

Technological developments for the quality of life of women with neoplasms: an integrative literature review

Desenvolvimentos tecnológicos para a qualidade de vida de mulheres com neoplasia: revisão integrativa da literatura

Avances tecnológicos para la calidad de vida de las mujeres con cáncer: una revisión integradora de la literatura

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Abstract

Objective: To synthesize the literature on technological developments for promoting the quality of life of women undergoing cancer treatment. **Methods:** Integrative literature review, conducted between February and April 2023, on the CAPES Periodicals Portal, in the following databases: Web of Science, Scopus (Elsevier), Latin American and Caribbean Literature in Health Sciences (LILACS), and Publisher Medline (PubMed). The selection criteria for publications were defined for original articles available online, in Portuguese, English, and Spanish. The research focused on the period from 2013 to 2022, and excluded manuals, theses, and incomplete or duplicate works. **Results:** The sample included 50 studies, in which 45 technologies/interventions/strategies to promote quality of life were identified, categorized into technologies for lifestyle modifications and adaptive technologies for treatment adherence. **Considerations:** The importance of educational aspects attributed by researchers in addressing the disease and encouraging the patient's active participation in their treatment is evident for clinical practice, teaching, and research.

Keywords: Neoplasms; Integrative Oncology; Women's Health; Quality of Life; Health Promotion; Technological Development; Biomedical Technology.

Resumo

Objetivo: Sintetizar a literatura sobre desenvolvimentos tecnológicos para a promoção da qualidade de vida de mulheres em tratamento oncológico. **Métodos:** Revisão integrativa da literatura, realizada entre fevereiro e abril de 2023, no Portal de Periódicos CAPES, nas bases de dados: Web of Science, Scopus (Elsevier), Literatura Latino-americana e do Caribe em Ciências da Saúde (LILACS) e Publisher Medline (PubMed). Os critérios de seleção das publicações foram definidos para artigos originais disponíveis online, nos idiomas português, inglês e espanhol. A pesquisa focou no período de 2013 a 2022, e excluiu manuais, teses e trabalhos incompletos ou duplicados. **Resultados:** A amostra contemplou 50 estudos, nos quais foram identificadas 45 tecnologias/intervenções/estratégias para promover a qualidade de vida, categorizadas em tecnologias para modificações de estilo de vida e tecnologias adaptativas para adesão ao tratamento. **Considerações Finais:** Observa-se a importância para a prática clínica, ensino e pesquisa, dos aspectos educativos atribuídos pelos pesquisadores no enfrentamento da doença e o estímulo à participação ativa do paciente em seu tratamento.

Palavras-chave: Neoplasias; Oncologia Integrativa; Saúde da Mulher; Qualidade de Vida; Promoção da Saúde; Desenvolvimento Tecnológico; Tecnologia Biomédica.

Resumen

Objetivo: Sintetizar la literatura sobre desarrollos tecnológicos para promover la calidad de vida de mujeres en tratamiento de cáncer. **Métodos:** Revisión integradora de la literatura, realizada entre febrero y abril de 2023, en el Portal de Periódicos de CAPES, en las siguientes bases de datos: Web of Science, Scopus (Elsevier), Literatura Latinoamericana y del Caribe en Ciencias de la Salud (LILACS) y Publisher Medline (PubMed). Los criterios de selección de publicaciones se definieron para artículos originales disponibles en línea, en portugués, inglés y español. La investigación se centró en el período de 2013 a 2022 y excluyó manuales, tesis y trabajos incompletos o duplicados. **Resultados:** La muestra incluyó 50 estudios, en los que se identificaron 45 tecnologías/intervenciones/estrategias para promover la calidad de vida, categorizadas en tecnologías para modificaciones del estilo de vida y tecnologías adaptativas para la adherencia al tratamiento. **Consideraciones finales:** La importancia que los investigadores atribuyen a los aspectos educativos en el abordaje de la enfermedad y en el fomento de la participación activa del paciente en su tratamiento es evidente para la práctica clínica, la docencia y la investigación.

Palabras clave: Neoplasias; Oncología Integrativa; Salud de la Mujer; Calidad de Vida; Promoción de la Salud; Desarrollo Tecnológico; Tecnología Biomédica.

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Introduction

In Brazil, according to the National Cancer Institute (INCA), approximately 704,000 new cases of cancer are estimated for the three-year period 2023-2025. Of these, 244,000 cases will be in women, with breast cancer standing out with 74,000 cases (20.3%), colon and rectal cancer with 24,000 (6.5%), cervical cancer with 17,000 (4.7%), trachea, bronchi and lung cancer with 15,000 (4.0%), and thyroid cancer with 14,000 (3.9%).¹

An analysis of the years 2010 and 2019 showed that neoplasms are the leading cause of death in women between 30 and 59 years of age, with the highest proportions being those of the female genital organs and breast. Among women aged 30 to 49, deaths from neoplasms of the genital organs and breast predominated, while among women aged 50 to 59, the deaths were from neoplasms of the digestive organs and breast.²

Female cancer encompasses neoplasms affecting the organs of the reproductive system: breasts, cervix, uterine body, endometrium, ovary, vulva, vagina, and fallopian tube. The treatment negatively impacts these women's living conditions. They suffer from bodily dysfunctions harming them physically, emotionally, professionally, and socially, resulting in significant decrease in their quality of life.³

Over the years, due to advances in cancer treatment, these patients' survival time has increased, reflecting the greater interest of the scientific community in the impacts of treatment and health-related quality of life (HRQoL), proceeding from variations in understanding, functionality, emotional state, and social aspects that are influenced by health, disease, and the treatments resulting from it; that is, physical, emotional, social, and cognitive issues, and especially disease symptoms and treatment side effects.^{4,5}

Cancer treatment is considered invasive and traumatic, where the effects of the treatment compromise women's ability to have a healthier lifestyle. Therefore, quality of life cannot be ignored by healthcare professionals in the context of treatment; on the contrary, actions should be taken both to maintain and to improve quality of life. In this study, we adopt the concept of quality of life as defined by the World Health Organization (WHO) as "an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns".⁶

Despite the growing presence of technological innovations in the healthcare sector, the literature still lacks a comprehensive synthesis on the application of these resources specifically in oncological care practice for women, and how these interventions have been validated by other research in national and international settings. Another relevant aspect relates to the increased interest in the quality of life of people with cancer. It is observed that, in healthcare practice, the strategies and/or measures adopted by health professionals to improve the quality of life of this population are superficial and scarce, revealing weakness in planning, tactics, and the care process, resulting in measures that are not very effective in optimizing these women's quality of life.

The social relevance of this study lies in the need to understand how health technologies are produced and used on a global scale, with a view to contributing to improving the quality of life of women undergoing cancer treatment and, based on this knowledge, providing support for future studies to propose measures to minimize social, demographic or any other differences that negatively affect access to knowledge and cancer treatment.

Thus, the study aimed to synthesize the literature on technological developments for promoting the quality of life of women undergoing cancer treatment.

Methodology

This is an integrative literature review, developed in six stages:⁷ (i) identification of the problem to be solved and formulation of the research question; (ii) development of inclusion and exclusion criteria for articles; (iii) extraction of relevant information from the selected studies; (iv) evaluation of the studies selected to compose the integrative review; (v) reading and interpretation of the studies; and (vi) organization, discussion and complete synthesis of the publications.

The first stage began with the guiding question formulation, based on the mnemonic PICO (Population, Interest, and Context)⁸, with the following definition: P: Women; I: Technologies for promoting quality of life; Co: Cancer treatment. Therefore, the following question was defined: What technologies have been developed to promote the quality of life of women who are or have been undergoing cancer treatment?

The searches for scientific publications were conducted in the following databases: Web of Science (WoS), Scopus (Elsevier), Latin American and Caribbean Literature in Health Sciences (LILACS), and Publisher Medline (PubMed), through CAPES Journal Portal. With the assistance of a librarian in developing the search strategy, the Health Sciences Descriptors (DecCS) and Medical Subject Headings (MeSH) were used: Neoplasias/Neoplasms; Saúde da Mulher/Women's Health; Qualidade de Vida/Quality of Life; Promoção da Saúde/Health Promotion, as well as its synonyms and the Boolean operators "AND", "OR", and "NOT" to combine the descriptors and synonyms, as detailed in Chart 1.

DATA BASE	SEARCH STRATEGY
Web Of Science	TS=((NEOPLAS* OR CANCER OR TUMOR) AND (Women* Health) AND (Quality of Life) AND (HEALTH PROMOTION) NOT (PEDIATRIC*) NOT (MEN'S HEALTH) NOT (prostate))
SCOPUS	(TITLE-ABS-KEY (neoplasm*) OR TITLE-ABS-KEY (cancer) OR TITLE-ABS-KEY (tumor*) AND TITLE-ABS-KEY (women's AND health) AND TITLE-ABS-KEY (quality AND of AND life) AND TITLE-ABS-KEY (health AND promotion) AND NOT TITLE-ABS-KEY (pediatric*) OR TITLE-ABS-KEY (prostate)) AND PUBYEAR > 2012 AND PUBYEAR < 2023 AND (LIMIT-TO (LANGUAGE , "English") OR LIMIT-TO (LANGUAGE,"Portuguese") OR LIMIT-TO (LANGUAGE, "Spanish"))
Medline/ PubMed	((((((((Neoplasms) OR (cancer)) OR (tumor)) AND (Women's Health)) AND (health promotion)) AND (Quality of Life)) NOT (MEN'S HEALTH)) NOT (prostate)) NOT (pediatric) Filters applied: English, Portuguese, Spanish, from 2013/1/1 - 2022/12/31
LILACS	(neoplasia) OR (cancer) OR (tumor) AND (saúde da mulher) OR (saúde das mulheres) OR (saúde feminina) AND (qualidade de vida) AND (promoção da saúde) AND (db:("LILACS") AND la:("en" OR "pt" OR "es")) AND (year_cluster: [2013 TO 2022])

Source: Prepared by the authors (2023).

The second stage, which involved searching for publications according to the established criteria, took place between February and March 2023. The sample included original studies, in Portuguese, English, and Spanish, available online in full, published between 2013 and 2022, a period justified by the approval of Ordinance no. 874, Law No. 16, of May 16, 2013, which establishes the National Policy for the Prevention and Control of Cancer in the Healthcare Network for People with Chronic Diseases within the scope of the Brazilian Public Health System (SUS).⁹ Manuals, editorials, letters, opinion articles, monographs, dissertations or theses, duplicate or incomplete works, studies that did not meet the objective of this study, and studies whose method was not well described were excluded.

A total of 533 publications were retrieved, of which 223 were excluded after applying the inclusion and exclusion criteria, and 192 after reading titles and abstracts or due to duplication. For full-text reading, 118 articles were selected, of which 68 were excluded for not meeting the research objective, thus concluding the third stage of the review. The final sample consisted of 50 studies, as detailed in Figure 1

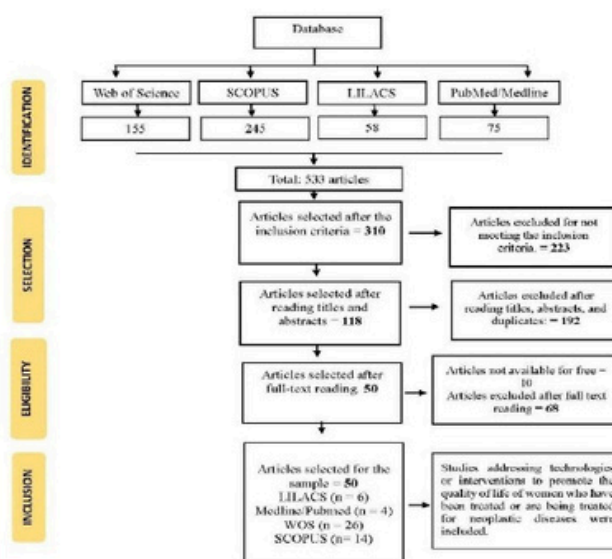


Figura 1- Fluxograma da coleta de dados e seleção dos estudos que compõem a amostra
Fonte: Elaborado pelos autores (2023).

To address the fourth stage, the evaluation of the studies selected for the review, and to organize the data, a table was created using Excel® 2019, with the following being highlighted: study reference, article title, objective, intervention/outcome and domain of quality of life, which according to WHO can be understood as a broad category of interrelated aspects of an individual's experience that reflect essential dimensions of well-being, i.e., aspects of physical health, psychological health, level of independence, social relationships, environment, spiritual aspects, religion or personal beliefs.⁶

In the fifth stage, based on an exhaustive reading of the publications, the decision was made to describe their characteristics considering the country of origin, year of publication, type of study, type of cancer, and technology studied.

In the sixth stage, organization, discussion, and complete synthesis, the findings related to the technologies were categorized by themes, according to the uniqueness of their objectives. Therefore, the assumption of Thematic Network Analysis was used, which seeks to identify the main themes contained in a text and present them in basic (technologies), organizational (categories), and global (technological developments for the quality of life of women with neoplasms) themes.¹⁰ The findings are presented in a discursive manner.

Results

It was observed that, out of the total of 50 publications making up the final sample, the period with the most publications on the topic was in 2021 (n=9), followed by the years 2022 and 2019, both with eight publications. The United States of America was the country that published the most (n=16), followed by Australia (n=7), Iran, and Canada (n=6). In the period studied, only four Brazilian articles were found in the selected databases. The databases with the largest number of published articles on the topic were Web of Science and Scopus (Elsevier).

Regarding the characteristics of the studies, five systematic literature reviews were found, three of which included meta-analyses. Randomized clinical trials were the most prevalent, accounting for 38% of the sample (n=19). Also noteworthy are mixed methods studies (n=5), pre-test and post-test (n=5), qualitative studies (n=4), descriptive studies (n=4) and pilot tests (n=4).

Regarding the types of cancer studied, the most prominent were breast, ovarian, cervical, endometrial, vulvar, lung, hematological, osteosarcoma, and colorectal cancers. Two studies did not specify the type of cancer. The prevalence of studies focused on breast cancer is observed, with 70% of the sample (n=35) specifically studying breast cancer, followed by gynecological cancer with 22% (n=11). It is also detected that most studies were conducted with or for women who were cancer survivors.

Forty-five technologies/interventions/strategies were identified and presented in Chart 2, with the aim of promoting the quality of life of women undergoing cancer treatment. They primarily addressed the domain of psychological health, in 41 articles found, followed by physical health, in 33 articles; social relationships and environment were both addressed in 26 articles on quality of life. Level of independence and personal beliefs and values were both addressed, with four articles in the sample. It should be noted that a technology, strategy, or intervention can encompass more than one domain of quality of life.¹¹⁻⁶⁰

Chart 2- Articles selected for the integrative review, according to study design, objective, intervention/outcomes, and quality of life domain.

Author and Year	Objective	Intervention	QoL Mastery
Manouchehri et al., 2022.¹¹	To explore the coping strategies of breast cancer survivors in Iran.	<u>Behavioral coping:</u> Strategies for healthy habits; use of oncology services; health literacy about breast cancer. <u>Emotional coping:</u> Denial and temporary escape; Positive thinking and focus on the positive aspects of life; Reinforcement of spirituality and support of family members.	Psychological Physical Level of independence Social relationships; Environment Beliefs and values
Seib et al., 2022.¹²	To test the effectiveness of a digital multimodal lifestyle intervention on the HRQoL of women undergoing cancer treatment.	<u>Women's Wellness after Cancer Program or WWACP:</u> training online, ebook for physical activity, healthy diet, stress and menopause management, sexual well-being, smoking and alcohol cessation, and sleep hygiene.	Psychological; Physical; Social relationships; Environment
Shi et al., 2022.¹³	To explore the effect of family empowerment on post-traumatic stress and fear of cervical cancer recurrence.	<u>Family empowerment:</u> Lectures on the treatment of cervical cancer, basic nursing knowledge, and a video of the operation. Family members and staff discuss personalized plans. Meetings with the patient to reduce fear of the disease and increase their confidence.	Psychological; Social relationships; Environment

Rubio et al., 2022.¹⁴	To evaluate the work process in the co-creation of a physical activity program for breast cancer survivors.	<u>My Body:</u> Physical activity through dance among breast cancer survivors. It included group sessions. Psychoeducational booklet with activities for behavior change.	Physical; Psychological; Social relationships; Environment
Male et al., 2022.¹⁵	To evaluate the feasibility and effectiveness of the HLM-ABC program.	<u>HLM-ABC Program:</u> Lifestyle modification following group intervention with interactive exchange of closed-access information with sharing and upload of documents and discussion forums.	Physical; Psychological; Social relationships; Environment
Edmed et al., 2022.¹⁶	To examine the association between sleep problems and HRQoL, and to examine the effectiveness of WWACP in improving sleep and other sleep problems in participants.	<u>Women's Wellness after Cancer Program (WWACP):</u> Content about sleep, including a book with sleep management strategies, encourages the use of rules for better sleep. A podcast with sleep-related approaches is available for participants; the oncology treatment nurse provides support in this specific area.	Physical
Setyowibowo et al., 2022.¹⁷	To evaluate the effectiveness of psychoeducation in breast cancer in relation to adherence to procedures, treatment, anxiety, depression, and quality of life.	<u>Psychoeducation:</u> Strategies to help patients cope with difficult everyday situations. Delivered in sessions, the method is adapted to suit the location and includes group discussions, individual consultations, or interactive materials.	Psychological; Social relationships; Environment
Changizi et al., 2022.¹⁸	To promote physical activity, manage stress, improve self-efficacy, provide social support, and enhance quality of life.	<u>Intervention based on engagement with the patient's health:</u> Education was provided through clips, pamphlets, and lectures in 8 sessions lasting 15 to 25 minutes each.	Physical; Psychological; Social relationships; Environment
Pozzar et al., 2021.¹⁹	To describe perceptions about Patient-Centered Communication and its associations with health-related quality of life and symptom burden of ovarian cancer.	<u>Patient-centered communication (PCC):</u> Recognizes and validates the patient's perspective, promotes understanding of the patient within their psychosocial context. Functions: information exchange, decision-making, fostering of healing relationships, self-management training, uncertainty management, and response to emotions.	Social relationships Level of independence

Liu et al., 2021. ²⁰	To evaluate the educational effect of the HBM intervention on the self-perception of gynecological cancer complications in older women.	<u>Educational intervention based on the health belief model (HBM)</u> : In-person training through instruction, video observation, simulation instruction, hand grip guidance etc. Each session did not exceed 30 minutes, and family members were invited to participate.	Psychological Environment	Smith et al., 2021. ²⁶	To evaluate the effectiveness of a physical activity promotion program (BEAT Cancer) for cancer survivors in rural women.	<u>Better Exercise Adherence after Treatment for Cancer (BEAT Cancer)</u> : Aerobic exercise sessions and group meetings, discussion on education and counseling focused on self-efficacy, barriers to exercise, goals, and time management.	Physical Psychological
Murphy et al., 2021. ²¹	To evaluate the effectiveness and usability of an app for promoting health in women with breast cancer.	<u>BreastMate</u> : Customized smartphone application, with an emphasis on physical activity. It has a platform for assessing cardiovascular risk factors and uses an automated 'traffic light' system to represent goal achievement.	Physical Psychological Level of independence	Zamania et al., 2021. ²⁷	To investigate the mediating/moderating effect of Coping Behaviors and a Sense of Coherence in the quality of life of breast cancer patients.	<u>Sense of Coherence (SOC)</u> : a holistic view of an individual's life and an internal resource for coping with stressful life events; <u>Coping Behaviors (CBs)</u> : Cognitions and behaviors that people use to remove a source of stress or alleviate its adverse effects.	Psychological
Khezri et al., 2021. ²²	To examine the effects of nursing care based on the Supportive Spiritual Care Model on the hope of women with breast cancer.	<u>Nursing care based on the Supportive Spiritual Care Model</u> : Therapy to provide spiritual care directly (systematic spiritual care process) and indirectly (providing family support, training interventions).	Psychological Personal beliefs and values	Muñoz-Alcaraz et al., 2020. ²⁸	To verify the effectiveness of (APAT) therapy versus conventional treatment in patients with arm lymphedema due to breast cancer.	<u>Activity-oriented proprioceptive antiedema therapy</u> : Lymphedema health education workshop; 10 sessions led by an Occupational Therapist, including activity-oriented neurodynamics and proprioceptive neuromuscular facilitation activities. 10-minute proprioceptive antiedema dressing.	Physical
Phillips et al., 2021. ²³	To test the feasibility and acceptability of the Fit2ThriveMB intervention.	<u>Fit2ThriveMB</u> : A smartphone app for self-monitoring, goal setting, personalized real-time feedback, app notifications, and a group message board.	Physical	Millman et al., 2020. ²⁹	To assess women's interest in and attendance at a sexuality education workshop after cancer.	<u>Lowdown on Down There</u> : Workshop about sexual health, mindfulness meditation exercise, psychoeducation on responsive sexual desire, the psychological benefit of social support, and discussion.	Physical, psychological, Environment, social relationships
Mkuu et al., 2021. ²⁴	To explore the influence of religiosity, including beliefs and experiences with breast cancer among African American Christian survivors.	<u>Spirituality</u> : influences: (1) struggling with God, (2) regaining my power, and (3) needing religious social support. Spiritual relationships have created "church families", cancer support groups, financial aid, and therapeutic support.	Psychological Social relations Environment Personal beliefs and values	Cao et al., 2020. ³⁰	To investigate the effect of a control intervention to reduce perceived stress on symptomatic groups at different time points in breast cancer.	<u>Stress reduction control intervention</u> : Use of photos, paintings, objects, meditation and music therapy, breathing techniques; counseling and conversations among doctors, nurses and family members. Muscle activity and functional exercise of the affected limb, and rehabilitation yoga exercises.	Physical Psychological Social relations
Thomps on et al., 2021. ²⁵	To determine whether an intervention using survivor stories affected the quality of life of breast cancer patients.	<u>Survivor Stories</u> : a video program with 207 clips of stories about the experiences of women survivors. It includes a dictionary of terms related to diagnosis, treatment, side effects, and recovery.	Psychological Environment				
Smith et al., 2021. ²⁶	To evaluate the effectiveness of a physical activity promotion program (BEAT Cancer) for cancer survivors in rural women.	<u>Better Exercise Adherence after Treatment for Cancer (BEAT Cancer)</u> : Aerobic exercise sessions and group meetings, discussion on education and counseling focused on self-efficacy, barriers to exercise, goals, and time management.	Physical Psychological				

Reese, et al., 2020.³¹	To evaluate a couple-based intervention designed to address sexual concerns for breast cancer survivors.	<u>Intimacy Enhancement (IE)</u> : conducted by telephone. It integrates skills practice and applies effective practices drawn from cognitive-behavioral couples therapy (e.g., communication skills training) and sex therapy (e.g., sensory focus).	Psychological Social relations
Chan et al., 2020.³²	To test the feasibility of EMINENT for implementing an integrated and shared care model.	<u>EMINENT</u> : Pre-specified shared care, enabled by nurses, with follow-up shared between specialists from oncology centers and general practitioners.	Psychological Social relations
O'Neill et al., 2020.³³	To determine the role of yoga in improving cancer-related fatigue and quality of life in women with breast cancer.	<u>Yoga</u> : Exercise is practiced to improve health and well-being and supposedly affects multiple dimensions of health. Yoga can be adapted for individuals with cancer.	Physical Psychological
Çol et al., 2019.³⁴	To evaluate the effect of a training and counseling program for mastectomized women and their spouses on family functioning and quality of life.	<u>Training and counseling program</u> : Home visits for follow-up and phone calls to improve family functioning and quality of life. Visits conducted in four sessions, once a week. One month after the training, a phone call and a visit are arranged; counseling continues for 3 months.	Psychological Environment Social relations
Gorzelitz et al., 2019.³⁵	To identify the trajectory of physical activity over time for survivors of endometrial and ovarian cancer.	<u>Physical activity</u> : Use of wrist accelerometers to measure rest-activity patterns over a three-day period at one week, four weeks, and four months after surgery, 24 hours a day.	Physical
Caperchione et al., 2019.³⁶	To examine the translational potential of the MOVE Project model in a real-world community setting.	<u>MOVE Project</u> : an intervention to increase physical activity levels in breast cancer survivors, combining the use of micro-donations and financial incentives. Physical activity was objectively assessed using a specific accelerometer.	Physical Environment

Beesley et al., 2019.³⁷	To identify gaps in care for survivors of gynecological cancers and their caregivers.	Interventions for late and long-term effects of treatment, for coordination and communication of care for psychological well-being and health promotion; Dyadic interventions for women and their caregivers.	Physical Psychological Environment Social relations
Bieyabanie, et al., 2019.³⁸	To investigate the effectiveness of group counseling on self-efficacy in mastectomized women.	<u>Group counseling sessions</u> : sessions on health promotion and lifestyle. It includes self-efficacy, behavioral skills for nutrition, physical activity, stress management, spirituality, and interpersonal relationships, and others.	Psychological Environment Social relations
Liu et al., 2019.³⁹	Evaluate the effects of stress reduction with mindfulness combined with music therapy in the treatment of symptoms in patients with osteosarcoma.	<u>Music therapy</u> : a session led by a music therapist, followed by <u>stress reduction course with mindfulness</u> guided by a trained psychologist. Later, another session of music and encouragement to carry out the intervention every day.	Physical Psychological
Peng et al., 2019.⁴⁰	To explore the effect of lidocaine/prilocaine on oncological wounds and optimize the pain management protocol.	<u>Lidocaine cream</u> : Use 2.5% lidocaine/2.5% prilocaine 10 minutes before changing the dressing. The wound treatment was completed within 30 minutes to ensure data consistency.	Physical
Buscemi et al., 2019.⁴¹	Describe the feasibility of a 4-week pilot trial of <i>My Guide</i> among Hispanic breast cancer survivors.	<u>My Guide</u> : A smartphone app focused on psychosocial adaptation after breast cancer, cancer knowledge, awareness and stress management, social support, and communication with friends, family, and professionals.	Psychological; Physical; Social relationships; Environment.
Phillips et al., 2018.⁴²	To test a set of components for intervention in physical activity through technologies for breast cancer survivors.	<u>Fitbit and the app of smartphone Fit2Thrive</u> : use on a personal phone. Component testing performed. Standard self-monitoring app, educational materials, and exercise prescription for gradual and safe progression within the program.	Physical; Social relationships; Environment

Lynch et al., 2018. ⁴³	To evaluate the effectiveness of wearable technology and behavioral counseling for physical activity in breast cancer survivors.	The intervention comprises three components: (1) a Garmin Vivofit2®; (2) a behavioral feedback and goal setting session; and (3) five telephone behavioral counseling sessions, spread over 12 weeks.	Physical Psychological
Yanezet al., 2018. ⁴⁴	To evaluate the effectiveness of <i>My Guide</i> with regard to a smartphone application in the general promotion of health (<i>My Health</i>).	<i>My Guide</i> : Symptom, health and emotions management; friends; specific medications; community and daily support; videos, audio; favorites. <i>My Health</i> : Food and nutrition; prevention of diabetes and heart disease; exercise; lifestyle; doctor's recommendations.	Psychological; Physical; Social relationships; Environment.
Taylor, et al., 2018. ⁴⁵	To assess the feasibility of an eight-week yoga program among African American breast cancer survivors.	<i>Restorative yoga</i> : 75 minutes per session, one day a week for eight weeks, under the supervision and guidance of a certified instructor from <i>Howard University</i> . It emphasizes restorative postures and Pranayama breathing techniques.	Psychological; Physical
Anderson et al., 2017. ⁴⁶	To determine the effectiveness and cost-effectiveness of the Women's Wellbeing After Cancer Program or WWACP.	<i>WWACP</i> : e-health platform, includes virtual consultations with healthcare professionals, interactive web interface, podcasts, ebook with interventions, a diary to record information about health and lifestyle.	Physical Psychological Environment Social relations
Espindula et al., 2017. ⁴⁷	To analyze the effectiveness of Pilates compared to other exercises and to no exercise for women with breast cancer.	<i>Pilates method</i> : Relief of symptoms, restoration of functionality, reduced fatigue, improved performance in daily activities and quality of life. Principles: breathing, concentration, body alignment, precision, control, rhythm, and endurance.	Physical Psychological

Ribeiro et al., 2017. ⁴⁸	To investigate the effects of oral zinc supplementation on fatigue intensity and quality of life in patients undergoing chemotherapy for colorectal cancer.	<i>Zinc supplementation</i> : administered as zinc sulfate (154mg/capsule). All participants were instructed to take the capsule after breakfast and dinner, which corresponded to 70mg of elemental zinc per day. The study lasted approximately 16 weeks.	Physical
Fisher et al., 2017. ⁴⁹	To generate knowledge for implementing personalized interventions in the relationship, giving voice to the family and improving mother-daughter communication during cancer.	<i>Mother-daughter opening/avoidance</i> : Women with more open mother-daughter bonds had better relational health. Those who got involved in avoidant coping reported poorer physical health. They discussed side effects, procedures, disease risks and prevention, medical decisions, and avoided discussions about emotions and distressing topics, as well as uncertainties about the future.	Psychological Social relations
Lucas et al., 2017. ⁵⁰	To examine the feasibility and preliminary effectiveness of providing an intervention of dietary advice based on mindfulness for survivors of endometrial cancer.	<i>Mindfulness in Motion</i> (MIM): 8-week intervention with instruction and practice in music, yoga, and mindfulness. Participants received a CD/DVD and instructions for mindfulness and yoga at home. <i>Dietary advice</i> : conducted by a nutritionist. It encourages reductions in portion sizes and in calorie and fat consumption.	Physical Psychological Environment
Caperchione et al., 2016. ⁵¹	To assess the feasibility of the MOVE Project and estimate changes in motivation for physical activity and social interaction.	<i>MOVE Project</i> The survivors, as a group, develop a physical activity initiative and apply for a microcredit to support the activity. They receive additional financial incentives to increase the group's physical activity.	Physical Social relations Environment
Larkey et al., 2016. ⁵²	To explore the effects of <i>Qigong/Tai Chi Easy</i> (QG/TCE) in quality of life.	<i>QG/TCE Sessions</i> were compared to <i>Sham Qigong</i> (SQG), a gentle movement control intervention similar to QG/TCE, but without the focus on breathing and the meditative state.	Physical Psychological

Leach <i>et al.</i> , 2015. ⁵³	Evaluate the effects of the program <i>BEAUTY</i> in the physical and psychosocial outcomes after 12 and 24 weeks.	<i>BEAUTY</i> : an exercise program where participants receive fitness assessments and individualized exercise plans, group exercise classes twice a week, and bi-weekly educational sessions.	Physical Psychological Environment
Esmali <i>et al.</i> , 2015. ⁵⁴	To determine the effectiveness of group psychotherapy based on acceptance and commitment to improving the mental health and quality of life of breast cancer patients.	<i>Acceptance and Commitment Therapy Protocol</i> – eight sessions in four weeks: 1st: contact therapy; 2nd: creative anguish; 3rd: The control itself is not a solution; 4th: How to replace the remote control; 5th: concept of cognitive failure; 6th: concepts of role and underlying; 7th: The concept of values and the difference between values, goals, and needs; 8th: Commitment to action.	Psychological Social relations Environment
Loh <i>et al.</i> , 2015. ⁵⁵	To investigate the variety of methods for improving physical, psychosocial, occupational, and social well-being in women with breast cancer after surgery.	<i>Physiotherapy</i> : Decongestive therapy, lymphatic drainage, standard physiotherapy, occupational therapy. <i>Physical exercise</i> : homebound and guided. <i>Psychosocial</i> : Psychoeducation and cognitive-behavioral therapy. <i>Nutritional</i> : Healthy eating habits. <i>Alternative</i> : Yoga, music therapy, acupuncture. <i>Combined complex interventions</i> : advice and exercises.	Physical Psychological Social relations
Falzon <i>et al.</i> , 2015. ⁵⁶	To examine and compare the effects of two messages promoting physical activity, one narrative and the other informative, on the perceptions and behavioral intentions of cancer patients.	<i>Fictional testimony of a survivor</i> of breast cancer who engaged in regular physical activity during and after treatment or <i>expert recommendations on physical activity for breast cancer patients</i> . Both contained similar elements regarding the physical and psychological benefits of physical activity and the absence of risks for patients with breast cancer.	Psychological
Silva <i>et al.</i> , 2014. ⁵⁷	To understand the perspective and care strategies of nurses regarding family participation in hospitalization in oncology palliative care.	<i>Strategies to encourage family involvement in caregiving</i> : Training for providing care through demonstration, dialogue, formation of family groups, interdisciplinary approach, and use of explanatory leaflets.	Psychological Social relations Environment

Pérez <i>et al.</i> , 2014. ⁵⁸	To describe the process of selecting survivor stories for the development of a new health communication intervention.	<i>Interactive video program</i> : Stories from breast cancer survivors about faith and spirituality, the breast cancer diagnosis, the reaction and support of others, their health experiences, self-esteem, self-care, side effects, fears, and quality of life.	Psychological Physical Level of independence Social relations Environment Personal beliefs and values
Costa-Júnior ; Lima, 2013. ⁵⁹	To investigate and describe what professionals from different backgrounds in the health field consider to be the social support provided to patients with breast cancer.	<i>The social support</i> : Listening to, talking to, and answering patient questions; assisting with material resources and informing patients of their rights; engaging the community and family; making referrals to other specialized professionals; providing follow-up care throughout treatment; and reducing waiting times for tests and treatment.	Psychological Social relations Environment.
Van Puymbroeck <i>et al.</i> , 2013. ⁶⁰	To describe the health benefits reported by breast cancer survivors after an 8-week yoga intervention.	<i>Yoga</i> : An eight-week intervention, conducted by a yoga therapist. The sessions lasted 75 minutes and consisted of a variety of <i>pranayamas</i> (breathing), <i>asanas</i> (postures) and <i>hāranā</i> (meditation).	Physical Psychological

Note: QoL = Quality of Life.

Source: Prepared by the authors (2022).

Discussion

The results showed that most of the technologies developed addressed, directly or indirectly, more than one field within the domains established by WHO.⁶ This reflects the understanding that quality of life cannot be limited to or understood as a single factor, but rather as the result of the intertwining of many aspects related to healthy habits, for example: adequate nutrition and physical activity, considering the relationship of daily life with psychosocial factors such as emotional distress, fear of relapse, and sleep quality.¹²

Aiming at providing a basis for the discussion of the results of this research, the technologies were categorized according to the main theme of each health technology found, where the themes focused on lifestyle modifications and adaptations for adherence to treatment.

Technologies for lifestyle modifications

This study highlights the trend towards the use of digitally supported technologies aimed at developing healthy habits, as well as programs that used soft or semi-hard technology, with an emphasis on promoting physical activity.

An e-health platform was created to promote women's well-being after treatment for breast, gynecological, and hematological cancers. It includes virtual oncology nursing consultations, podcasts, and an e-book for physical activity, healthy diet, stress management, menopause, sex life, smoking cessation, alcohol consumption, and sleep hygiene. The results showed improved survival rates, benefits in overall health, pain, vitality, and physical and mental health. However, there was no statistically significant effect of the interventions on sleep when analyzed in isolation. The results were related to physical health and not to mental health, which had been hypothesized by the researchers.^{12, 16, 46}

Another online platform program conducted a 10-week at-home group lifestyle intervention for breast cancer survivors, involving sharing and upload of documents, and asynchronous meetings through discussion forums. The outcome demonstrated quantitative and qualitative trends of weight loss, increased intuitive eating, more physical activity, motivation and self-efficacy (regarding eating habits), and improved body image.¹⁵

Mobile health technologies have been identified for smartphones. A study has developed an app that encourages physical exercise to increase the six-minute walking distance during breast cancer treatment and reduce cardiovascular risk. It included telehealth consultations and an activity tracker linked to the smartphone accelerometer, allowing the monitoring of the number of steps and the distance traveled. A social networking platform was designed for participants to post photos, links, and comments, with the intention of motivating them to carry out the activities.²¹

Similarly, another program combined wearable technology (accelerometer), training calls, and a smartphone app for self-monitoring to encourage physical activity in patients with metastatic breast cancer. The participants were encouraged to accumulate more steps throughout the day, moving more and sitting less, along with structured exercise sessions, contributing to a reduction in sedentary behavior.^{23,42}

Programs have also been developed that combine dance and psychoeducation to promote behavioral change. Other studies have also linked physical activity with education and counseling on self-efficacy, facilitators and barriers to exercise, goal setting, time management, physical and psychosocial benefits, nutrition, sleep and fatigue, stress management, social support and brain fog, as well as personalized exercise plans, group and in-home exercise classes and education.^{14, 26, 53}

Significant improvements were observed in the increase in time spent in moderate to vigorous physical activity, which improved aerobic fitness and waist-to-hip ratio, improved anxiety, depression, self-efficacy, social support, fatigue, and decreased interference from barriers. Participants highlighted the group activities, personalized exercise plan, and suggestions such as a guide for home workouts. Operational points were considered: logistics, personnel training and certification, cost, to improve organizational readiness for program execution. It is worth highlighting that sustainable intersectoral collaborative processes are fundamental for promoting health.^{14, 26, 53}

A study linked music practices, yoga, mindfulness, and eating behavior to dietary counseling based on mindfulness in women with endometrial cancer, where there were significant changes in mindfulness, sleep quality, and fruit and vegetable intake. A phenomenological study showed that yoga can be an important tool in the healing process for women with breast cancer, with health-promoting benefits in the areas of physical health and healing, mental health and healing, and social health and healing.^{50,60}

A systematic review with meta-analysis examined the effects of yoga practice on reducing breast cancer-related fatigue in active and inactive individuals. The results showed a slight to moderate improvement in symptoms when compared to no physical activity, but no greater improvements were observed when compared to other physical activity.³³

Adaptive technologies for treatment adherence

In cancer treatment, a more compassionate approach is necessary, prioritizing the recognition of needs related to lack of information, communication, autonomy, and other factors. Healthcare professionals must listen attentively, communicate effectively, and develop strategies to address situations of heightened vulnerability. The literature also exemplifies family and social support, spirituality, and multidisciplinary support as coping strategies.¹

In life-threatening chronic diseases, such as cancer, psychosocial adjustment coping strategies are important for identifying and managing daily stressors. The sense of coherence and coping are intrinsic resources an individual has to cope with stressful life events, and they impact mental health and quality of life. The former emphasizes the origins of health and well-being rather than the factors that cause disease. Coping, in turn, is related to the perceptions and behaviors an individual uses to remove a source of stress from their environment or to alleviate its adverse effects.¹⁹

To facilitate greater adherence to treatment and

follow-up for cancer patients, a shared care channel was developed for the exchange of information between specialists from oncology centers and family health centers, as multidisciplinary care helps in embracing, understanding, and greater patient participation in decision-making.^{32,61} To encourage family involvement in the care of cancer patients, nurses developed training in basic daily care, empowering lectures, and the creation of personalized care plans. This resulted in improved family adaptation, comfort, reduced symptoms of post-traumatic stress disorder, and decreased fear of recurrence, thus facilitating treatment and improving patient satisfaction rates.^{13,39}

Group counseling sessions for women with breast cancer have proven effective in promoting self-efficacy and health-promoting behaviors, such as taking responsibility for one's health and interpersonal relationships. Nursing interventions for women and their spouses through a training and counseling program, including home visits and phone calls to improve family functioning, suggest a positive influence on resolving financial and moral problems, developing open communication, and the equitable distribution of roles.^{34,38}

A qualitative study identified healthcare professionals as the third largest source of social support, after children and husband. Professionals consider social support to include listening to and talking with the patient, embracing and helping with material resources, answering their questions and clarifying diagnostic and treatment procedures, providing information about patient rights, promoting their engagement in the community and family, assisting in referrals to other specialized professionals, and reducing waiting times for tests and treatment.⁵⁹

Treatment for female cancer can cause dysfunctions in self-esteem, body image, femininity, and sexual health.⁶⁴ Therefore, it is necessary to promote these women's sexual health. A vulvovaginal educational workshop for women after cancer treatment identified vaginal dryness and pain as the main complaints, and emphasized the use of vaginal moisturizers and lubricants, pelvic floor physiotherapy, adaptation of sexual practices, mindfulness meditation and psychoeducation about responsive sexual desire and sensory focus.²⁸ Another intervention, conducted via telephone sessions, utilized couples therapy and sex therapy, such as training in communication skills and sensory focus, respectively.³¹

Another challenge in promoting the quality of life of women with breast cancer is lymphedema, a chronic and progressive condition resulting from fluid retention in the interstitial space, causing tenderness, pain, and movement limitations.⁶⁵ A study conducted a health education workshop on lymphedema with sessions for activity-oriented neurodynamics, proprioceptive neuromuscular facilitation, and proprioceptive anti-edema dressing.²⁸ A systematic review showed that complex decongestive therapy decreased the incidence of lymphedema compared to standard physiotherapy.⁵⁵

Technologies for promoting well-being related to cancer pain were also not found in our sample, perhaps because it is a difficult pain to control and medication is required. However, the analgesic effect of topical application of lidocaine/prilocaine cream was evaluated on oncological wounds. The results were satisfactory, and the lidocaine compound may be an alternative to systemic

Study limitations

One limitation is that some of the included studies do not detail the technology used, but they were chosen to remain in the sample because they describe its use, even if superficially. The limitations of the studies analyzed may lead to analytical bias. Furthermore, despite the large number of publications in the sample, few were developed in Brazil, which may not reflect the local reality of the population when considering sociodemographic and cultural differences.

Contributions to the field of Health and university extension.

The study synthesizes and classifies a variety of technologies and interventions that aim to improve the quality of life of women undergoing cancer treatment. This provides a comprehensive overview of the available options, helping healthcare professionals choose the best approaches for their patients.

Furthermore, by synthesizing and categorizing the various technologies and interventions identified, this study establishes a basis for the development and improvement of new tools. This rationale establishes a link with university extension programs, as it encourages higher education institutions to collaborate with healthcare professionals, developing innovative and personalized solutions that meet the specific needs and socio-demographic and cultural realities of the Brazilian population. This includes focusing on digitally supported technologies for healthy habits and programs that utilize soft or semi-hard technology, especially in promoting physical activity, as evidenced in the research results.

Final Considerations

This study considered various types of technologies and strategies developed with the aim of promoting the quality of life of women undergoing cancer treatment. The importance of educational aspects attributed by researchers in addressing the disease and encouraging the patient's active participation in their treatment is evident for clinical practice, teaching, and research. It should be noted that some of the difficulties are not directly related to cancer treatment and its therapeutic modalities, but rather to organizational, social, and emotional issues that negatively impact patients' quality of life.

Thus, the development and implementation of technologies to promote the well-being of this population is extremely important, especially in the Brazilian context where few studies have been published, since redesigning strategies and behaviors under the guidance of health professionals allows patients and their families to face their struggles with dignity and quality of life, as evidenced in the studies analyzed.

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