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The Impact of Telemedicine on Quality of Life in Patients with Breast Cancer: A Scoping Review

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ABSTRACT

Background: Breast cancer is the most frequently diagnosed cancer among women worldwide and is associated with substantial physical and psychological burden that negatively affects quality of life. Telemedicine has emerged as a promising strategy to improve supportive cancer care by facilitating remote monitoring, symptom management, and patient engagement. This scoping review aimed to map the available evidence on telemedicine interventions and their impact on quality of life in women with breast cancer.
Method: This scoping review was conducted in accordance with the PRISMA 2020 guidelines. Studies published between January 2022 and February 2026 were identified through searches of PubMed, Scopus, and Web of Science. Studies evaluating telemedicine interventions in women with breast cancer and reporting quality-of-life outcomes were included. Owing to the heterogeneity of the interventions and outcome measures, findings were synthesized narratively.
Results: Seven studies met the inclusion criteria. Three telemedicine approaches were identified: psychosocial support applications, integrated biopsychosocial web-based platforms, and multimodal eHealth lifestyle programmes. Five studies reported improvements in quality of life or psychological outcomes, while two found no significant benefits. Overall, interventions combined with personalized clinical or psychosocial support were more effective than stand-alone self-managed approaches.
Conclusion: Telemedicine represents a promising complementary approach to breast cancer care, particularly when combined with human support and tailored to patients' psychosocial needs. Rather than replacing conventional care, its value lies in its integration within personalized models of care. Future studies should standardize quality-of-life outcomes and identify strategies to improve engagement with digital interventions.

Keywords: *Breast Cancer; Telemedicine; eHealth; Quality of life*

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Introduction

Breast cancer remains the most frequently diagnosed cancer among women worldwide and a major focus of contemporary oncology research. According to GLOBOCAN (2022) estimates from the International Agency for Research on Cancer, approximately 2.3 million new breast cancer cases and over 666,000 breast cancer-related deaths were recorded globally, making it the leading cause of cancer death among women (Bray et al., 2024). Despite advances in early detection and treatment, many patients continue to receive a diagnosis at an advanced stage of the disease, often associated with poor prognosis and increasing morbidity and mortality. This stage is accompanied by substantial psychological distress, which profoundly affects patients' quality of life and highlights the need to pay particular attention to their mental health (Wu et al., 2023; Breitbart et al., 2018; Teo et al., 2020; de Mol et al., 2020). Although significant progress has been made in therapeutic approaches and in the development of advanced drug delivery systems, resulting in reduced mortality rates, achieving a definitive cure continues to represent a major challenge, and treatment options remain largely determined by disease stage, requiring personalized therapeutic strategies (Khan et al., 2025). Against this backdrop of unmet clinical and psychological needs, mobile technologies have emerged as a potentially transformative complement to conventional cancer care. According to the World Health Organization (2021, 2024), mobile health (mHealth) has the potential to profoundly reshape the delivery of healthcare services worldwide. The term refers to medical and public health practices supported by mobile and wireless technologies, encompassing health applications, informational text messaging services, wearable devices, social media platforms, and remote monitoring systems (World Health Organization, 2021; Zini et al., 2019), and represents one component of the broader field of digital health, alongside telemedicine and artificial intelligence-based tools. Much of its promise stems from the sheer scale of mobile technology adoption: an estimated 2.5 billion individuals worldwide own a mobile phone, generally affordable and easily accessible devices (Charbonneau et al., 2020), making mobile applications a particularly cost-effective channel for delivering healthcare services at scale (Niu, 2023). This is especially relevant for chronic diseases such as diabetes, cancer, and hypertension, which represent a substantial global health burden, with major consequences for public health and life expectancy; since most patients living with chronic conditions already use mobile applications in daily life, mHealth is increasingly regarded as an effective strategy to expand healthcare delivery and improve quality of life (Charbonneau et al., 2020; Rowland et al., 2020).

In breast cancer specifically, this shift marks a departure from a traditionally passive patient role. Patients have historically relied primarily on conventional healthcare services for disease management, symptom control, access to information, and communication with healthcare professionals, both during active treatment and throughout the often long-term follow-up care that characterizes breast cancer survivorship (Rowland et al., 2020). Over the last decade, however, mHealth has emerged as a valuable complement to this model, particularly as an increasing number of treatments are now administered in home settings, requiring greater patient engagement, education, and behavioral adaptation. Through its accessibility and capacity for remote monitoring, mHealth enables breast cancer patients to adopt a more active role in managing their condition, fostering patient empowerment and healthier self-management behaviors, with behavioral interventions targeting health literacy, adherence to therapeutic and preventive behaviors, and restructured patient–clinician interactions (Charbonneau et al., 2020; Siebenhüner et al., 2021). Building on this foundation, recent advances in digital oncology suggest that telemedicine is progressively evolving beyond the simple remote delivery of care toward more proactive, personalized, and data-driven models. One of the most promising developments concerns electronic patient-reported outcomes (ePROs), which allow

patients to remotely report symptoms, treatment toxicities, and psychosocial concerns through digital platforms and mobile applications.
Unlike traditional clinic-based assessments, ePRO systems enable continuous monitoring between visits, facilitating earlier identification of complications and more timely interventions; several randomized clinical trials have shown that electronic symptom monitoring is associated with improved symptom control, better health-related quality of life, reduced emergency department utilization, and, in some settings, even improved overall survival among patients undergoing cancer treatment (Basch et al., 2016; Basch et al., 2017; Basch et al., 2022). Beyond symptom surveillance, digital health is also moving toward digital therapeutics (DTx), evidence-based software interventions, developed through rigorous clinical validation pathways, designed to prevent, manage, or treat medical conditions. In cancer care, DTx interventions have shown promising results in improving treatment adherence, managing fatigue and insomnia, reducing anxiety and depressive symptoms, and addressing fear of cancer recurrence, extending access to psychosocial support beyond hospital settings (Goh et al., 2025).
A further frontier is digital phenotyping, based on the passive collection of behavioral and physiological data from smartphones, wearables, and digital sensors during everyday life; parameters such as physical activity, sleep, mobility, social interaction, and smartphone usage patterns may offer objective, ecologically valid indicators of functional status and psychological well-being, potentially revealing early signs of fatigue, distress, depression, or clinical deterioration (Jenciūtė et al., 2023; Fahed et al., 2022). Together, ePRO systems, digital therapeutics, wearable technologies, and digital phenotyping are contributing to a transition from reactive supportive care toward precision supportive oncology, in which interventions are tailored to patients' symptom trajectories, behavioral profiles, and individual needs. Within this framework, telemedicine is increasingly conceived not as a replacement for face-to-face care, but as a complementary component of hybrid models integrating in-person visits, remote monitoring, and digital interventions across the entire breast cancer continuum (Kruse et al., 2022; Trisyani et al., 2025). Nevertheless, important challenges remain regarding accessibility, digital literacy, data privacy, and technological equity: the so-called digital divide may disproportionately affect older adults, individuals with lower educational attainment, and socially vulnerable populations, potentially exacerbating existing healthcare inequalities. In light of these considerations, it is essential to understand the current state of the art in the use of telemedicine in the management of breast cancer, in order to identify the strategies currently available and the areas requiring further development. In this context, this scoping review aims to map the types of telemedicine interventions developed and tested in women diagnosed with breast cancer, describing their impact on quality of life.

Materials and Methods

This scoping review was conducted and reported in accordance with the PRISMA extension for scoping reviews (PRISMA-ScR), (Tricco et al., 2018). The review protocol was not prospectively registered and no protocol was prepared prior to the review. The objective of this scoping review was to map the available evidence on telemedicine interventions for patients with breast cancer, with particular attention to the types of interventions implemented and their influence on patients' quality of life. The study identification, screening, eligibility assessment, and inclusion process are presented in the PRISMA flow diagram (Figure 1).The PRISMA-ScR checklist (Figure 2) was used to guide the reporting and synthesis of the evidence identified in the included studies, ensuring a transparent

and comprehensive presentation of the review process and findings.

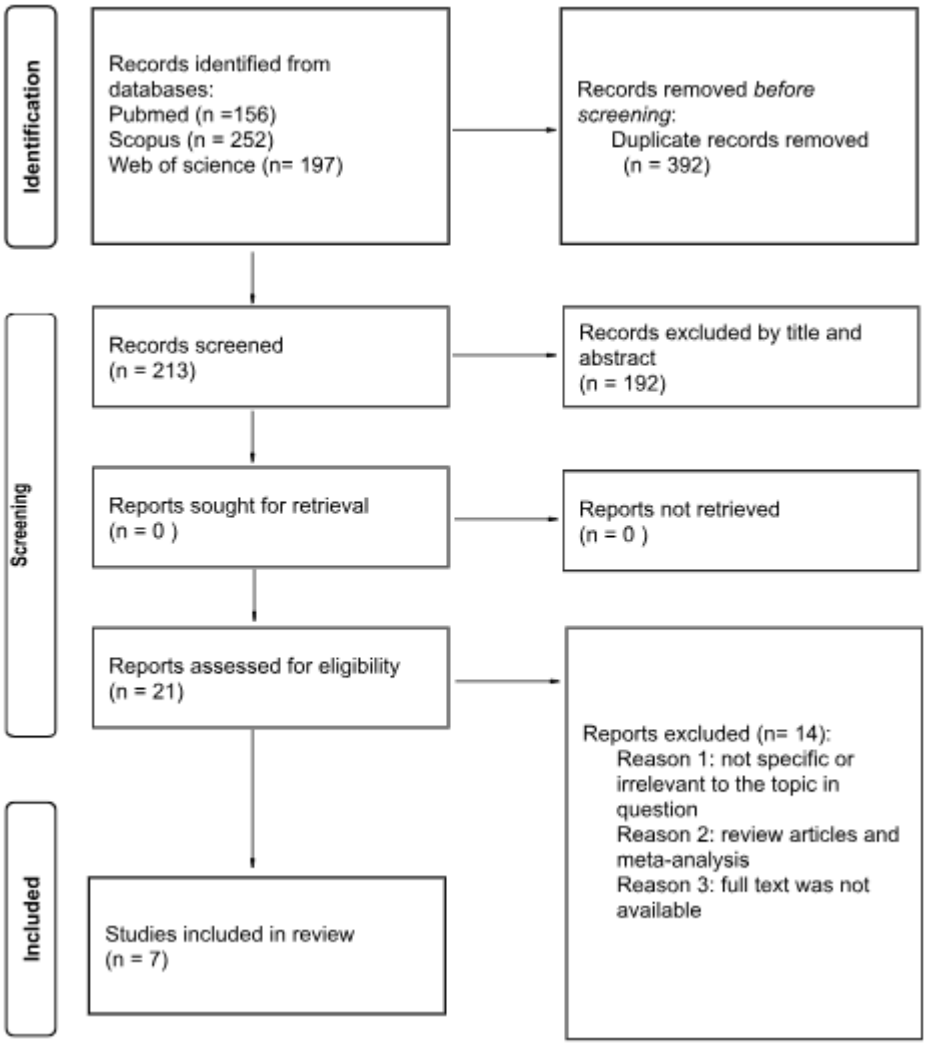


Figure 1 (PRISMA- ScR Flow Diagram)

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Figure 2. Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	1
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	3
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	3-5
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	N/A
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	4-5-6
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	4
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	4
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	4-5
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	N/A
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	N/A
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the	N/A

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
		methods used and how this information was used in any data synthesis (if appropriate).	
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	5
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	4
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	6-7-8
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	N/A
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	6-7-8
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	8-9-10
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	8-9-10
Limitations	20	Discuss the limitations of the scoping review process.	12
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	10-11-12
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	N/A

Note: JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.
* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.
† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).
‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.
§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

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Search Strategy

The search strategy was developed by combining controlled vocabulary (e.g., MeSH terms) and free-text keywords related to the main concepts of the review, using Boolean operators (AND, OR). The core conceptual search string was: *"breast cancer OR breast neoplasm* OR mammary carcinoma AND telemedicine OR telehealth OR eHealth AND quality of life OR QoL OR HRQoL OR health-related quality of life."* The same conceptual strategy was applied across all databases (PubMed, Scopus, Web of Science) and adapted to the specific syntax and indexing system of each database. No study design filters were applied to maximize the retrieval of potentially relevant evidence.
The search was restricted to studies published between January 2022 and February 2026 in order to focus the review on the most recent evidence, reflecting the rapid evolution of telemedicine and eHealth technologies in oncology care over the past few years.

Data extraction

An initial exploratory search was conducted to identify relevant studies on telemedicine interventions in patients with breast cancer. Studies were included in the review according to predefined eligibility criteria. Eligibility was defined according to the Population, Concept, and Context (PCC) framework recommended for scoping reviews (Tricco et al., 2018; Peters et al., 2020). *Population:* Adult women (≥18 years) diagnosed with breast cancer at any stage of the care pathway, including active treatment, the immediate post-surgical period, and survivorship.
Concept: Telemedicine, telehealth, or eHealth interventions, defined as any remotely delivered intervention using digital or mobile technology (e.g., mobile applications, web-based platforms, remote monitoring systems) intended to support clinical, psychosocial, or lifestyle-related aspects of breast cancer care.
Context: No restriction was placed on country, healthcare setting, or care phase; both hospital-initiated and home-based interventions were eligible.
Studies were included if they: (a) were empirical studies with an observational, quasi-experimental, or experimental design (including randomized controlled trials, non-randomized trials, pilot/feasibility studies, and pre-post studies); (b) enrolled a clinical population of women with breast cancer; (c) evaluated a telemedicine, telehealth, or eHealth intervention as defined above; (d) reported at least one quality-of-life outcome, either as a primary or secondary measure, assessed through a validated instrument or a recognized proxy (e.g., distress, psychological well-being); and (e) were published in English between January 1, 2022 and February 1, 2026.
Studies were excluded if they: (a) were reviews, meta-analyses, protocols without outcome data, conference abstracts, editorials, or books; (b) did not report an empirical evaluation of a telemedicine intervention; (c) enrolled mixed cancer populations without breast-cancer-specific outcome data; (d) did not include any quality-of-life or related psychosocial outcome; or (e) were not available in English.
Because quality of life in breast cancer is a multidimensional construct encompassing physical, psychological, and social well-being, studies reporting closely related patient-centered outcomes — such as psychological distress, self-efficacy, perceived stress, and physical activity — were also considered eligible when these outcomes were used as established proxies or correlates of quality of life, consistent with prior digital health literature in oncology.

Study selection

Records retrieved from the three databases were imported into Zotero reference management software, where duplicates were identified and removed. Title and abstract screening, followed by full-text assessment, was conducted independently by two reviewers. Disagreements at either stage were resolved through discussion with a third reviewer, who acted as an arbiter.

Data synthesis

A total of 605 records were initially identified through the database search. Of these, 392 duplicates were removed prior to screening. The remaining 213 studies were screened based on title and abstract, resulting in the exclusion of 192 articles. Full-text assessment was conducted on 21 articles, of which 14 were excluded for reasons including study design (e.g., reviews or non-empirical studies), lack of relevance to the topic, or insufficient eligibility based on the inclusion criteria. Ultimately, 7 studies met the inclusion criteria and were included in the review. Given the heterogeneity of the included studies, a qualitative synthesis was performed instead of a quantitative meta-analysis. The characteristics of the included studies: authors and year of publication, country, study design, sample size and population characteristics, description of the telemedicine intervention, quality-of-life and related outcome instruments, and main outcomes (summarized in Table 1), while the study selection process is illustrated in the PRISMA- Scflow diagram.

Authors	Country	Study Design	Intervention	Population	Instruments	Outcomes
Baik et al. (2024)	USA	Pilot RCT	PatientCareAnywhere – adaptive web-based platform for biopsychosocial screening, triage, personalized education and social support	59 patients diagnosed with breast cancer 28 experimental group 12.32 ± 34-77 31 control group 12.37 ± 30-79	FACT-G (Functional Assessment of Cancer Therapy – General) Self-Effectiveness for Managing Chronic Disease (SEMCD)	Significant improvement in HRQOL in the intervention group (MD +6.08) vs control (MD −2.95; p=.01; Cohen d = 0.70). More pronounced effects in frequent users (≥5 accesses; p=.007; d=0.80)
Im et al. (2023)	USA	RCT	TICAA – culturally adapted virtual program in 5 languages: peer social media, interactive online educational sessions and specific web resources for three Asian American	199 breast cancer survivors 104 experimental group 51.60±11.38 95 control group 53.14±13.62	FACT-B (quality of life; secondary outcome); SCNS-34SF (needs; primary); MSAS-SF (symptoms;	Significant reduction in unmet needs (SCNS) from T0 to T1 and T2 in the TICAA group (p < .05); not significant in control.

			subgroups (Chinese, Korean, Japanese)		secondary)	Significant improvement in QoL (FACT-B) at 12 weeks in the intervention vs control group (β=5.25; 95% CI 0.43–10.08; p<.05; time×group interaction p=.06). No significant difference for symptoms (MSAS-SF)
Jung et al. (2023)	South Korea	RCT open-label	WalkON app – mobile peer support community for physical activity monitoring and distress management	175 survivors of breast cancer (stage 0-III) 85 experimental group 46.8 ± 6.2 90 control group 44.7 ± 5.7	Distress Thermometer (DT); conteggio settimanale dei passi	Significant reduction in moderate-to-severe distress in the intervention group (OR 0.572; p<.001) and significant increase in physical activity (RR 1.132; p<.001) at 24 weeks
Seib et al. (2022)	Australia	RCT multicentrico	Women's Wellness after Cancer Program (WWACP) – 12-week multimodal eHealth program: interactive iBook, website, online coaching and 3 virtual consultations with nurse on physical activity, diet, stress and menopause management, sexual well-being, sleep	351 post-treatment women for breast cancer within 24 months of completing chemo/radiation therapy 175 experimental group 52.6 ± 9.4 176 control group 53.7 ± 8.1	SF-36 (Short Form Health Survey, + PCS e MCS	Significant between-group improvements for bodily pain and PCS at 12 weeks (p<.05) and for vitality and general health at 24 weeks (p<.05). Sustained intra-group effects for PCS (d=0.49) and MCS (d=0.63) at 24 weeks in the intervention group. Improvements also present in the control, but to a lesser extent

Soto-Ruiz et al. (2025)	Spain	Single-arm pre-post pilot study	CUMACA-M – multimodal mobile app with modules on health advice, nutrition and physical activity, developed for long-term survivors	23 long-term breast cancer survivors (disease-free for ≥5 years) 52,8 ± 6,1	QOL-CS (Quality of Life – Cancer Survivors); SEMCD-S (Self-Efficacy to Manage Chronic Disease)	Excellent usability (average SUS = 80.8) and 100% retention rate. No statistically significant difference for total QoL (p=.07) nor self-efficacy (p=.40). Significant reduction in the spiritual well-being subscale of QOL-CS (p=.05)
Svendsen et al. (2025)	Norway	RCT	StressProffen – two versions of the app: CBI (cognitive-behavioral) and MBI (mindfulness), 10 modules with educational material, audio, video and exercises; 6 months of download-only access; telephone support on 3 occasions	430 women with breast cancer (DCIS and stages I-III, HER2+ or ER−), recruited 6-9 months after diagnosis via the Cancer Registry of Norway 140 Allocated to CBI 53.1 ± 9.5 143 Allocated to MBI 51.5 ± 9.5 147 Allocated control group 51.5 ± 9.5	RAND-36 (HRQoL, 8 domini; outcome secondario); PSS-10 (perceived stress; outcome primario); PHQ-4; CFQ-11; FFMQ-15	No statistically significant difference between intervention groups (CBI or MBI) and control for perceived stressed or HRQoL domains. Combining the two intervention arms observed a borderline improvement in overall health (MD +3.58; 95% CI 0.06–7.09). Limited adherence (43% of ≥7 out of 10 module completers)
Wolff et al. (2024)	Germany	Prospective multicenter RCT	PINK! Coach – multimodal app that can be prescribed as a digital device: distress management, nutritional education, physical activity, mindfulness, side-	396 patients with early breast cancer (EBC) and metastatic breast cancer (MBC), recruited during	PHQ-9 (Patient Health Questionnaire -9; psychological distress as a proxy for	Significant reduction in psychological distress in the intervention vs. control group (LS estimate −1.52;

			effect management during therapy and follow-up	active therapy or in follow-up 191 experimental group 205 control group Mean ± SD (Not Reported)	psychological QoL)	p<.001; Cohen d = 0.5) in all subgroups analyzed (EBC/MBC, on therapy/follow-up, with/without chemotherapy)

Table 1.

Results

Characteristics of the studies included

The seven included studies vary in terms of design, geographical setting, type of intervention and measurement tools, whilst sharing the objective of assessing the impact of a telemedicine intervention on quality of life in the target population. From a methodological perspective, five studies adopt a randomised controlled design: three are RCTs with passive control (Jung et al., 2023; Seib et al., 2022; Wolff et al., 2024), one is an RCT with an active control (Im et al., 2023), and one is a three-arm RCT (Svendsen et al., 2025). One study is a two-phase pilot RCT (Baik et al., 2024), and one is a single-arm pre-post pilot study (Soto-Ruiz et al., 2025). The countries of origin include South Korea, the USA, Australia, Germany, Spain and Norway. Sample sizes range from 23 (Soto-Ruiz et al., 2025) to 396 participants (Wolff et al., 2024). The study populations include both patients undergoing active treatment or in the immediate post-surgical period (Jung et al., 2023; Wolff et al., 2024; Baik et al., 2024), and women in the survival phase within 24 months of the end of treatment (Seib et al., 2022; Im et al., 2023; Svendsen et al., 2025), as well as long-term disease-free survivors for at least five years (Soto-Ruiz et al., 2025).

Types of telemedicine interventions

In line with the first objective of the review, the interventions identified fall into three main categories. The first comprises psychosocial support and distress management apps, designed to reduce the emotional and psychological impact of breast cancer through strategies such as peer support, psychoeducation, CBT or mindfulness. This category includes the WalkON mobile community, which combines physical activity tracking with a peer support system for distress management (Jung et al., 2023); the PINK! Coach app, a digital tool that integrates side-effect management, mindfulness, nutrition and physical activity (Wolff et al., 2024); and the two versions of the StressProffen app (one based on CBT and the other on mindfulness) developed for stress management in breast cancer survivors (Svendsen et al., 2025). This category also includes the TICAA virtual programme, which has been culturally adapted for Asian American survivors through social media, interactive educational sessions and web resources in five languages (Im et al., 2023). The second category includes integrated biopsychosocial support systems based on web platforms, represented by PatientCareAnywhere, which coordinates adaptive multidimensional screening, automated triage,

personalised education, referrals to community resources and communication with the clinical team (Baik et al., 2024). The third category comprises multimodal eHealth programmes aimed at promoting a healthy lifestyle, with a focus on overall health improvement in the post-treatment phase. This group includes the Women's Wellness after Cancer Programme (WWACP), which combines online coaching, an interactive iBook and virtual consultations with a nurse across multiple behavioural domains (Seib et al., 2022), and the CUMACA-M app, aimed at long-term survivors and featuring modules on health advice, nutrition and physical activity (Soto-Ruiz et al., 2025).

Effects of interventions on quality of life

The TICAA programme resulted in a significant improvement in quality of life (QoL), as measured by the FACT-B at 12 weeks, in the intervention group compared with the group using the ACS website alone ($\beta = 5.25$; $p < .05$) (Im et al., 2023), alongside a significant reduction in unmet needs; the absence of significant effects on physical symptoms was attributed to a floor effect linked to low baseline levels of symptomatic distress. With regard to the management of distress through digital peer support, the WalkON mobile community demonstrated a significant reduction in moderate-to-severe distress and a significant increase in physical activity (Jung et al., 2023), indicators closely correlated with quality of life even in the absence of a direct measure of QoL.

Two studies did not show any statistically significant effects on quality of life as either a primary or secondary outcome. Soto-Ruiz et al. (2025) found no significant pre-post differences in overall quality of life or self-efficacy with the CUMACA-M app; this result was mainly attributable to the small sample size (n=23), the short follow-up period (3 months) and the probable ceiling effect linked to the high baseline levels of quality of life among long-term survivors. Svendsen et al. (2025) observed no significant differences between the intervention and control groups in either perceived stress or the domains of HRQoL as measured by the RAND-36, despite a large sample size (n=430) and a robust methodological design. The authors identified two main factors underlying these results: the sample's already low baseline stress levels, similar to those of the healthy female population of the same age, and low adherence to the app in the exclusively digital delivery model without a face-to-face introductory session, with only 43% of participants classified as completers.

Quality of Life Measurement Instruments

The instruments used to measure quality of life show moderate heterogeneity across the included studies. The FACT-B, an instrument specific to breast cancer, is used in one study (Im et al., 2023), whilst the general oncology version of the FACT-G is used by Baik et al. (2024). The SF-36 and its RAND-36 version, both generalised multidimensional tools, are used by Seib et al. (2022) and Svendsen et al. (2025) respectively, enabling an assessment of the physical and mental domains of health. The PHQ-9, a tool for measuring depressive distress, is adopted by Wolff et al. (2024) as an indicator of psychological quality of life. The study by Soto-Ruiz et al. (2025) uses the QOL-CS, developed specifically for cancer survivors. Jung et al. (2023) do not use direct QoL instruments, but measure distress using the Distress Thermometer and physical activity using a pedometer, both of which are validated proxies for well-being in cancer patients. The heterogeneity of the instruments reflects the variety of populations and clinical contexts considered, and limits the possibility of direct comparison between study results, representing one of the most significant sources of methodological variability in the analysed corpus. Overall, the studies included in this scoping review identified three

main categories of telemedicine interventions aimed at women with breast cancer: applications for psychosocial support and the management of distress; integrated biopsychosocial support systems based on web-based platforms; and multimodal eHealth programmes designed to promote healthy lifestyles.

With regard to outcomes, five of the seven included studies reported favourable effects on at least one aspect of quality of life or psychological well-being. The most consistent results were found in interventions based on integrated care systems and in psychosocial support applications evaluated using controlled experimental designs. Conversely, studies that did not show significant benefits consistently reported samples characterised by low baseline levels of distress and limited adherence to digital interventions – factors frequently associated with the absence of detectable changes in the outcomes under consideration.

Discussion

The seven studies included in this review suggest that telemedicine can improve quality of life in patients with breast cancer when it is delivered as more than just a standalone app. Programmes such as TICAA (Im et al., 2023), PatientCareAnywhere (Baik et al., 2024), PINK! Coach (Wolff et al., 2024) and WalkON (Jung et al., 2023) all combined digital content with a human or social component – such as culturally adapted educational material, a coordinating clinical team, a peer support group or contact with a nurse – and all produced measurable benefits, whether in terms of FACT-B scores, unmet needs, psychological distress or physical activity. The Women's Wellness after Cancer Programme also essentially followed the same approach, combining an interactive iBook with three live virtual consultations, and its effects on physical pain, vitality and general health were sustained at 24 weeks (Seib et al., 2022). The key point is that none of these five interventions worked simply because they were digital; rather, they worked because the digital component was underpinned by something resembling ordinary clinical or social contact. The two non-significant results confirm the same hypothesis but in the opposite direction. Soto-Ruiz et al. (2025) tested CUMACA-M on women who had been disease-free for at least five years, a population whose quality of life was presumably already improved even before the intervention began. Svendsen et al. (2025) conducted a study on StressProffen and found no benefit whatsoever for either the CBT version or the mindfulness-based version compared with standard care. In this case too, the baseline stress levels of the study sample were similar to those of the general female population. This is consistent with what the oncology literature on engagement has long reported; in a systematic review (Montalescot et al., 2024), among the factors associated with adherence to digital interventions in cancer patients, actual usage was consistently higher when programmes included some form of 'human facilitation', and significantly lower when this was absent. A meta-analysis of telehealth interventions in breast cancer survivors reported an overall benefit on physiological and psychological outcomes, but with effect sizes that varied considerably depending on the intensity and mode of delivery of the intervention (Ajmera et al., 2023).

A scoping review of reviews covering the entire field of digital oncology has reached a similar conclusion: benefits are frequently reported, but very few reviews document sustained use over time, and even fewer link usage data to outcome data (Shaffer et al., 2023). The seven studies included in the review appear to be fairly representative of this field, as evidence of a genuine benefit is concentrated in interventions designed with some form of retention mechanism, and is absent in studies that expect an app alone to hold a patient's attention for months. A second aspect that emerged from this review concerns the marked variability in how quality of life was assessed across the included studies. FACT-B and QOL-CS are tools specific to the oncology context, whilst SF-

36/RAND-36 are generic, multidimensional measures of health-related quality of life. In contrast, the PHQ-9 is not a direct measure of quality of life, but assesses the presence and severity of depressive symptoms, a psychological domain closely associated with perceived well-being.

In line with this, a recent systematic review and meta-analysis of internet-based interventions in women with breast cancer highlighted significant heterogeneity amongst the included studies, attributable to variations in the digital interventions employed, the outcome measures used and the characteristics of the samples analysed (Vitale et al., 2025). Therefore, based on the current evidence, it is difficult to determine the differences in the observed effects between interventions such as StressProffen and PINK! Coaches are attributable to specific intervention mechanisms or reflect, at least in part, the different nature of the outcomes assessed and the tools used. A shared minimum set of outcomes for future telemedicine trials in breast cancer, even if only one cancer-specific tool plus one generic one, would make the results far more comparable than they currently are, a point also recently raised in a meta-analysis on digital psychological interventions in cancer survivors more generally (Dong et al., 2025). This heterogeneity of outcome domains has important implications for the interpretation of our findings. Because quality of life, distress, self-efficacy, stress, and physical activity are related but conceptually distinct constructs, the results cannot be treated as convergent evidence on a single unified outcome; rather, they should be read as a descriptive map of how different facets of patient well-being have been assessed across the digital health literature. This precluded any pooled quantitative estimate and means that comparisons across studies remain qualitative and interpretive rather than statistical.

Finally, none of the seven included studies addressed the question of who was excluded from these programmes.

Digital literacy, language, socio-economic status and age all influence the ability to use, and remain engaged with, telemedicine tools, and a growing body of literature describes this digital divide as a tangible barrier to equity in cancer care (Lopez, 2024). Given that several of the interventions examined here required a smartphone, a stable internet connection or a basic familiarity with apps, it is reasonable to suspect that some of the patients most likely to benefit from remote support, such as older women, those with lower health literacy, or those in resource-poor settings, were also the ones least likely to be reached by any of these programmes. Overall, this body of evidence supports a rather pragmatic view of what telemedicine can currently offer breast cancer patients: a real benefit, but one that is conditional.

Limitations

This review has some limitations that need to be made clear. The protocol was not registered in advance, which leaves open the possibility of selection bias in the application of eligibility criteria during screening. Only seven studies met the inclusion criteria, a small number that partly reflects a field that is indeed still limited, but which also reflects our choices regarding the search window (2022–2026) and language (English only), both of which may have excluded potentially relevant earlier or non-English-language evidence. Finally, the heterogeneity of the outcome measurement tools discussed above precluded any quantitative pooling; consequently, the findings presented in this review are necessarily descriptive rather than a precise estimate of the effect.

Conclusion

Telemedicine appears to be capable of improving quality of life in women with breast cancer, but the evidence gathered in this review does not support treating it as a one-size-fits-all solution, valid regardless of who receives it or how it is delivered. The clearest benefits emerged from interventions

that combined digital content with some form of human contact, offered to patients with genuine unmet psychosocial needs from the outset. Interventions delivered as simple self-managed downloads to populations already enjoying a good quality of life showed no significant advantage over standard care. Future trials in this area would benefit from a shared minimum set of quality of life (QoL) measurement tools, and from study designs that treat engagement not as a secondary outcome but as part of what is actually being tested. Based on the currently available evidence, telemedicine is probably best understood as a complement to breast cancer care rather than a substitute for it, the value of which depends less on the underlying technology and more on how carefully it is tailored to the individual patient.

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