

Review

From Evidence to Implementation: A Clinical Algorithm for Individualized Exercise Prescription in Breast Cancer

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Abstract

Background/Objectives: Exercise is increasingly recognized as an effective supportive intervention in breast cancer (BC), with substantial evidence demonstrating benefits on cancer-related fatigue, physical function, and quality of life. However, despite this strong scientific basis, its implementation in routine clinical practice remains inconsistent. Existing exercise oncology frameworks have primarily focused on screening, risk stratification, and referral, with limited availability of practical tools to guide individualized exercise prescription across the BC continuum. Accordingly, this narrative review aimed to synthesize current evidence to develop a clinically applicable, stepwise algorithm for individualized exercise prescription in women with BC. **Methods:** Current evidence from randomized controlled trials, systematic reviews, meta-analyses, and international clinical guidelines on exercise interventions in women with BC was synthesized narratively, with emphasis on exercise modality, intensity, progression, safety considerations, treatment phase, and patient-specific factors. **Results:** Aerobic and resistance exercise are safe and effective across different phases of BC care, including active treatment, survivorship, and advanced disease, with consistent improvements in fatigue, physical function, cardiorespiratory fitness, and health-related quality of life. However, heterogeneity in interventions, patient populations, and clinical contexts limits direct translation into clinical practice. To address this implementation gap, the available evidence was translated into a structured clinical algorithm based on the FITT principle (frequency, intensity, time, and type), treatment phase, risk stratification, patient-specific characteristics, treatment-related toxicities, and safety considerations, allowing individualized adaptation to different clinical scenarios. **Conclusions:** Exercise should be considered a core component of BC care rather than a general lifestyle recommendation. Bridging the evidence-to-implementation gap requires structured, individualized, and clinically applicable approaches to exercise prescription. The proposed algorithm translates current evidence into a structured clinical decision-support framework that may facilitate the routine implementation of individualized exercise prescription across the BC continuum.

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conditions of the [Creative Commons](#)[Attribution \(CC BY\)](#) license.**Keywords:** breast cancer; exercise prescription; clinical algorithm; exercise oncology; cancer-related fatigue; survivorship

1. Introduction

Breast cancer (BC) is the most frequently diagnosed malignancy among women worldwide and remains a leading cause of cancer-related morbidity and mortality [1]. Advances in early detection, surgical techniques, radiotherapy, and systemic treatments have significantly improved survival outcomes, resulting in a growing population of women living during and after BC treatment [2]. Consequently, this epidemiological shift has increased the clinical relevance of survivorship care, including the management of treatment-related adverse effects and the preservation of long-term health and functional capacity.

Nevertheless, despite improvements in oncological outcomes, BC and its treatments are associated with a broad spectrum of short- and long-term adverse effects. Commonly reported complications include cancer-related fatigue, reduced cardiorespiratory fitness, muscle weakness, impaired physical function, weight gain, and decreased health-related quality of life [3–6]. Among these complications, cancer-related fatigue is one of the most prevalent and distressing symptoms, affecting a substantial proportion of patients during active treatment and often persisting after treatment completion [3,7]. Additionally, reductions in habitual physical activity and cardiorespiratory fitness are frequently observed during treatment, contributing to physical deconditioning and further functional decline [6,8].

Accordingly, exercise is increasingly recognized as an evidence-based supportive intervention in oncology, with a growing body of evidence specifically focused on women with BC. Exercise interventions have been evaluated across different treatment phases, including adjuvant chemotherapy, radiotherapy, and survivorship [6,9,10]. For example, randomized controlled trials in women receiving adjuvant chemotherapy have demonstrated that structured aerobic and resistance exercise programs can improve cardiorespiratory fitness, muscle strength, and selected patient-reported outcomes compared with usual care [9,11]. These findings are further supported by systematic reviews and meta-analyses indicating that exercise can reduce cancer-related fatigue and improve physical functioning and quality of life in women with BC, both during adjuvant treatment and after completion of active therapy [5,6,12,13].

Importantly, resistance training has also been shown to be feasible and safe in women with BC, including those with or at risk of BC-related lymphedema. Randomized trials have demonstrated that progressive weight lifting does not increase the risk of lymphedema when appropriately prescribed and supervised [14,15]. Beyond symptomatic and functional improvements, observational studies have suggested that higher levels of physical activity after BC diagnosis may be associated with improved survival and reduced recurrence risk [16,17]. However, these associations should be interpreted cautiously because of the observational nature of the available evidence and the potential influence of residual confounding factors.

Although the efficacy and safety of exercise in BC are now supported by a substantial body of high-quality evidence, translating this evidence into routine oncology practice remains a major challenge. Exercise continues to be recommended predominantly as a general lifestyle intervention rather than prescribed as a structured therapeutic strategy integrated into routine clinical care. Consequently, despite the availability of robust evidence and international recommendations, implementation in daily oncology practice remains inconsistent. Effective exercise interventions require careful consideration of key prescription parameters, including type, intensity, frequency, duration, progression, and supervision. The FITT principle (frequency, intensity, time, and type) provides a useful framework for structuring exercise prescription [18].

At the same time, its application in BC care is complex and must account for substantial heterogeneity in patient characteristics, including age, baseline fitness,

comorbidities, treatment modality, symptom burden, and risk of treatment-related complications [18,19]. Therefore, a one-size-fits-all approach is unlikely to be appropriate in this setting. Accordingly, there is a need to move beyond general recommendations toward a more precise and clinically oriented model of exercise prescription in BC.

Several international guidelines and exercise oncology frameworks have been published. Most have primarily focused on evidence synthesis, general exercise recommendations, screening, risk stratification, or referral pathways [10,19]. Comparatively fewer efforts have sought to integrate these elements into a practical, stepwise clinical tool that assists healthcare professionals in individualizing exercise prescription according to treatment phase, treatment-related toxicities, functional status, and patient-specific characteristics. This implementation gap remains a significant barrier to the routine incorporation of exercise as a component of comprehensive BC care.

The present work was conceived to address this implementation gap by translating the best available evidence into a clinically applicable decision-support framework for exercise prescription in women with BC. Rather than simply providing another narrative summary of the literature, our objective was to integrate current evidence into a practical, BC-specific clinical algorithm that supports individualized exercise prescription across the BC continuum. To achieve this objective, the narrative synthesis was undertaken as the scientific foundation for the development of this implementation-oriented framework, integrating key exercise prescription principles, including modality, intensity, frequency, progression, and safety considerations, with treatment phase, treatment-related toxicities, functional status, and patient-specific characteristics to facilitate individualized clinical decision-making and promote the routine implementation of exercise across the BC continuum.

2. Materials and Methods

This narrative review was undertaken to translate the best available evidence into a practical, clinically applicable algorithm for individualized exercise prescription in women with BC. Because the primary objective was to develop a clinical decision-support framework rather than to answer a single focused clinical question or quantitatively synthesize intervention effects, a narrative review methodology was considered the most appropriate approach for integrating diverse sources of evidence. This approach allowed the integration of evidence from different methodological sources into a coherent framework intended to facilitate the implementation of exercise in routine oncology practice.

A structured literature search was performed in the electronic databases PubMed and Scopus to identify clinically relevant evidence published through April 2026. No predefined lower date limit was applied, as the objective was to integrate the highest-quality evidence supporting the proposed algorithm, including landmark studies that continue to underpin contemporary exercise-oncology practice. The search strategy included combinations of keywords related to BC, exercise, physical activity, exercise prescription, exercise oncology, fatigue, quality of life, resistance training, aerobic exercise, survivorship, rehabilitation, and implementation. Additional publications were identified through manual screening of the reference lists of relevant articles, systematic reviews, meta-analyses, and international clinical practice guidelines.

Evidence was selected according to its methodological quality, clinical relevance, clinical applicability, and contribution to the development of the proposed clinical algorithm. Priority was given to randomized controlled trials, systematic reviews, umbrella reviews, meta-analyses, and international clinical practice guidelines, including those published by the American College of Sports Medicine (ACSM) [10] and the American Society of Clinical Oncology (ASCO) [19]. Accordingly, both contemporary

evidence and landmark publications with enduring relevance to exercise prescription in BC were incorporated when considered essential for the development of the proposed algorithm.

Unlike a systematic review, the purpose of the literature search was not to identify all available publications addressing a predefined PICO question, perform a formal risk-of-bias assessment, or conduct a quantitative evidence synthesis. Instead, the search strategy was designed to ensure comprehensive coverage of the most robust and clinically relevant evidence required to support the development and clinical implementation of the proposed exercise prescription algorithm. Accordingly, the selected evidence was synthesized narratively, with emphasis on exercise modality (aerobic, resistance, flexibility, and high-intensity interval training), intensity, frequency, duration, progression, safety considerations, treatment phase, treatment-related toxicities, and patient-specific characteristics. Evidence synthesis and algorithm development were conducted iteratively, allowing continuous refinement of the proposed algorithm as evidence from different sources was integrated into a clinically applicable decision-support framework. The resulting algorithm was specifically designed to facilitate individualized clinical decision-making and support the routine implementation of exercise prescription across the BC continuum.

3. Proposed Clinical Algorithm for Individualized Exercise Prescription in Breast Cancer

Despite the growing body of evidence supporting exercise as an integral component of BC care, translating this evidence into routine clinical practice remains challenging because exercise prescription must account for substantial heterogeneity in treatment phase, functional status, symptom burden, treatment-related toxicities, comorbidities, and individual patient characteristics [10,19]. Existing international guidelines provide robust evidence-based recommendations regarding exercise in patients with cancer; however, these recommendations are generally presented according to specific interventions or clinical scenarios rather than within a unified clinical pathway that facilitates individualized decision-making across the BC continuum [10,19].

To address this implementation gap, we developed a stepwise clinical algorithm designed to facilitate individualized exercise prescription throughout the BC continuum. Rather than functioning as a prescriptive protocol, the algorithm should be interpreted as a flexible clinical decision-support tool that assists healthcare professionals in adapting exercise prescription according to the patient's clinical status while remaining consistent with current evidence and international recommendations. Its objective is not to replace existing clinical guidelines but to translate their recommendations into a structured and clinically applicable framework that supports routine decision-making in oncology practice. In this regard, this algorithm is intended to complement existing evidence syntheses and international recommendations by providing a structured, BC-specific clinical decision-support framework designed to facilitate the implementation of individualized exercise prescription in routine clinical practice.

This framework integrates the principal determinants of exercise prescription into a single structured pathway, including initial clinical assessment, risk stratification, disease and treatment phase, FITT-based exercise prescription [10], treatment-related toxicities, safety considerations, exercise progression, ongoing monitoring, and referral to supervised or multidisciplinary exercise programs when appropriate. By combining these components within a single framework, the algorithm aims to facilitate safe, individualized, and clinically applicable exercise prescription while promoting the routine implementation of individualized exercise across the BC continuum.

Figure 1 illustrates the proposed clinical algorithm for individualized exercise prescription across the BC continuum and serves as the practical framework through which the evidence synthesized in this review is translated into clinical decision-making.

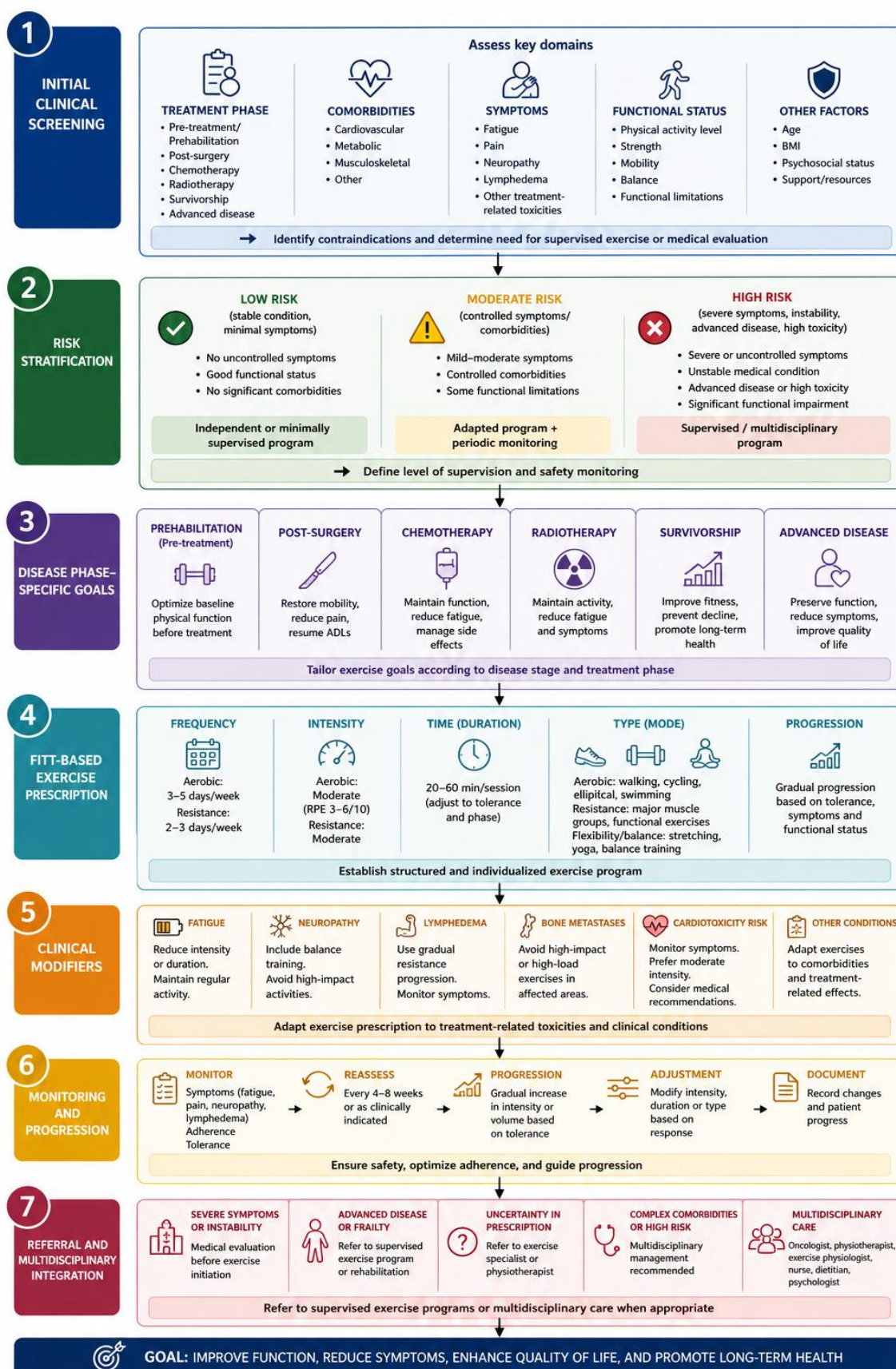


Figure 1. Proposed clinical algorithm for individualized exercise prescription in women with breast cancer across the disease continuum. **Abbreviations:** BC, breast cancer; FITT, frequency–intensity–time–type; RPE, rating of perceived exertion; BMI, body mass index; ADLs, activities of daily living.

The algorithm comprises seven sequential and interconnected steps that guide clinicians from the initial patient assessment to long-term follow-up and exercise progression. It outlines a structured approach to individualized exercise prescription, including initial clinical screening, risk stratification, disease phase-specific goals, and FITT-based exercise prescription (frequency, intensity, time, and type). The algorithm further incorporates adaptation to treatment-related toxicities and common clinical conditions (e.g., fatigue, peripheral neuropathy, lymphedema, and bone metastases), as well as ongoing monitoring, exercise progression, and criteria for referral to supervised or multidisciplinary exercise programs when appropriate.

Each decision node is underpinned by the scientific evidence synthesized in the following sections of this review. Consequently, the subsequent sections should not be interpreted as independent narrative summaries but as the scientific rationale supporting each component of this framework. The proposed algorithm therefore represents the practical translation of the evidence synthesized in this review into a structured clinical decision-support tool. By linking each decision node to the supporting scientific evidence, it provides an evidence-to-implementation framework that facilitates individualized clinical decision-making and promotes the routine integration of exercise prescription across the BC continuum.

To facilitate practical implementation, Table 1 summarizes the operational components of the proposed algorithm and the clinical implications of each sequential step.

Table 1. Structured framework for individualized exercise prescription in breast cancer.

Step	Domain	Key Elements	Clinical Implication
1	Initial Clinical Screening	Treatment phase; comorbidities; cardiovascular risk; symptom burden; fatigue; pain; neuropathy; lymphedema; musculoskeletal limitations; baseline physical function; contraindications to exercise	Identify contraindications and determine need for supervised exercise or medical evaluation
2	Risk Stratification	Low risk: clinically stable, independent exercise generally feasible; Moderate risk: symptom burden or treatment-related toxicities requiring individualized adaptation; High risk: advanced disease, severe deconditioning, major comorbidities, bone metastases, or cardiotoxicity risk requiring closer supervision and monitoring	Define level of supervision (independent, adapted, or supervised program)
3	Disease Phase–Specific Exercise Prescription	Prehabilitation: optimize baseline physical function and physiological reserve before surgery or systemic therapy; Post-surgical phase: restore shoulder mobility, upper-limb function, and functional independence while minimizing postoperative complications; Active treatment: maintain function, reduce fatigue, minimize deconditioning, and preserve treatment tolerance during systemic therapy and radiotherapy; Survivorship: improve fitness, body composition, and long-term health outcomes; Advanced disease: preserve independence, minimize symptom burden, and maintain quality of life.	Tailor exercise goals according to disease stage and treatment phase

4	FITT-Based Exercise Prescription	Aerobic exercise: progress toward ≥ 150 min/week of moderate-intensity activity when clinically feasible; walking and cycling commonly used. Resistance exercise: progressive resistance training 2–3 days/week as tolerated targeting major muscle groups. Flexibility/mobility: shoulder mobility, stretching, balance, and functional exercises according to clinical needs. Progression should remain individualized, symptom-guided, and adapted to treatment tolerance and recovery capacity rather than based on fixed progression schedules.	Establish structured and individualized exercise program
5	Clinical Modifiers	Fatigue: temporary reduction in intensity or volume may be necessary; neuropathy: incorporate balance and sensorimotor training; lymphedema: gradual resistance progression with symptom monitoring; bone metastases: avoid high-impact loading and excessive skeletal stress in affected regions; cardiotoxicity risk: monitor and adapt intensity	Adapt exercise prescription to treatment-related toxicities and clinical conditions
6	Monitoring and Progression	Periodic reassessment of symptoms, functional capacity, treatment tolerance, adherence, and exercise-related adverse events; gradual and individualized progression according to recovery, fatigue, toxicity, and clinical response. Exercise intensity and volume should be adjusted based on tolerance and reassessed regularly (e.g., every 4–8 weeks) according to treatment phase and clinical status	Ensure safety, optimize adherence, and guide progression
7	Referral and Multidisciplinary Integration	Referral to supervised exercise, rehabilitation, cardio-oncology, physiotherapy, or multidisciplinary supportive-care programs should be considered in patients with severe symptoms, clinical instability, advanced disease, frailty, complex comorbidities, or uncertainty regarding safe exercise prescription, progression, or monitoring	Refer to supervised exercise programs or multidisciplinary care

Abbreviations: FITT, frequency–intensity–time–type; RPE, rating of perceived exertion.

4. Clinical Benefits of Exercise in Breast Cancer

4.1. Cancer-Related Fatigue

Cancer-related fatigue is one of the most frequent and clinically relevant symptoms in women with BC, particularly during adjuvant treatment and survivorship [3]. Exercise is supported as an effective non-pharmacological intervention for cancer-related fatigue in women with BC [5,6]. During adjuvant chemotherapy, structured exercise programs have shown benefits in reducing fatigue and improving physical fitness compared with usual care or less intensive physical activity interventions [11,20].

Beyond findings from individual randomized trials, meta-analytic evidence confirms that exercise interventions improve fatigue and physical functioning both during and after BC treatment, with some benefits persisting at follow-up, thereby supporting the robustness and consistency of these effects across the disease continuum [21,22]. Higher-level evidence syntheses further indicate that both aerobic and resistance exercise are beneficial for managing cancer-related fatigue in BC patients, reinforcing exercise as a core supportive-care strategy despite some heterogeneity in study quality [23].

Comparative analyses also suggest that the magnitude of benefit may vary according to exercise modality, with multimodal approaches—including combined aerobic-resistance training and mind-body interventions such as yoga—showing potentially greater effectiveness for fatigue reduction during and after treatment [24,25]. More recent evidence-mapping analyses further support the role of exercise and mind-body therapies as relevant non-pharmacological strategies for cancer-related fatigue management in women with BC, although heterogeneity in interventions and methodological quality across studies should be considered when interpreting these findings [26].

4.2. Quality of Life

Health-related quality of life may be impaired during and after BC treatment, and exercise interventions have been evaluated as a strategy to improve this outcome [6]. Evidence from randomized controlled trials indicates that combined aerobic and resistance exercise after BC treatment is associated with improvements in health-related outcomes, including quality of life, thereby supporting the role of structured, multimodal exercise programs in survivorship care [27].

In line with findings from individual trials, meta-analytic data confirm that physical activity is positively associated with health-related quality of life in women with BC across different stages of the disease, reinforcing the role of exercise as a key supportive-care strategy [13]. Additional meta-analyses also demonstrate that exercise interventions are associated with improvements in overall quality of life and specific domains such as physical, emotional, and social functioning in BC survivors, both during and after treatment [28,29].

Higher-level evidence syntheses indicate that exercise during adjuvant therapy is also associated with improvements in quality of life, although the magnitude of benefit may vary depending on exercise modality, intensity, and patient characteristics, highlighting the need for individualized prescription [6].

4.3. Physical Function and Fitness

Women with BC may present reduced cardiorespiratory fitness, reflecting the combined impact of cancer treatment, deconditioning, reduced physical activity, and treatment-related cardiometabolic toxicity. This highlights the relevance of assessing and targeting fitness as part of survivorship care [8]. Aerobic and resistance exercise during chemotherapy have demonstrated improvements in physical fitness, cardiorespiratory capacity, and muscle strength in randomized trials, suggesting that structured exercise can attenuate treatment-related declines in physical function during adjuvant therapy [9,11].

Progressive resistance training can improve strength-related outcomes in women treated for BC, with potential benefits for body composition, functional capacity, and treatment-related fatigue [4,30]. These observations are supported by systematic-review evidence showing that exercise interventions improve several dimensions of physical fitness in BC patients and survivors, including cardiorespiratory fitness, muscular strength, fatigue, and health-related quality of life [31]. More specifically, meta-analytic evidence suggests that aerobic exercise during chemotherapy improves cardiorespiratory fitness in women with BC, with training intensity appearing to influence the magnitude of improvement in $\text{VO}_{2\text{max}}$ [32].

At a broader level, overviews of systematic reviews and meta-analyses suggest that physical exercise programs positively affect cardiorespiratory fitness and body composition in BC survivors, reinforcing the need to incorporate fitness-oriented goals into survivorship care [33]. Recent meta-analytic evidence also suggests that exercise improves health-related quality of life, cardiorespiratory fitness, and physical function in

patients with BC, although effects on muscle strength may vary according to exercise modality, dose, and measurement method [34].

4.4. Body Composition

Weight gain and unfavorable body composition changes are relevant concerns in BC survivors, particularly in the context of reduced physical activity, endocrine therapy, chemotherapy-related metabolic changes, and treatment-associated loss of lean mass [30]. Exercise interventions appear to improve body composition in BC survivors, especially when resistance training is included, although effects vary according to intervention design, training dose, baseline adiposity, treatment phase, and patient characteristics [35,36].

In overweight or obese BC survivors, meta-analytic evidence suggests that exercise can reduce body weight, body mass index, body fat percentage, and waist circumference, while also improving quality of life, thereby supporting its role as a therapeutic strategy for managing adiposity-related risk [36]. In addition to adiposity reduction, preserving or increasing lean body mass is clinically relevant because skeletal muscle loss may contribute to reduced strength, impaired physical function, fatigue, and poorer metabolic health. Systematic-review and meta-analytic evidence indicates that exercise training has a beneficial effect on lean body mass in women with BC, both during and after treatment [35].

More recent meta-analytic evidence also supports the role of exercise in improving body composition in patients with BC by reducing body fat and increasing lean mass, with subgroup analyses suggesting that resistance exercise may be particularly relevant for reducing fat mass and preserving metabolically active tissue [37]. Overall, the available evidence supports the inclusion of body-composition goals within individualized exercise prescription for BC survivors, prioritizing combined aerobic and resistance training when the clinical aim is to reduce adiposity while preserving or improving lean mass.

4.5. Lymphedema and Upper-Limb Safety

Progressive resistance training has been specifically evaluated in women with breast-cancer-related lymphedema and did not worsen limb swelling when implemented gradually and under appropriate supervision [14]. In women at risk of breast-cancer-related lymphedema, slowly progressive weight lifting did not increase lymphedema incidence compared with no exercise [15].

These observations have been consistently supported by systematic review and meta-analytic evidence indicating that resistance and upper-limb exercise are safe in women with or at risk of breast-cancer-related lymphedema and do not increase limb volume or symptom severity when appropriately prescribed [38,39]. Overall, the available evidence supports a shift away from previous precautionary restrictions, indicating that appropriately prescribed upper-limb exercise is not only safe but may also be actively encouraged as part of comprehensive survivorship care in women with or at risk of breast-cancer-related lymphedema.

4.6. Recurrence and Survival

Higher levels of post-diagnosis physical activity have been consistently associated with lower BC-specific mortality and improved overall survival in observational cohort studies [16,40]. Meta-analytic evidence also supports an association between post-diagnosis physical activity and reduced BC-specific and all-cause mortality [41]. Subsequent meta-analyses have further reinforced these findings, showing that higher physical activity after diagnosis is associated with lower BC-specific mortality and all-cause mortality in BC survivors [17,42].

Regarding recurrence, more recent meta-analyses suggest that post-diagnosis recreational physical activity may be associated with a lower risk of BC recurrence, although effect estimates vary across studies and should be interpreted within the limitations of observational evidence [43,44]. Nevertheless, because most available data derive from observational studies, these associations cannot establish causality, and residual confounding, reverse causation, and differences in physical activity assessment remain important methodological limitations.

5. Biological Rationale

Exercise may influence BC biology through several plausible pathways, including systemic inflammation, metabolic regulation, immune function, skeletal muscle-derived myokines, and interactions with the tumor microenvironment [45]. Physical exercise has been proposed to modulate immune–tumor interactions in BC, including effects on tumor-associated macrophages and immune surveillance, although much of this evidence remains mechanistic or translational rather than being based on clinical recurrence endpoints [46]. Exercise training may reduce inflammatory biomarkers in BC patients and survivors, supporting a potential anti-inflammatory mechanism linking physical activity to improved clinical outcomes, although heterogeneity across interventions and biomarkers remains substantial [47–49].

In addition, comparative evidence further suggests that different exercise modalities may exert distinct effects on inflammatory mediator profiles in BC survivors, supporting the possibility of modality-specific anti-inflammatory adaptations. Nevertheless, considerable heterogeneity persists regarding exercise dose, intervention duration, and biomarker assessment across studies [50]. Meta-analytic evidence further suggests that exercise may influence immune-related pathways in women with BC, supporting a potential role of exercise-induced immunomodulation during treatment and survivorship, although the clinical relevance of these biological adaptations remains incompletely established [51].

Exercise performed during prehabilitation, neoadjuvant, or adjuvant treatment may also modulate immune-related responses in women with BC, supporting the biological plausibility of exercise-induced immune regulation across different phases of the disease continuum. However, the magnitude and durability of these immunological effects remain uncertain [52]. Moreover, skeletal muscle acts as an endocrine organ during exercise through the release of myokines that may participate in BC-related biological pathways, including modulation of tumor growth, inflammation, and metabolic signaling, although this area of research remains largely mechanistic [45].

Emerging translational evidence in BC survivors suggests that acute exercise may induce transient increases in circulating anti-cancer myokines and inhibit BC cell growth *in vitro*; however, these findings should not be extrapolated to clinical outcomes such as recurrence or survival [53]. Exercise may additionally influence metabolic pathways associated with BC prognosis, including insulin sensitivity, adiposity, and metabolic inflammation, although causal relationships between these metabolic adaptations and oncologic outcomes remain uncertain [19].

Overall, despite these biologically plausible mechanisms, current evidence does not support a direct anti-tumor effect of exercise in clinical settings, and mechanistic findings should be interpreted within the limitations of translational research [10,19].

6. Exercise Prescription in Breast Cancer

Exercise prescription in BC should be structured rather than generic. It should explicitly define frequency, intensity, time, type, progression, and supervision according to the FITT principle, while adapting these components to the clinical context of each patient [10,18]. For women with BC, exercise prescription should be individualized according to treatment phase, baseline physical fitness, comorbidities, symptom burden, treatment-related toxicities, patient preferences, and safety considerations. This individualized approach is important because tolerance to exercise may vary substantially during surgery, chemotherapy, radiotherapy, endocrine therapy, and survivorship [18,19].

During active treatment, including chemotherapy, aerobic and resistance exercise can be considered when clinically appropriate. Randomized trials and systematic reviews have demonstrated benefits in physical fitness, fatigue, quality of life, and selected patient-reported outcomes, although the starting intensity and volume should be adapted to clinical status and treatment tolerance [9,11,54,55]. In addition, exercise performed during radiotherapy has also been associated with improvements in treatment-related side effects, fatigue, and physical functioning, supporting the feasibility of maintaining appropriately adapted exercise interventions throughout radiation treatment [56].

Aerobic exercise is commonly prescribed at moderate intensity, with walking and cycling frequently used in clinical trials and survivorship programs because they are accessible, scalable, and generally feasible across a wide range of functional capacities [6,10,57].

Resistance training should be included because it targets muscle strength, physical function, lean mass preservation, and treatment-related deconditioning. Evidence from randomized trials and systematic reviews supports progressive resistance exercise as a relevant component of BC rehabilitation and survivorship care [4,30]. Furthermore, combined aerobic and resistance exercise programs appear to provide broader benefits than single-modality exercise, particularly regarding fatigue, quality of life, and overall physical function [34,57,58]. More recent network meta-analytic evidence suggests that combining aerobic and resistance exercise does not appear to compromise strength or functional adaptations in women with BC, supporting the feasibility of concurrent training approaches within comprehensive rehabilitation programs [59,60].

Exercise interventions may also improve psychological outcomes, including anxiety and depressive symptoms, particularly when multicomponent exercise programs are used. However, these findings should be interpreted within the context of the heterogeneity of interventions, populations, and outcome measures across studies [61]. Sleep disturbances and psychological distress may also respond favorably to exercise-based interventions in selected BC populations. In this context, comparative evidence suggests that aerobic exercise and mind–body interventions may improve sleep quality and psychological distress in older women with BC, supporting the role of multimodal exercise approaches for symptom management during survivorship. However, variability in intervention protocols and patient populations should be considered when interpreting these findings [62]. Similarly, dose–response meta-analytic evidence further suggests that yoga-based interventions may improve cancer-related fatigue, sleep quality, and quality of life in BC survivors, although the optimal exercise dose and intervention characteristics remain incompletely standardized across studies [63].

Exercise may have a favorable effect on cognitive function in BC patients and survivors, although the magnitude of benefit appears modest and the optimal exercise modality, dose, and timing remain uncertain. Therefore, cognitive benefits can be considered a potential supportive effect, but not as a definitive primary indication for a specific exercise protocol [64,65]. Additionally, network meta-analytic evidence further

suggests that different exercise modalities may have variable effects on cognitive outcomes in patients with BC, supporting the need to individualize exercise selection while recognizing that the comparative evidence remains limited and heterogeneous [66].

In women with BC-related lymphedema or at risk of lymphedema, progressive resistance training can be prescribed cautiously, beginning with low loads and gradual progression while monitoring symptoms, limb volume, discomfort, heaviness, or swelling. Available evidence indicates that appropriately prescribed resistance exercise is not harmful with respect to lymphedema risk and may be beneficial for strength and function [14,15,38,39,67].

Supervision may be particularly useful during chemotherapy in patients with low baseline fitness, substantial fatigue, comorbidities, frailty, or uncertainty regarding safe progression. Supervised programs can facilitate symptom monitoring, individualized progression, and adherence, especially when exercise is prescribed during active systemic treatment [11,68,69].

High-intensity interval training has been studied in selected women with BC during chemotherapy. It may improve cardiorespiratory fitness and selected treatment-related outcomes, but it should be reserved for clinically stable patients, with appropriate screening, supervision, and individualized progression [70,71]. Overall, the practical goal is not to prescribe the same exercise program for all patients but to establish a safe starting point and progress according to tolerance, symptoms, treatment phase, clinical response, and patient goals [10,18].

6.1. General Principles of Exercise Prescription

Exercise prescription in women with BC should begin with a clinical assessment that includes treatment status, comorbidities, baseline physical fitness, symptom burden, functional limitations, and potential contraindications. This assessment should guide the choice of exercise modality, intensity, initial volume, need for supervision, and criteria for progression [18,19]. In parallel, patients should be encouraged to avoid inactivity throughout the cancer continuum. Even low levels of physical activity may provide benefits compared with complete sedentary behavior, particularly regarding fatigue, physical function, and health-related quality of life [10,13].

Exercise programs should follow a gradual progression model, starting with low intensity and volume when necessary, particularly in patients undergoing active treatment or presenting with significant deconditioning. Progression should be based on tolerance, recovery, symptoms, and clinical response rather than on a fixed protocol [10,11]. Because long-term benefit depends not only on efficacy but also on feasibility, adherence is a critical determinant of effectiveness. Individualized exercise prescriptions tailored to patient preferences, perceived barriers, treatment schedules, symptoms, and functional capacity may improve long-term engagement and sustainability [18,69].

Finally, when clinically feasible, general recommendations for cancer survivors support regular aerobic activity combined with resistance training. However, these targets should be interpreted as goals to progress toward rather than mandatory starting doses for every patient, particularly during chemotherapy or in patients with severe fatigue, frailty, or comorbidities [10,19].

6.2. Components of Exercise Prescription (FITT Model)

6.2.1. Aerobic Exercise

Aerobic exercise is a central component of exercise prescription in BC and has been consistently incorporated into clinical trials during and after adjuvant therapy. The available evidence supports aerobic exercise as one of the most effective non-

pharmacological strategies for improving cardiorespiratory fitness, reducing cancer-related fatigue, and enhancing physical functioning and quality of life [6,10,13,54].

In practical terms, moderate-intensity aerobic exercise, particularly walking and cycling, is the most frequently prescribed modality in BC rehabilitation programs because of its accessibility, tolerability, and feasibility across different treatment phases. Clinical trials and meta-analyses have associated moderate-intensity aerobic training with improvements in fatigue, cardiorespiratory fitness, physical function, and selected patient-reported outcomes [9,10,34,57]. Moreover, meta-analytic evidence from randomized controlled trials further suggests that exercise prescriptions combining aerobic and resistance components may improve multiple domains of physical fitness in women with BC before, during, and after treatment, although the optimal exercise dose and modality may vary according to treatment phase and baseline conditioning [72].

Accordingly, current exercise recommendations for most BC survivors generally support progressing toward at least 150 min per week of moderate-intensity aerobic activity or 75 min per week of vigorous-intensity activity when clinically feasible. However, exercise dose should be individualized according to symptoms, treatment tolerance, and baseline conditioning [10,19].

6.2.2. Resistance Training

Resistance training is recommended as part of a comprehensive exercise program because it improves muscle strength, physical function, preservation of lean body mass, and treatment-related deconditioning. Resistance exercise may also contribute to maintaining independence and reducing functional decline during systemic therapy [4,10,73].

Importantly, resistance exercise can be safely performed in BC patients when appropriately prescribed and progressively advanced, including during active treatment. Current evidence supports the use of supervised progressive resistance training with gradual load progression and symptom monitoring [14,30,38]. When combined with aerobic training, resistance exercise programs appear to provide broader benefits than isolated modalities, particularly regarding fatigue, quality of life, and overall physical function [34,58,60].

6.2.3. Flexibility and Mobility

Flexibility and mobility exercises are frequently included as complementary components of exercise programs, especially after breast surgery or axillary procedures, where limitations in shoulder range of motion, upper-limb mobility, pain, and functional impairment are common [74].

In this context, early supervised shoulder mobility exercises after surgery may contribute to improving range of motion and upper-extremity function, although progression should take into account wound healing, postoperative pain, and surgical restrictions [74,75]. Overall, current evidence suggests that flexibility and mobility exercises are most effective when integrated into broader multimodal rehabilitation programs that also include aerobic and resistance exercise [10].

6.2.4. High-Intensity Interval Training (HIIT)

High-intensity interval training has been investigated in selected populations of women with BC, particularly during chemotherapy and survivorship. Available studies suggest that HIIT may improve cardiorespiratory fitness and selected treatment-related outcomes in clinically stable patients [70,71].

Despite these findings, HIIT should not be considered a universal strategy for all BC patients. Its prescription should be individualized according to cardiovascular risk,

treatment-related symptoms, baseline fitness, and exercise tolerance, ideally under professional supervision [10,70].

6.3. Exercise According to Disease Stage

6.3.1. During Active Treatment

During active treatment, including chemotherapy, radiotherapy, targeted therapy, and endocrine therapy, exercise can generally be performed safely in most women with BC when appropriately adapted to individual tolerance, symptoms, treatment-related toxicities, and overall clinical status. Current evidence supports exercise as a feasible supportive intervention across different treatment phases, although intensity and progression frequently require modification during periods of increased fatigue or treatment-related toxicity [9,11,19]. Within this setting, exercise during treatment has consistently been associated with improvements in physical fitness, reductions in cancer-related fatigue, and maintenance of physical functioning compared with usual care. Meta-analyses also suggest favorable effects on quality of life and selected psychological outcomes during active treatment [6,54,57,61].

For this reason, exercise intensity during active treatment is typically prescribed at low-to-moderate levels, with progression based on tolerance, symptom burden, hematologic status, treatment-related toxicity, and recovery capacity. In patients with substantial deconditioning or severe fatigue, lower initial exercise volumes and supervised progression may be more appropriate [10,18]. Accordingly, supervised exercise programs may be particularly useful during chemotherapy because they facilitate individualized progression, symptom monitoring, and adherence, especially in women with low baseline fitness, multiple comorbidities, or high symptom burden [11,69].

6.3.2. Survivorship

After completion of primary treatment, exercise plays a central role in the recovery of physical function, improvement of long-term health outcomes, and prevention of treatment-related comorbidities. Exercise interventions in survivorship are associated with improvements in cardiorespiratory fitness, muscle strength, body composition, fatigue, and health-related quality of life [10,13].

In this phase, combined aerobic and resistance exercise programs have been associated with clinically meaningful improvements in cardiorespiratory fitness, muscle strength, physical functioning, and quality of life. Contemporary evidence suggests that multicomponent exercise interventions may provide broader benefits than isolated training modalities [27,34,58].

Beyond functional recovery, observational studies have shown that higher levels of post-diagnosis physical activity are associated with improved overall survival and lower BC-specific mortality. However, these associations derive predominantly from observational evidence and should not be interpreted as definitive proof of causality [16,76]. In addition, exercise during survivorship may also contribute to reducing cardiovascular risk, preserving bone and muscle health, and improving psychological well-being, which are particularly relevant given the long-term effects of endocrine therapy and cancer treatment-related deconditioning [19,77].

6.3.3. Advanced Disease

In women with advanced or metastatic BC, exercise prescription should be individualized, with primary goals focused on maintaining physical function, preserving independence, reducing symptoms, minimizing deconditioning, and improving quality of life. The exercise program should account for disease burden, metastatic sites, treatment toxicity, performance status, and overall prognosis [10,19].

Available evidence suggests that exercise is feasible and may improve physical function, fatigue, and selected patient-reported outcomes in women with advanced BC, although the evidence base remains smaller and more heterogeneous than that available for early-stage disease [78]. Consistent with this cautious interpretation, recent systematic-review evidence also indicates increasing interest in structured physical activity interventions for women with metastatic BC, although available randomized data remain limited and heterogeneous regarding exercise protocols and clinical outcomes [79].

From a safety perspective, exercise prescription in advanced disease requires careful consideration of bone metastases, fracture risk, neurologic compromise, cachexia, cardiopulmonary limitations, and treatment-related adverse effects. In women with metastatic BC, recent evidence supports supervised, structured, and individualized exercise when clinically appropriate, excluding situations involving unstable bone metastases or high skeletal risk [80,81].

6.4. Tailored Exercise Prescription According to Clinical Conditions

6.4.1. Lymphedema or Risk of Lymphedema

In women with BC-related lymphedema, progressive resistance training can be implemented safely when introduced gradually, appropriately supervised, and adjusted according to symptoms and limb response. Current evidence does not support the historical recommendation to avoid resistance exercise in this population. Instead, carefully prescribed resistance training may improve strength, physical function, and quality of life without increasing lymphedema severity in clinically stable patients [14,38,39]. In addition, recent dose–response meta-analytic evidence further supports the safety and potential functional benefits of progressive resistance training in women with BC-related arm lymphedema [82].

Similarly, in women at risk of BC-related lymphedema, slowly progressive weight lifting did not increase the incidence of lymphedema compared with usual care. These findings support the inclusion of resistance exercise in appropriately monitored survivorship programs rather than the routine avoidance of upper-extremity loading [15].

6.4.2. Chemotherapy-Induced Peripheral Neuropathy

Chemotherapy-induced peripheral neuropathy is a common treatment-related toxicity in women receiving taxane-based chemotherapy for BC. Preliminary evidence suggests that exercise interventions combining aerobic, resistance, balance, and sensorimotor training may help attenuate neuropathic symptoms and preserve physical function, although the available evidence remains limited and heterogeneous [83,84].

6.4.3. Aromatase Inhibitor-Related Symptoms and Bone Health

In postmenopausal BC survivors receiving aromatase inhibitors, exercise interventions have been associated with improvements in body composition, physical function, and selected musculoskeletal outcomes. Given the adverse effects of aromatase inhibitors on bone and muscle health, structured exercise may contribute to reducing treatment-related deconditioning. Recent meta-analytic evidence also suggests that exercise interventions may have favorable effects on bone health and body composition in postmenopausal women with BC, although the magnitude of benefit varies according to exercise modality, intensity, and duration [85,86]. Moreover, resistance and impact training may contribute to preserving musculoskeletal health and reducing bone loss in postmenopausal BC survivors. Current evidence supports the incorporation of resistance exercise into survivorship programs when clinically feasible [87,88].

6.4.4. Aromatase Inhibitor-Induced Arthralgia

Exercise has been associated with reductions in joint pain and improvements in physical functioning in BC survivors receiving aromatase inhibitors. Combined aerobic and resistance exercise appears to be the most frequently studied exercise strategy in this setting [89,90].

6.4.5. Cardiotoxicity Risk

In women receiving potentially cardiotoxic therapies for BC, exercise interventions may be incorporated into structured rehabilitation or cardio-oncology programs with appropriate clinical monitoring. Emerging evidence in BC suggests that exercise may help preserve functional capacity and attenuate some cardiotoxicity-related outcomes, although effects on left ventricular function remain inconsistent and the optimal exercise prescription is still under investigation [91–94].

Taken together, tailored exercise prescription in BC should account for treatment-related toxicities, comorbidities, symptom burden, functional limitations, patient preferences, and safety considerations. Exercise programs should therefore remain flexible and adaptable across the disease continuum rather than relying on standardized prescriptions for all patients [18,19].

6.5. Contraindications and Safety Considerations

Exercise in women with BC is generally considered safe when appropriately prescribed and individualized. Nevertheless, clinical evaluation before initiating or progressing an exercise program is important to identify situations in which exercise should be modified, temporarily postponed, or performed under supervision. Safety considerations should account for the treatment phase, symptom burden, comorbidities, functional limitations, and treatment-related toxicities [10,19].

Accordingly, temporary contraindications to exercise may include acute infection, fever, severe anemia, uncontrolled pain, severe nausea or vomiting, symptomatic cardiopulmonary compromise, or significant treatment-related toxicity. In these situations, exercise prescription should be reassessed and adapted according to clinical recovery and symptom stabilization [10,95].

In patients with bone metastases from BC, exercise prescription should be individualized according to metastatic location, skeletal stability, pain, and fracture risk. High-impact activities, excessive torsional loading, and high-load exercises affecting involved skeletal regions are generally avoided, whereas supervised and appropriately modified exercise may still be feasible in selected patients [80,81]. Similarly, patients receiving potentially cardiotoxic therapies or presenting with established cardiovascular disease may require baseline cardiovascular assessment, individualized exercise prescription, and monitoring during exercise interventions. Emerging evidence in BC suggests that exercise may help preserve functional capacity and attenuate some cardiotoxicity-related outcomes, although the optimal cardioprotective exercise prescription remains under investigation [91–93,96].

Beyond disease or treatment-specific risks, exercise intensity and progression should be adjusted in the presence of severe fatigue, dizziness, orthostatic symptoms, marked deconditioning, or other limiting symptoms. During active treatment, lower starting volumes and gradual progression may improve tolerability and adherence [11,18].

Consequently, supervised exercise may be particularly appropriate in patients with advanced disease, frailty, substantial functional impairment, multiple comorbidities, severe treatment-related symptoms, or uncertainty regarding safe exercise progression. In these settings, supervision may facilitate symptom monitoring, individualized adaptation, and improved adherence [18,81].

7. Detailed Description and Clinical Application of the Proposed Clinical Algorithm for Exercise Prescription in Breast Cancer

The following section provides a practical description of each sequential step of the proposed algorithm and illustrates how it can be applied in routine clinical practice.

7.1. Step 1—Initial Clinical Screening

Exercise prescription in women with BC should begin with a structured clinical screening aimed at identifying contraindications, treatment-related toxicities, functional limitations, and factors that may influence exercise safety, feasibility, and adherence. This initial assessment should include the treatment phase, comorbidities, cardiovascular risk, baseline physical function, and symptom burden, particularly fatigue, pain, neuropathy, lymphedema, and musculoskeletal impairment. Patients presenting with uncontrolled symptoms, marked deconditioning, severe treatment-related toxicities, or medical instability may require supervised or medically guided exercise programs before initiating independent exercise participation [10,18,19]. The information obtained during this assessment forms the basis for subsequent risk stratification.

7.2. Step 2—Risk Stratification

Based on the findings of the initial assessment, patients may be stratified into clinically meaningful risk categories to guide exercise prescription, supervision requirements, and monitoring intensity. Women with stable clinical status, minimal symptom burden, preserved physical function, and no major comorbidities may be considered appropriate candidates for independent or minimally supervised exercise programs. In contrast, patients with treatment-related toxicities, functional limitations, cardiovascular risk, frailty, or significant comorbid conditions may require individualized exercise adaptation and closer clinical monitoring. Patients with unstable disease, severe symptoms, bone metastases, or substantial cardiotoxicity risk may particularly benefit from supervised exercise integrated within multidisciplinary oncology, rehabilitation, or supportive-care programs [10,19,80]. Risk category subsequently determines the appropriate exercise prescription strategy.

7.3. Step 3—Disease Phase–Specific Exercise Prescription

Once risk has been established, exercise prescription should be individualized according to disease phase, treatment exposure, symptom burden, and overall clinical objectives. During the pre-treatment phase (prehabilitation), exercise interventions aim to optimize baseline physical function and physiological reserve before surgery or systemic therapy. During adjuvant chemotherapy, exercise programs generally prioritize maintenance of physical function, mitigation of fatigue, and preservation of cardiorespiratory fitness, typically using flexible low-to-moderate intensity approaches adapted to day-to-day symptom variability. During radiotherapy, exercise may support symptom control and maintenance of physical function. After completion of primary treatment, exercise programs can progressively increase in intensity and volume to improve cardiorespiratory fitness, muscle strength, body composition, and long-term health outcomes. In advanced or metastatic BC, exercise goals frequently shift toward maintaining independence, reducing symptom burden, minimizing deconditioning, and preserving quality of life while accounting for disease-related limitations and treatment toxicity [9,11,27,81]. Once disease phase has been established, exercise prescription can be individualized according to FITT principles.

7.4. Step 4—FITT-Based Exercise Prescription

Once the patient's risk profile and disease phase have been established, exercise prescription should be structured according to the FITT principle (frequency, intensity, time, and type), ensuring that the exercise program is individualized, safe, and aligned with the patient's clinical status, treatment objectives, and functional capacity. Aerobic and resistance training constitute the core components of exercise prescription throughout the BC continuum. Moderate-intensity aerobic exercise, commonly performed as walking or cycling, generally represents the foundation of most exercise programs because of its accessibility, tolerability, and feasibility across treatment phases. Resistance training targeting major muscle groups is recommended to counteract treatment-related deconditioning, preserve muscle mass, and improve physical function. Flexibility, mobility, and balance exercises may additionally be incorporated, particularly in women with reduced mobility, postoperative shoulder dysfunction, neuropathy, or treatment-related impairments. Exercise programs should begin at a tolerable level and progress gradually according to symptoms, recovery, and individual response rather than fixed progression schedules. The resulting exercise prescription should subsequently be adapted according to treatment-related toxicities and coexisting clinical conditions [4,6,34,57].

7.5. Step 5—Adaptation to Clinical Conditions

As illustrated in Figure 1, exercise prescription should be continuously adapted according to treatment-related toxicities and coexisting clinical conditions. In women with cancer-related fatigue, temporary reductions in exercise intensity or duration may be necessary while maintaining regular physical activity whenever feasible. In the presence of chemotherapy-induced peripheral neuropathy, exercise programs may incorporate balance, coordination, and sensorimotor training while avoiding activities associated with an increased risk of falls. In women with BC-related lymphedema or at risk of developing lymphedema, progressive resistance training can be safely implemented when introduced gradually and appropriately monitored. In patients with bone metastases, exercise prescription should avoid high-impact or excessive loading in affected skeletal regions because of fracture risk [14,15,38,83]. These clinical adaptations should subsequently be reassessed regularly as part of the ongoing monitoring process.

7.6. Step 6—Monitoring and Progression

Ongoing monitoring is essential to ensure safety, optimize adherence, and guide individualized progression of exercise programs. Patients should undergo periodic reassessment according to clinical status and treatment phase to evaluate symptom burden, functional capacity, treatment tolerance, and exercise-related adverse events. Progression should generally be gradual and symptom-guided, prioritizing long-term consistency, adherence, and functional improvement rather than rapid increases in exercise intensity or volume. Accordingly, modifications in intensity, duration, frequency, or modality may be required according to fatigue, pain, neuropathy, treatment cycles, or changes in clinical condition [11,18,69]. When safe progression cannot be achieved or greater clinical complexity emerges, referral to supervised or multidisciplinary exercise programs should be considered.

7.7. Step 7—Referral and Multidisciplinary Integration

Referral to supervised exercise programs or specialized professionals should be considered in patients with advanced disease, severe treatment-related toxicities, significant comorbidities, substantial functional impairment, or uncertainty regarding safe exercise progression. Integration of exercise into multidisciplinary oncology care, including collaboration with physiotherapists, rehabilitation specialists, exercise physiologists, cardio-oncology teams, and supportive-care services, may improve safety, adherence, symptom management, and overall clinical outcomes. This multidisciplinary approach may be particularly relevant in higher-risk patients requiring individualized and closely monitored exercise interventions [10,19,81].

Finally, the practical application of the algorithm across different clinical scenarios is summarized in Table 2.

Table 2. Evidence-informed practical application of the clinical algorithm for exercise prescription in breast cancer.

Step	Clinical Scenario	Exercise Type	Intensity	Frequency/Volume	Key Considerations
1–2	Low-risk patients	Aerobic + resistance	Moderate–vigorous	Progress toward ≥150–300 min/week+ strength 2–3×/week as tolerated	Can safely progress; minimal supervision
	Moderate-risk patients	Combined training (adapted)	Low–moderate	Individualized	Periodic monitoring required
	High-risk/frail patients	Supervised, low-intensity	Low	Short, frequent sessions	Requires closer supervision and individualized progression
3	During active treatment	Aerobic + light resistance	Low–moderate (RPE 3–5/10)	3–5 days/week; 10–30 min sessions	Prioritize symptom control, treatment tolerance, and adherence
	Survivorship	Aerobic + resistance	Moderate–vigorous	Progress toward ≥150–300 min/week+ strength 2–3×/week as tolerated	Long-term health, physical function, and secondary prevention
	Advanced disease	Individualized (aerobic + mobility)	Low–moderate	Flexible	Focus on quality of life and function
4	FITT-based exercise prescription (core program)	Aerobic + resistance + flexibility	Moderate (RPE-guided)	Aerobic 3–5 days/week; resistance 2–3 days/week; 20–60 min/session	Establish structured, individualized, and symptom-guided exercise prescription
5	Cancer-related fatigue	Aerobic (walking, cycling)	Moderate	Progress toward ≥150 min/week (accumulated)	Strong evidence for fatigue reduction
	Lymphedema/at risk	Progressive resistance training	Low–moderate	2–3 sessions/week	Safe if gradual progression
	Peripheral neuropathy	Balance + aerobic	Low–moderate	3–5 days/week	Fall prevention; consider supervision
	Bone fragility/metastases	Resistance + low-impact weight-bearing exercises (adapted)	Moderate	2–3 sessions/week	Avoid high-impact; adapt to site

	Cardiotoxicity risk	Aerobic (structured)	Moderate (monitored)	Progressive aerobic exercise as tolerated	Consider cardiac assessment
6–7	All patients requiring monitoring or referral	All exercise modalities	—	Reassess every 4–8 weeks	Adjust intensity, volume, and modality according to symptoms and clinical response; refer if needed

Abbreviations: ACSM, American College of Sports Medicine; ASCO, American Society of Clinical Oncology; FITT, frequency–intensity–time–type; RPE, rating of perceived exertion; min, minutes; **Note:** Recommendations are based on randomized controlled trials, systematic reviews, meta-analyses, and international guidelines (ASCO, ACSM).

8. Strengths and Clinical Implications of the Proposed Algorithm

A key strength of this review is the development of a BC-specific, clinically applicable algorithm that moves beyond general exercise recommendations and existing referral-based pathways in exercise oncology. Although several exercise oncology frameworks and pathways have been proposed, these have primarily focused on screening, risk stratification, and referral to exercise or rehabilitation services. By contrast, the algorithm presented in this review provides a structured, stepwise approach to individualized exercise prescription, specifically designed for women with BC across the disease continuum.

The proposed algorithm integrates multiple dimensions that are often addressed separately in the literature, including:

- (i) The FITT principle (frequency, intensity, time, and type);
- (ii) Treatment phase (active treatment, survivorship, and advanced disease);
- (iii) Patient-specific characteristics such as baseline fitness, comorbidities, and symptom burden;
- (iv) Treatment-related toxicities and potential contraindications;
- (v) Safety considerations and progression criteria.

By integrating these elements into a single clinically oriented framework, the algorithm facilitates the translation of evidence into practical decision-making and supports individualized exercise prescription in routine clinical practice.

Importantly, an additional strength of this review is its specific focus on BC, a population with distinct clinical characteristics, treatment-related toxicities, and survivorship needs that may not be fully addressed by general oncology exercise recommendations.

From a clinical perspective, this approach may help bridge the gap between evidence and implementation by providing healthcare professionals with a practical tool that can be applied in real-world practice. In this context, it may also contribute to a shift from viewing exercise as a general lifestyle recommendation toward its recognition as a structured and integral component of BC care.

Nevertheless, future research should evaluate the feasibility, implementation, and clinical impact of this algorithm in prospective clinical settings.

9. Barriers and Future Directions

Despite the growing body of evidence supporting the benefits and safety of exercise in BC, its integration into routine clinical care remains limited. Exercise is still frequently

communicated as a general lifestyle recommendation rather than implemented as a structured, individualized supportive-care intervention [18,19].

9.1. Barriers to Implementation

Implementation barriers operate at multiple levels, including the healthcare system, oncology professionals, exercise providers, and patients. At the system level, limited availability of structured exercise programs, lack of referral pathways, insufficient integration with oncology services, and uncertainty regarding funding or responsibility for program delivery may restrict routine implementation [97,98]. At the provider level, limited training in exercise prescription, uncertainty regarding safety in complex clinical scenarios, and lack of time during oncology consultations may contribute to under-referral or non-specific advice [18,98].

Patient-related barriers also remain highly relevant. Fatigue, treatment-related symptoms, low baseline fitness, lack of motivation, concerns about exercise safety, body mass index, and social support may influence adherence during and after treatment [6,69].

9.2. Variability in Evidence and Prescription

A major challenge for clinical translation is the heterogeneity of exercise interventions evaluated in BC studies. Differences in exercise modality, intensity, frequency, duration, supervision, adherence, and timing relative to treatment make it difficult to define a single optimal exercise prescription [6,18]. Moreover, this variability is compounded by differences in patient populations, including treatment phase, baseline fitness, comorbidities, symptom burden, menopausal status, body composition, and risk of treatment-related complications. As a result, rigid standardized prescriptions may be less useful than structured frameworks that allow individualized adaptation [10,19].

9.3. Future Directions

Future research should move beyond demonstrating that exercise is beneficial and focus on how exercise can be prescribed, delivered, adapted, and sustained in real-world BC care. Priority areas include the validation of individualized prescription algorithms, identification of optimal FITT parameters for specific clinical scenarios, and evaluation of implementation strategies within oncology pathways [18,97].

In this context, remote, home-based, and digital interventions may help expand access to exercise support, particularly for patients who cannot attend supervised programs. However, these approaches should be integrated with appropriate screening, monitoring, behavioral support, and escalation pathways for patients requiring supervised or multidisciplinary care [99–101].

Ultimately, future implementation efforts should integrate oncology teams, rehabilitation professionals, exercise specialists, and digital-health tools within coordinated care models. The ultimate objective is not merely to recommend physical activity but to embed individualized exercise prescription as a reproducible, safe, and clinically actionable component of BC care [10,19].

10. Conclusions

Exercise should be considered a core component of BC care rather than a general lifestyle recommendation. Although a substantial body of evidence supports its benefits for fatigue, physical function, fitness, and quality of life, translation into routine clinical practice remains limited because of heterogeneity in interventions, patient characteristics, and clinical contexts.

To address this gap, this review integrates current evidence into a structured, stepwise clinical algorithm for individualized exercise prescription across the BC

continuum. The proposed framework incorporates the treatment phase, risk stratification, patient-specific factors, and FITT-based principles to support clinically applicable and adaptable decision-making.

Accordingly, moving from evidence to implementation requires a shift toward personalized, structured, and context-specific exercise prescription. The proposed algorithm provides a practical tool to facilitate this transition and may support the integration of exercise into routine oncology care. Nevertheless, future research should focus on validating clinically applicable algorithms and defining optimal exercise prescriptions for specific patient subgroups across the disease continuum.

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