patients on telephone follow-up after treatment	28 breast cancer patients; 100% females; aged 48–80 years old	Qualitative research	Semi-structured interview	Content analysis	1. Convenience. 2. Continuity. 3. Normalizing. 4. Structure. 5. Putting a face to the voice.
Gorlick et al (2014)	United States	To explore the experience of cancer survivors who were minimally engaged with the online intervention	25 cancer patients (7 breast cancer, 5 prostate cancer, 4 thyroid cancer, 4 other cancers, including mouth, thymus, and leiomyosarcoma, 3 multiple cancers, 1 female rep cancer, and 1 blood cancer); 9 males, 16 females; average age 52.8 years old	Descriptive phenomenology	Semi-structured interview	Thematic analysis	1. *Connecting with similar others*: unable to relate; cancer type; more connection; phase of treatment; cancer stage. 2. *Individual expectations*: personal relevance; desire for information; tone of communication; facilitation; internet experience; previous support group. 3. *Problems with the site*: structure of website; time commitment; inadequate instruction; email reminders; problem with questionnaires; problem with waitlist; problem with site appearance.
Zhu et al. (2018)	China	To explore the breast cancer patients' perception of the Breast Cancer e-Support program, its strengths and weaknesses, and suggestions to improve the program	13 breast cancer patients; 100% females; aged 30–65 years old	Qualitative research	Semi-structured interview	Inductive content analysis	1. *Benefits of the Breast Cancer e-Support Program: enhanced knowledge*: improved confidence level; improved emotional well-being; received advice from experts; easy to use, easily accessible, and convenient. 2. *Challenges to engagement in the Breast Cancer e-Support Program*: physical or psychological health status; stigma with breast cancer; instability of the app. 3. *Suggested improvement*: design improvement; interesting, plain, and practical content; the

Table 4 (*continued*)

Author (year)	Country	Purpose	Participants	Study design	Data collection method	Data analysis method	Result
							information being updated more often; quicker responses to women's questions. 4. *Future direction:* Breast Cancer e-Support Program as routine care; Breast Cancer e-Support Program open to caregivers; breast Cancer e-Support Program applied to other cancer patients.
Hauffman et al. (2020)	Sweden	To explore the cancer participants' perceptions of an internet-based stepped-care program	15 cancer patients (10 breast cancer, 1 colorectal cancer, 4 prostate cancer); 5 males, 10 females; aged 37–69 years old	Inductive qualitative research	Semi-structured interview	Content analysis	1. *Gaining knowledge and support but wanting more personalization:* the importance of information and support; confirmation, recognition, and being taken seriously; a wish for more specifically tailored contents; positive, supportive contacts with the psychologist; turning down the offer of iCBT; limitations of iCBT. 2. *A feeling of safety that was needed earlier:* reliable and safe to trust; wanting to have access to step 1 earlier; seeking information online started early; information needs vary over time. 3. *Own situation, preferences, and timing determine the use of peer support:* not interested in peer support at all, besides lurking; higher presence of health care professionals in the forum; Facebook provided a better environment for online peer support. 4. *A complement to standard care:* information given at the hospital was insufficient; iCAN-DO as a source of information for others; standard care did not offer any support for emotional problems; fit into everyday life.
Igelström et al. (2020)	Sweden	To explore user experiences of the delivery, design, and structure of iCAN-DO from the perspective of cancer patients	15 cancer patients (10 breast cancer, 1 colorectal cancer, 4 prostate cancer); 5 males, 10 females; aged 37–69 years old	Qualitative research	Semi-structured interview	Latent content analysis	1. *User experience in the context of cancer:* my health status and environment affect how I use the portal; multiple delivery modes enable assimilation of the content; a web portal provides high availability and accessibility; questionnaires make you reflect on your health. 2. *Technical struggles require patience and troubleshooting:* complicated multistep log-in procedures; annoying technical problems reduce motivation to use the portal; troubleshooting; and the importance of support. 3. *Appealing and usable, but rather simple:* intuitive but unstable interface;

Table 4 (*continued*)

Author (year)	Country	Purpose	Participants	Study design	Data collection method	Data analysis method	Result
Crafoord et al. (2020)	Sweden	To describe the perceptions among patients with breast or prostate cancer of using the Interactor app	121 cancer patients (73 breast cancer, 58 prostate cancer); 58 males, 73 females; aged 27–81 years old	Mixed study	Semi-structured interview	Content analysis	appealing yet simple graphical design; technology that creates motivation and innovation. 1. User friendliness. 2. Interaction with health care professionals. 3. Support for self-care.

discharge from the hospital. Eight studies contributed to this theme.[17,31,36,37,40–43] For patients who lack support,[31,41] the continuity of care provided by telemedicine could improve their awareness of the illness and provide them with the means to self-manage and return to a normal life path as soon as possible.

"I think the Leukaemia Foundation [of Queensland] can do as much as they can during treatment. I think just a few follow-ups after your treatment, just to see that your family's okay, you're okay, you're back in the workforce, and you're back in the community doing what you do best.[38]"

Receiving professional assistance. Cancer patients felt that telemedicine provided professional support and assistance. Eight studies contributed to this theme.[17,31,35,40,42,44–46] Telemedicine has facilitated contact with specialists.[17,40,42,45,46]

"It's fantastic, I have gotten such good answers all the time. I must say that "ask an expert" is the best thing [in step 1] because it feels like someone takes me seriously someone is giving me a scientifically based answer in words that I can understand. You never have time for those things at the clinic.[40]"

The nursing staff spoke and handled the patient in a very professional manner, allowing the patient to be well-treated and privileged. Furthermore, cancer patients pointed out that telemedicine provided patients with respect.[31,35,40]

"I found her to be very professional in the way she spoke and the way she handled herself. I felt very well treated and privileged, I suppose, to have that time.[31]"

Telemedicine could strengthen patients' relationships with the health team and provide them with a sense of security and supervision, as they could get in touch with a professional if necessary.[33,40,42]

"I found it helpful and interesting. It made me feel that my existence had some purpose … I think it is something that ought to be continued. It does make people feel like they are being looked after … and somebody is keeping an eye on them.[33]"

Having flexibility. Having flexibility means that telemedicine is flexible in terms of distance, time, and location and is more convenient to use. This theme was supported by a total of eleven studies.[20,30,34,35,40,41,43–45,47,48] First, telemedicine could make long-distance travel easier, save time, and provide convenience to patients with limited mobility.

"Living up here in the country, it's just good to know that you can get that sort of thing.[20]"

"…Iit wasn't rushed. You didn't feel you were up against the clock and that you were wasting someone's time … they weren't hurrying you and hassling you …[45]"

Second, the freedom in telemedicine to choose the time and location of interventions encouraged patients to have more personal time to enjoy their lives outside of illness, while also being more private and effective in avoiding embarrassment.

"You can do it whenever, because my work schedule is really crazy …[20]"

"It's more private because I'm not in the best shape …[20]"

Furthermore, the online intervention allowed for telephone follow-up at any time when problems arose. It facilitated patients to get timely assistance.

"I used to make myself little cards that I carry around with me … so if I ever felt I needed to ring her up, I've got … ready access.[31]"
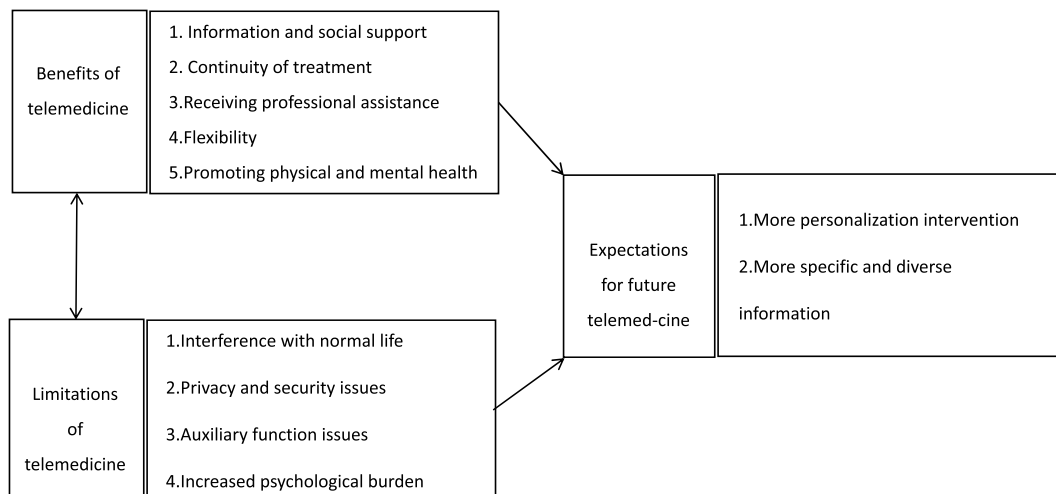

Figure 2. Overview of analytical and descriptive findings.

"I was impressed with the quick pick-up of the change in drugs … she [BCN] was the one person who saw the bigger picture … she spoke to the cardiac department … and there was a new prescription in the post or to the GP [General Practitioner] or something … she sorted it out.[45]"

Promoting physical and mental health. Promoting physical and mental health implies that telemedicine is useful for reducing physical fatigue, reducing negative emotions, and promoting positive psychology. A total of five studies contributed to this sub-theme.[17,20,31,35,49] Physiologically, telemedicine interventions could improve sleep quality as well as fatigue and strength.

"It helped with sleeping … I think that helped with fatigue … The benefits of the fatigue and the sleeping—especially the fatigue, is a huge difference.[20]"

Telemedicine contributed to lessening negative emotions and thoughts.[17]

"Before I joined your program, I searched online, and I was overwhelmed by the horrible information on breast cancer. I got more and more anxious while surfing the internet. But your program was different. There was credible information and expert advice. The more I used the app, the better I felt.[17]"

Patients believed that conversing with professionals could increase their sense of security while reducing negative psychological emotions such as anxiety, fear, and anger, as well as provide a sense of confidence.[17,20,31,35]

"It made me feel better, though, because I feel a bit confident and comfortable with her, and she was very good, and I feel a bit safe you know; you know, I felt like she's looking after me.[35]"

"When I faced with something I didn't know, I was so anxious. After I joined your program, I could ask questions through the app regarding my medical condition. … upload the lab results … Then I received corresponding advice from experts. I felt followed up. When I knew more about my medical condition, I felt more likely to gain control of my life.[17]"

Theme 2: limitations of telemedicine

The theme "limitations of teleintervention" refers to the psychological burden of cancer patients who may have reservations about the feasibility and efficacy of telemedicine due to frequent interventions, information security, and technical problems with the equipment. Four major sub-themes are included to further elaborate on this theme.

Interference with normal life. This sub-theme refers to the possibility that telemedicine might alert patients to their illnesses and disrupt their normal lives. Four studies contributed to this sub-theme.[17,38,42,44] Studies have shown that cancer patients are more prone to experience negative emotions such as worry, depression, and despair than other patients due to their fear of cancer recurrence and metastasis.[48] Some patients believed that frequent use of telemedicine did not bring psychological relief but rather made them excessively worried about their condition and experience greater psychological stress.

"I think it's better to use a little less because a little bit in I think about my disease, and it's hard on my heart, and I feel like a burden.[44]"

The use of telemedicine was met with reluctance by cancer patients due to its association with their illness, which evoked feelings of shame and other negative emotions as well as served as a reminder of their condition. This made them hesitant to engage with telemedicine, as they preferred to avoid confronting their cancer diagnosis or feeling different from others.[17,42]

"If I told my friends that I had breast cancer, they would reject me. I had such an experience … They perceived me as a different person. How can I have the courage to tell people about my disease? I do not want to touch on the topic of 'breast cancer'. I've tried to put it behind me. Using this program, reading and chatting, it constantly reminds me of my illness. I need to be done with it.[17]"

"It has been very easy and convenient … if you feel good, it is a negative reminder that you are sick.[42]"

Privacy and security issues. This sub-theme refers to privacy and security issues in virtual interventions due to the inability to secure the network. Three studies contributed to this sub-theme.[36,39,44] Some patients complained about advertising implants and personal information leakage while using telemedicine apps.

"I've used this before, and then I kept getting people calling me to sell it.[44]"

Furthermore, information on the Internet was disorganized, with some of it contradictory, and patients might doubt its authenticity and dependability.[36]

"You may find all kinds of information online; some claim that using Chinese medicine is beneficial, while others claim that waiting to take it is beneficial.[36]"

In addition, telemedicine carries the risk of doctors providing false information, leading patients to doubt their professionalism.[36,39,44]

"To fulfill these duties for our patients, I wish to develop a formal organization. I frequently seek advice online, but I'm unsure if the respondent is a qualified medical professional.[44]"

"… urologists … I mentioned sugar to him. He said, no, sugar's not going to make any difference … said, doctors don't know anything about diet …[39]"

Network function issues. This sub-theme describes how telemedicine may cause communication barriers between patients and medical professionals due to network stability, memory issues, and a lack of intelligence. A total of eleven studies contributed to this sub-theme.[17,20,31,34–36,41,43,46–48] Patients regarded network instability as a catastrophe and a source of frustration, and there was nothing that could be done when the network was unstable;[20] they even gave up using telemedicine when they had trouble logging in.[17]

"I don't know if it was my wifi or wha,t but there were a lot of videos that would like to just freeze up, umm, so sometimes that was a little frustrating.[20]"

"The app was sometimes unstable. It didn't work when I tried to open it. I contacted someone in the hospital and reinstalled the app. Then I could log in. However, after a period of time, I couldn't open the app again. Finally, I gave up using your program. I haven't logged in for the past month.[17]"

A lack of cell phone memory was also a barrier to online intervention.

"Because the capacity of my current phone is too small, it can no longer be loaded …[36]"

Technical problems reduce participants' motivation to use telemedicine.

"Technical hassles are not good; it's very annoying… and once you postpone your visit, it might never happen.[43]" Additionally, cancer patients felt that telemedicine lacked the sophistication to tailor support to each patient's specific issue, which means there is no customization and adjustment of features according to individual preferences.[34,35,46]

"It would be nice to see that they kept up [telegenetics] further down the track. But I think it needs to be personalized. That's the bottom line.[35]"

"To tell you the truth, I knew it was going to happen after a few days, and it was a bit of a pain in the neck. Because I'm saying, Oh, here we go, the phone's going to ring–another reason why I think these things should be tailored to the individual.[34]"

At the same time, telemedicine did not completely cover the elderly and vulnerable groups. Because of their age, knowledge level, technology, and policy context, these populations were unable to receive the assistance provided by telemedicine.

"The platform was very easy to access; it could hardly go wrong. In terms of function, it was right up my street. Of course, it depends on the individual's ability, and maybe age is a factor ....and whether you feel comfortable with digital solutions or not.[41]"

"Ethnic groups that are more educated and have better socioeconomic status are more willing to participate in the cancer support group and get help. Underprivileged ethnic groups do not have the help provided by cancer support groups in general.[29]"

Increased psychological burden. Three statements described how anxious and frightened the patients were about online intervention. First, some patients reported feeling uneasy when a doctor they had never met before intervened over the phone;[30] second, some patients reported feeling more nervous while waiting for the doctor's telephone intervention;[41] and third, some patients reported feeling anxious if the doctor did not intervene over the phone, regardless of whether the doctor spoke to them later.[41]

"Well, I've never met my doctor. I've only ever talked to him on the telephone, and I feel quite disconnected because the last time I saw a real doctor was in March. And then I was transferred to my current doctor, and it's been all telephone and two video conferences. I've never been face-to-face with him.[30]"

"You become more nervous when waiting for a clinician to call you than you do when you sit in a waiting room at the hospital waiting for your turn.[41]"

"The clinician called earlier than scheduled. I believe she [the clinician] would call me again if I didn't answer. Still, I would be anxious if she [the clinician] would not call me again.[41]"

Theme 3: expectations for future telemedicine

The theme "expectations for future telemedicine" illustrated how patients wanted telemedicine interventions to improve. Two sub-themes were identified: more personalized intervention and more specific and diverse information.

More personalized intervention. One of the most critical factors highlighted by many cancer patients was the need for more personalized telemedicine delivery systems. More personalization implied that the participants wanted the telemedicine intervention to be tailored to each patient's lifestyle habits.

"But I think that his idea of having more flexibility is a good one. Being able to tailor it to your particular lifestyle would be beneficial as well.[39]"

More specific and diverse information. The patients expressed their desire for more specific, diverse, and comprehensive information.[39,42,46] The patients wanted to be able to link to more detailed information about the specific cancer disease.

"I guess you could put more links in to connect us to information.[39]"

"I've had a couple bouts with heart failure, so right now I'm on a salt-free diet, and it would be helpful to me to be a little more specific as to what I can eat and what I can't eat regarding that particular restriction.[39]"

Discussion

This study systematically reviewed and integrated the perceptions of adult cancer patients about their telemedicine experiences and identified three main themes: benefits of telemedicine, limitations of telemedicine, and expectations for future telemedicine. Our synthesis contributes to the growing body of knowledge about the experiences and needs of these patients.

The integration of qualitative meta-findings shows how telemedicine can strengthen the engagement of adult cancer patients and shed light on ways to make patients feel more powerful by using telemedicine. Internet-related technologies have the potential to be an important means of achieving patient engagement in health care[50] and promoting continuity of treatment and care,[37,38] especially for those who have difficulty reaching or continuing in care.[51] From the perspective of adult cancer patients, telemedicine can benefit them in a variety of ways, such as receiving more information about cancer, treatment, and diagnosis and social support,[17,33,37,38,40] having more flexibility in terms of distance, time, and location,[20,30] as well as maintaining social relationships[37] and communication with health care providers,[35] and experiencing greater respect and understanding during communication.[31] However, some patients were hesitant to use telemedicine because they were reluctant to be identified as patients and wanted their illness to remain invisible.[38,44] They strive to maintain a sense of normalcy all the time[17,42] to minimize the disruption caused by their illness.[38] However, the surveillance imposed by telemedicine restricts their autonomy to some extent and constantly reminds them that they are ill.[52] Additionally, cancer patients are characterized by long disease duration and difficulty in self-cure,[48] which may lead them to be overly concerned about the disease and frequent use of telemedicine, which further aggravates their psychological burden.[44]

Some patients believed that telemedicine could improve physical and mental health by helping with sleep,[20] relieving fatigue,[20] and reducing negative emotions.[17,49] It can also promote positive psychology and a sense of security.[17,20,35] However, some patients claimed that telemedicine treatment caused discomfort for the disease,[30] especially when waiting for telemedicine service was more stressful than waiting offline.[41] Timely access to medical information during treatment can reduce emotional symptoms[53] and lead to better short-term health outcomes.[25] However, when telemedicine appointment slots were pushed ahead or delayed, it may lead to doubt, anxiety, or unfounded assumptions,[41] since the patients feared being overlooked or delayed meant their health had deteriorated.[41] The experiences of cancer patients with telemedicine may be related to their health status,[54] which implies that telemedicine should be designed taking into account the individual needs and feelings of patients. Telemedicine can only work successfully if the provider is aware of the needs and health status of the patients receiving these services.

Most study participants acknowledged that telemedicine could provide them with more information and expert assistance. However, others felt that the information was inconsistent and messy, covering all aspects of the content,[36] making it difficult to ensure the professionalism of doctors[36,39,44] and the privacy and security of personal data[36] on telemedicine platforms. Telemedicine is an important source of information support for patients.[25] However, when faced with overwhelming information, patients tend to become more confused, which reduces the effectiveness of discussions with their physicians.[55] Moreover, the phenomenon of partial

false information and advertising implantation undermines patients' recognition and trust in the professionalism of telemedicine. Clearly, ensuring the accuracy of the provided information is a crucial requirement for telemedicine.[56] If telemedicine can provide more accurate and concise information, it can enhance convenience between patients and providers[56] while compensating for the lack of unidirectional information acquisition by patients. In addition, registering to obtain health information through telemedicine may reveal personal information and pose privacy and security risks.[36] In the future, hospital-led telemedicine should be vigorously developed, as it not only meets the requirements of professional background teams but also allows for patients' case review without interference from irrelevant personnel or disclosure of personal information.[57] At the same time, electronic medical records should be strengthened for telemedicine information sharing and supervision by relevant health departments to ensure patient privacy and safety.[58]

Despite the numerous benefits of telemedicine, there are still obstacles to its widespread acceptance. Studies have found that the frustration of not being able to use telemedicine is more common among older adults,[41,47,48] and vulnerable populations with low health literacy,[59] education, and socioeconomic status.[29] Older adults are not as familiar with smartphones and tablets as younger people,[56] and their lack of awareness[60,61] and slower access to information about telemedicine[60] increases their difficulty in using telemedicine platforms.[62] For those vulnerable groups or those who seek treatment in primary care hospitals, it is usually difficult to obtain the support of telemedicine due to a lack of information channels.[29] Furthermore, in line with the findings of Vo,[56] the auxiliary function limits the application of telemedicine.[20,31,35,36,47] Patients frequently experience network, memory, and platform intellectualization issues when utilizing telemedicine,[17,20,31,35,47] which often prevents patients from using it indefinitely to manage their disease indefinitely.[56] Therefore, it is critical to implement patient-specific problem-based intelligent services that address the characteristics of patients' use of telemedicine platforms[56] and promote a greater likelihood of patient acceptance and use of telemedicine.[36] Measures that can be considered include addressing patients' concerns about information security and privacy, enhancing the compatibility of telemedicine procedures with current health care systems and underlying networks, and reducing memory requirements.

Telemedicine is an essential information platform.[25] This systematic review discovered that telemedicine in the context of cancer care improves patient information and social support[35,37,39] while being flexible and fast, independent of time and space, and greatly satisfying patient convenience.[30,41,45,47] However, due to its developmental constraints, the usage of telemedicine may be hampered by the absence of corresponding technical support, auxiliary functions, and personalized customization, as well as the existence of information privacy and security issues.[25,56] Therefore, adult cancer patients anticipate telemedicine to be personalized and information diversified in the future.[39,42,46] Accordingly, future telemedicine developers can customize demand modules based on the characteristics of disease-related online browsing information and the preference goals of adult cancer patients, as well as pay attention to the update cycle and diversity of information.

Strengths and limitations

To our knowledge, this is the first systematic review to synthesize qualitative studies on the perceptions of all adult cancer patients about their telemedicine experience using a systematic approach. Two reviewers were involved in each review stage to ensure the integrity and authenticity of the data. The included papers described a range of approaches to offering telemedicine, and the most recent studies about the experience of telemedicine provided by smartphone apps were also included in this review, which contributes more useful knowledge on cancer patients' perceptions about various telemedicine interventions.

Despite the above-mentioned strengths, there are several limitations to be considered. First, this study only focused on the views of recent telemedicine experience, so our findings cannot explain the influence of previous telemedicine experience and the degree of process familiarity on the perception of telemedicine, especially in older people.[60–62] Therefore, future studies should take the patients' previous experience with telemedicine into consideration. Second, the findings of this review were limited by the interpretations of the study researchers. The included studies gave limited consideration to the relationship between researchers and patients. Finally, this review includes only articles published in English and Chinese. Thus, research published in other languages reporting cancer patients' perceptions of telemedicine may have been omitted.

Implications for practice and future research

Research has found that patients are often disadvantaged due to limited prior experience with smartphones or apps,[63] and those who suffer from chronic diseases like cancer may be less inclined to use smartphones due to a lack of financial support and advanced age.[64] Therefore, health care professionals should help patients become comfortable with the platform's operation and functional applications while choosing the suitable telemedicine platform based on their condition and needs, especially for cancer patients who are elderly, vulnerable groups, or visit primary care hospitals. Simultaneously, it is important to avoid increasing the psychological burden of patients as much as possible. Future research can examine the particular requirements of patients with various cancer types in greater detail, and understanding their individual preferences can also contribute to creating more effective telemedicine interventions to improve the health of adult cancer patients. More collaborative research is required to bridge the gap between technological innovation and successful service delivery; this could include research involving industry, patients, caregivers, and health professionals.

Conclusions

The systematic review includes a total of 23 qualitative studies on the perceptions of telemedicine among adult cancer patients. The majority of patients viewed telemedicine as an efficient medical aid in obtaining information and social support, maintaining continuity of treatment, receiving professional assistance, ensuring flexibility, and promoting physical and mental health. However, the limitations of telemedicine and the patients' expectations for future telemedicine were highlighted and need to be addressed. Future, well-designed telemedicine must be more personalized to meet the specific needs of each patient.

CRediT author statement

Liya Ren: Conceptualization, Methodology, Supervision, Data Curation, Formal analysis, Writing - Original Draft, Writing – Review & Editing. **Meijia Chen:** Data Curation, Formal analysis, Supervision, Writing – Review & Editing. **Hao Jiang:** Methodology, Software, Supervision, Writing – Review & Editing. **Yuxin Wang:** Methodology, Software, Supervision, Writing – Review & Editing. **Lin Xia:** Supervision, Writing - Review & Editing. **Chaoqun Dong:** Conceptualization, Funding Acquisition, Resources, Supervision, Writing - Review & Editing. All authors were granted complete access to all the data in the study, with the corresponding author bearing the final responsibility for the decision to submit for publication. The corresponding author affirms that all listed authors fulfill the authorship criteria and that no others meeting the criteria have been omitted.

Declaration of competing interest

The authors declare no conflict of interest.

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Ethics statement

This study has adhered to the guidelines of the PRISMA guidelines. The study did not violate any relevant ethical guidelines.

Data availability statement

Data availability does not apply to this article as no new data were created or analyzed in this study.

Declaration of Generative AI and AI-assisted technologies in the writing process

No AI tools/services were used during the preparation of this work.

Appendix A. Supplementary data

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