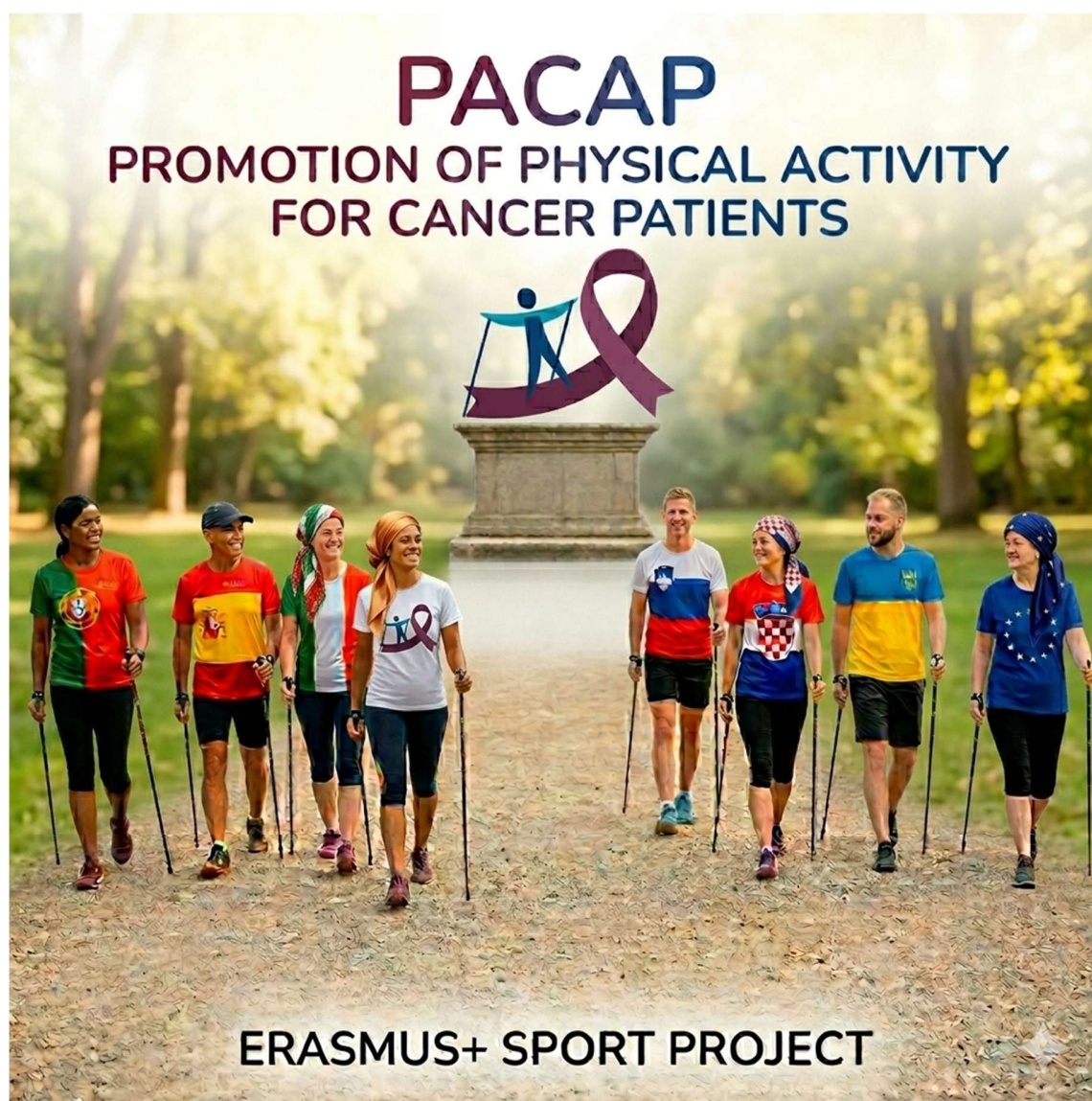


Guidelines: Physical Activity and Cancer



TITLE	Guidelines: Physical Activity and Cancer	
PUBLISHER	Consortium PACAP – Promotion of Physical Activity for Cancer Patients – ERASMUS+ Project Reference: 101183633	
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PUBLICATION	June 2026	

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CHAPTER 1. INTRODUCTION

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1.1. Background and Rationale

Cancer remains one of the most significant public health challenges in Europe and worldwide [1]. Advances in early diagnosis and medical treatment have substantially improved survival rates; however, a growing number of people now live with or beyond cancer while experiencing persistent physical, psychological, and social consequences related to the disease and its treatments [2]. As a result, there is an increasing need to move beyond survival alone and to promote long-term health, functional capacity, and overall well-being [3].

Physical activity (PA) is now widely recognised as a key component of cancer prevention, treatment support, and survivorship care [4]. Scientific evidence consistently demonstrates that regular physical activity reduces the risk of several common cancer types and contributes to improved treatment tolerance, reduced fatigue, enhanced physical function, and better quality of life among cancer survivors [4]. In addition to physical benefits, exercise positively influences mental health, social participation, and self-efficacy [4].

Despite these well-established benefits, physical inactivity remains highly prevalent among people living with cancer [5]. Common barriers include treatment-related fatigue, limited access to tailored exercise programs, and insufficient integration of physical activity into standard oncology care. Addressing these challenges requires structured, safe, and adaptable approaches that support patients across all phases of the cancer continuum.

Within this context, the PACAP – Promotion of Physical Activity for Cancer Patients project was developed to translate scientific evidence into practical and accessible strategies. By promoting health-enhancing physical activity within both clinical and community settings, PACAP seeks to support patients, healthcare professionals, and organisations in integrating movement as a fundamental element of comprehensive cancer care.

1.2. The PACAP Project and Its Relevance in the Cancer Care Continuum

The PACAP – Promotion of Physical Activity for Cancer Patients project is a European, transnational initiative designed to support the systematic integration of physical activity into cancer care across the full continuum, including prevention, active treatment, and survivorship.

As illustrated in Figure 1, PACAP is implemented through a multidisciplinary consortium involving academic institutions, oncology centres, sport and exercise organisations, and community-based partners from several European countries. This collaborative structure brings together complementary expertise in oncology,

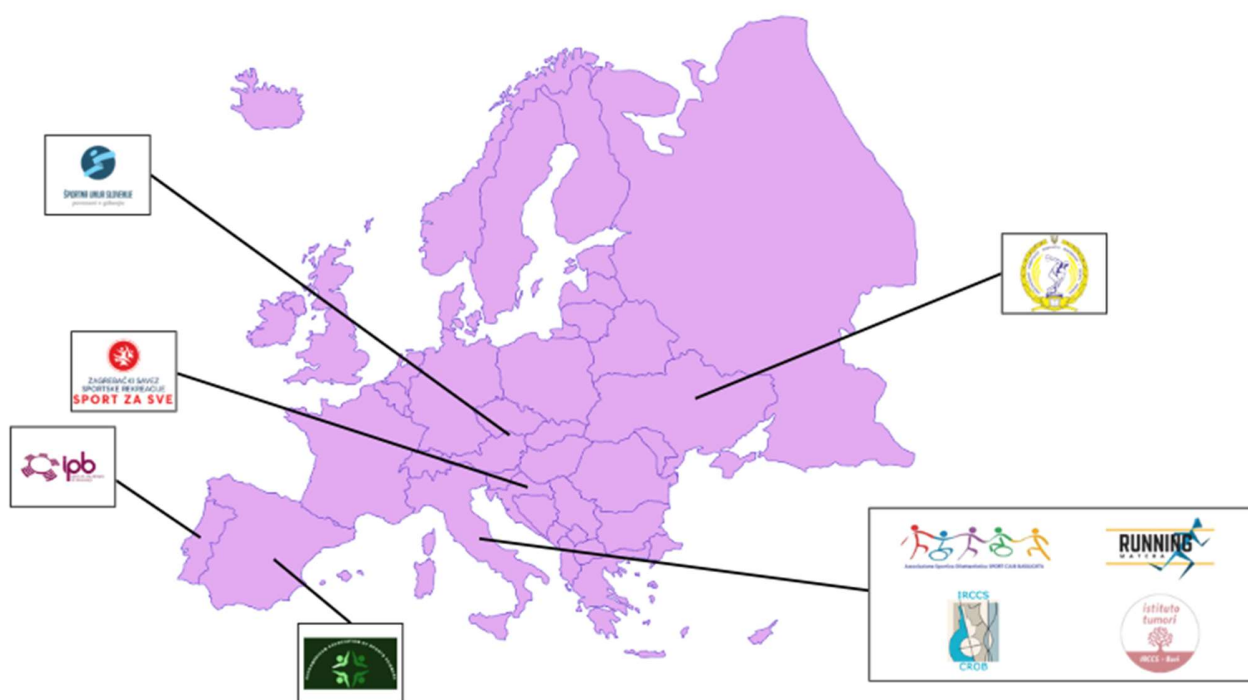
rehabilitation, sport sciences, professional training, and community health promotion, ensuring that physical activity interventions are evidence-based, safe, and contextually adaptable.

The project is grounded in the recognition that effective cancer care extends beyond medical treatment alone and requires coordinated action between clinical and community settings. PACAP promotes a shared European framework in which healthcare professionals, exercise specialists, researchers, and community organisations work together to facilitate continuity of care, from hospital-based services to community-based physical activity programmes.

By combining scientific evidence, professional capacity-building, and practical implementation models, PACAP supports long-term adherence to physical activity, social participation, and sustainable lifestyle change. This integrated and transnational approach reflects the Erasmus+ principles of lifelong learning through sport and contributes to strengthening physical activity as a core component of comprehensive, person-centred cancer care across diverse European health systems.

The figure 1, illustrates the geographic distribution and collaborative structure of the PACAP partners across Europe, integrating academic institutions, oncology centres, sport organisations, and community-based stakeholders involved in the development and implementation of the PACAP Guidelines.

Figure 1. Transnational PACAP Consortium and European Collaboration Network.



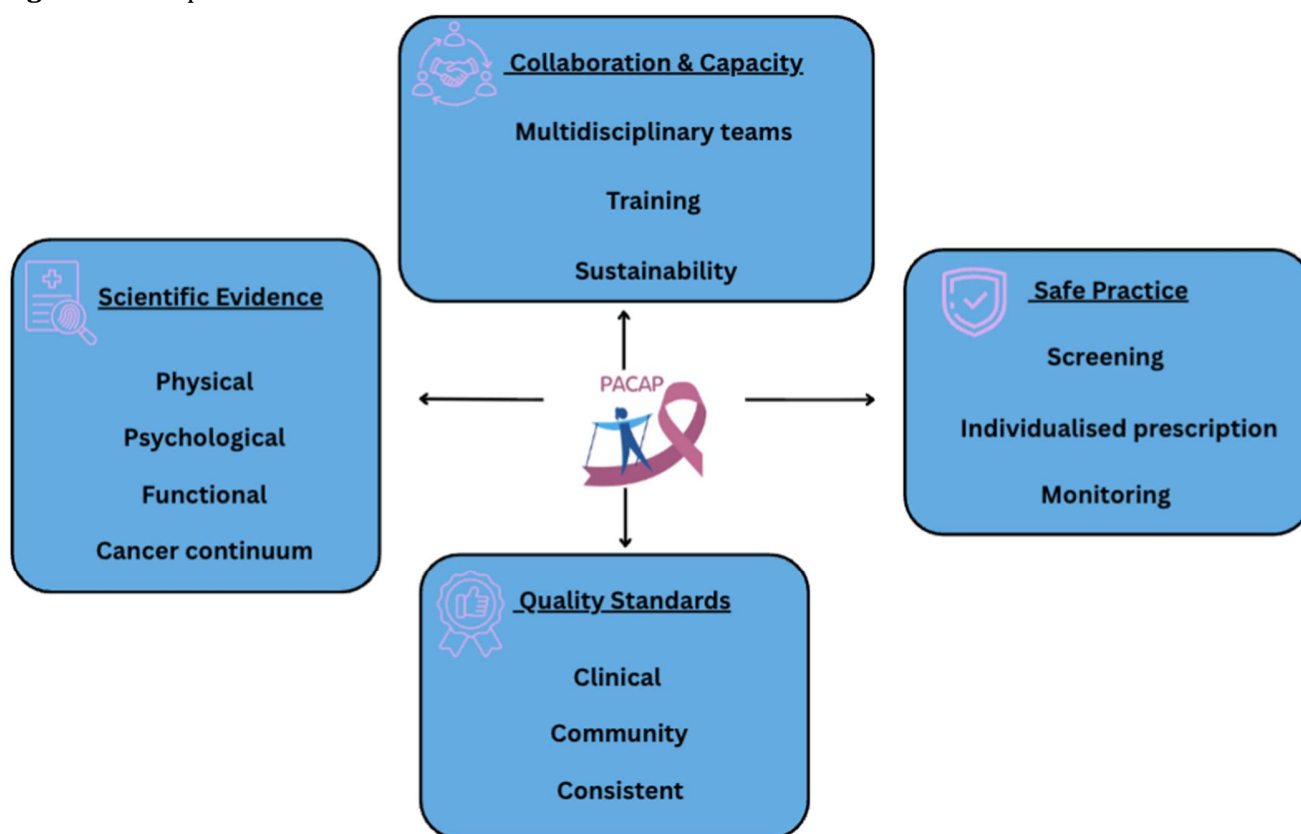
1.3. Objectives and Scope of the Guideline Manual

The primary objective of the PACAP Guidelines Manual is to provide a clear, practical, and evidence-based framework to support the systematic integration of physical activity into cancer prevention, treatment, and survivorship care across Europe.

As illustrated in Figure 2, the guidelines are structured around four interrelated pillars that underpin safe, effective, and sustainable exercise oncology practice. These include the synthesis of scientific evidence on physical, psychological, and functional outcomes across the cancer continuum; the promotion of safe practice through structured screening, assessment, individualised exercise prescription, and monitoring; the establishment of consistent quality standards applicable to both clinical and community settings; and the strengthening of multidisciplinary collaboration and professional capacity-building.

Together, these pillars position the PACAP Guidelines as both a reference document and an operational tool, supporting the translation of scientific principles into real-world practice. The manual is designed to be adaptable to different healthcare systems, organisational contexts, and population needs, while maintaining alignment with internationally recognised standards in exercise oncology.

Figure 2. Core pillars of the PACAP Guidelines Manual.



The figure illustrates the four interrelated pillars underpinning the PACAP framework: scientific evidence across the cancer continuum, safe exercise practice, consistent quality standards in clinical and community settings, and multidisciplinary collaboration with professional capacity-building to support sustainable implementation.

1.4. Target Audience and Use of the Manual

The PACAP Guidelines Manual is designed for a broad, multidisciplinary audience involved in cancer care, health promotion, and rehabilitation through physical activity. As illustrated in Figure 3, the manual targets professionals working across both clinical and community settings who contribute to the prescription, delivery, coordination, and promotion of physical activity for people living with and beyond cancer.

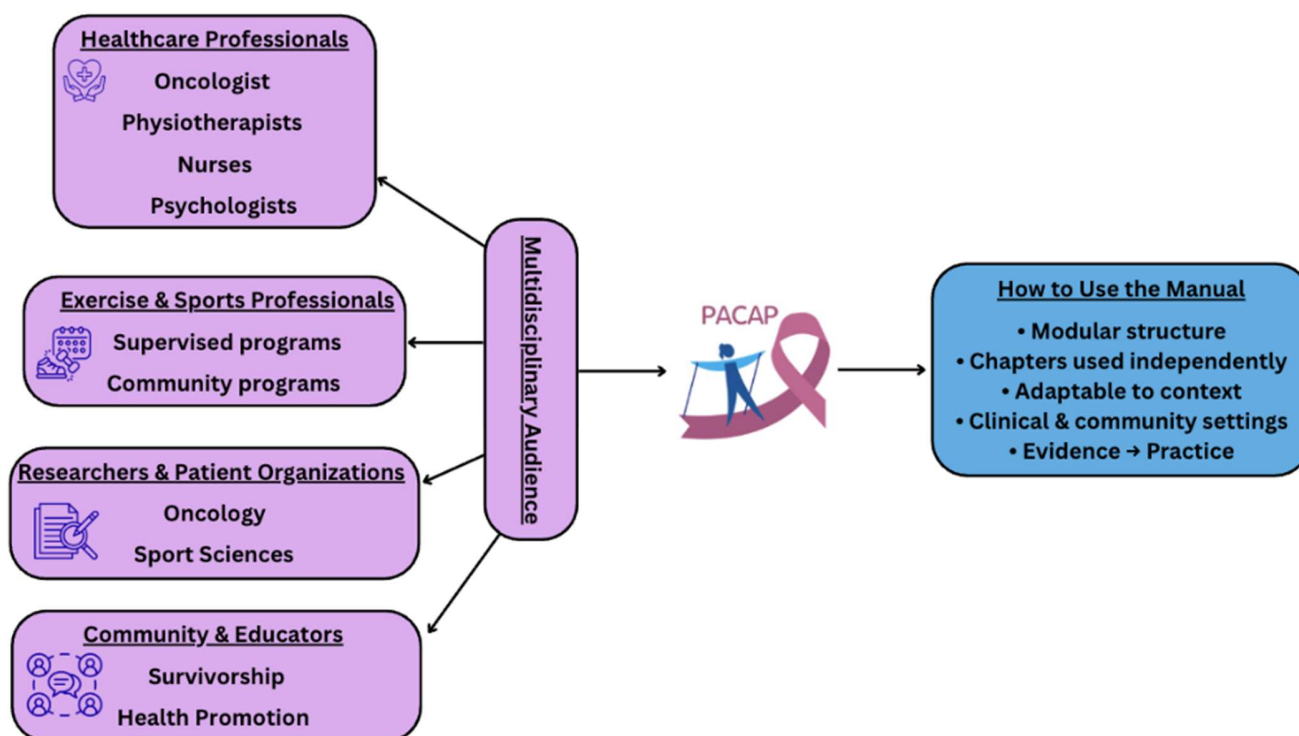
The primary user groups include healthcare professionals (such as oncologists, physiotherapists, nurses, psychologists, and rehabilitation specialists), exercise and sport professionals delivering supervised or community-based programmes, researchers and educators in oncology and sport sciences, as well as community organisations and patient associations engaged in cancer survivorship and health promotion.

The manual adopts a modular structure that supports flexible use according to professional roles and practical needs. Chapters may be consulted independently or sequentially, allowing users to focus on sections most relevant to their context, including safety and screening, exercise prescription, programme implementation, and monitoring. This approach facilitates the translation of scientific evidence into practice while enabling adaptation to local resources, healthcare systems, and population characteristics.

Overall, the PACAP Guidelines function both as a reference guide and as a practical working tool, supporting the consistent and safe integration of physical activity into cancer care pathways in line with evidence-based principles promoted by the PACAP project.

Figure 3 illustrates the multidisciplinary target audience of the PACAP Guidelines, encompassing healthcare professionals, exercise and sport professionals, researchers, educators, and community organisations, as well as the manual's modular, flexible use across clinical and community settings to support evidence-based practice.

Figure 3. Target audience and use of the PACAP Guidelines Manual.



1.5. Alignment with European and Global Frameworks

The development of the PACAP Guidelines Manual aligns with key European and international policy frameworks that recognise physical activity as a fundamental component of health promotion, disease prevention, and rehabilitation [6]. In particular, the project aligns with the objectives of the Erasmus+ Sport Programme, which emphasises sport and physical activity as drivers of health, social inclusion, and lifelong learning.

At the European level, PACAP supports the principles outlined in the EU Council Recommendation on Health-Enhancing Physical Activity (HEPA) and the EU Beating Cancer Plan, both of which identify physical activity as a modifiable factor for cancer prevention, improved treatment outcomes, and long-term survivorship. These frameworks encourage the integration of physical activity into healthcare systems and community-based initiatives.

Globally, the manual aligns with the World Health Organisation's Global Action Plan on Physical Activity (2018–2030) [7], and the WHO Rehabilitation 2030 initiative [8], which promote accessible, safe, and evidence-based physical activity as part of comprehensive care for people living with chronic conditions, including cancer. Together, these frameworks provide a coherent policy foundation for implementing the PACAP guidelines across diverse European contexts.

1.6. Structure and Use of the Manual

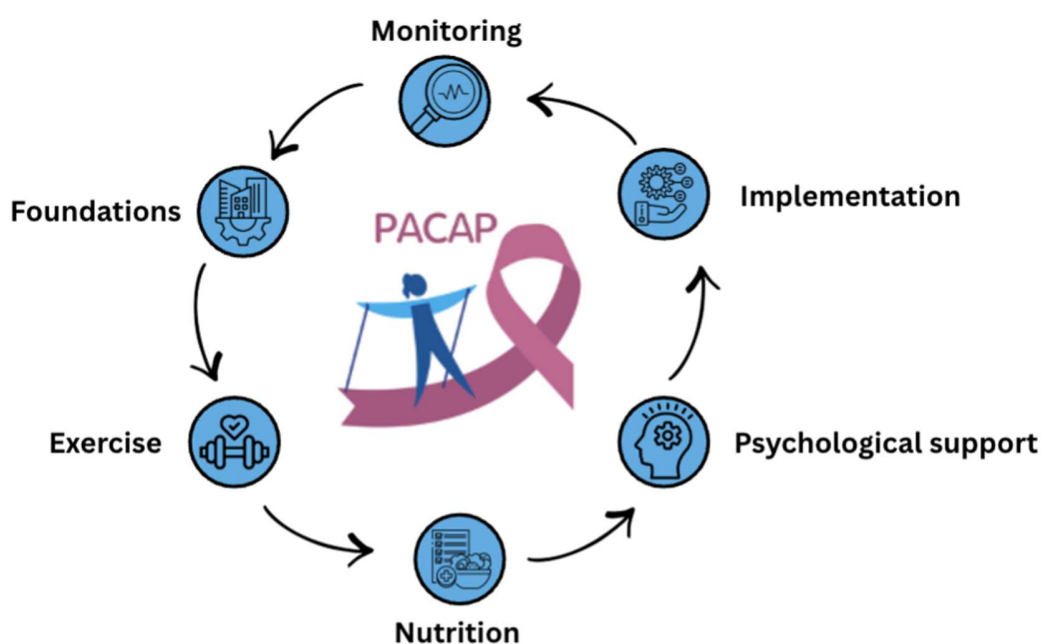
The PACAP Guidelines Manual is structured into thematic chapters that outline the core components required for implementing physical activity across the cancer care continuum. As illustrated in Figure 4, the manual is

organised around an integrated and cyclical framework that connects foundational principles, exercise prescription, nutritional care, psychological support, programme implementation, and continuous monitoring.

This structure reflects the interdependence of these domains and emphasises that effective physical-activity interventions in oncology are not linear, but dynamic and adaptive processes. Monitoring informs implementation, implementation interacts with psychological and nutritional support, and all components are grounded in shared scientific and organisational foundations.

The manual is designed to support flexible and practical use. Chapters may be consulted independently according to the reader's professional role, setting, or immediate needs, or followed sequentially to obtain a comprehensive overview of the PACAP framework. This approach allows the guidelines to be applied consistently across clinical, community, and educational contexts while maintaining conceptual coherence and alignment with evidence-based practice.

Figure 4. Structure and use of the PACAP Guidelines Manual.



The figure illustrates the integrated and cyclical organisation of the PACAP Guidelines, highlighting the interconnection between foundational principles, exercise prescription, nutrition, psychological support, implementation, and monitoring across the cancer care continuum.

1.7. From Research to Practice: A Paradigm Shift

Historically, physical activity in oncology was approached with caution due to concerns regarding safety and treatment-related fatigue. Over the past two decades, however, robust scientific evidence has demonstrated that appropriately prescribed exercise is safe and beneficial across all phases of the cancer continuum. As a result, physical activity is now recognised as an integral component of comprehensive cancer care rather than an optional recommendation.

The PACAP Guidelines reflect this shift by focusing on practical implementation. They support a structured approach in which patients are systematically screened, exercise is individually prescribed, progress is monitored, and programs are adapted over time. By translating research findings into clear and applicable guidance, the manual aims to facilitate the safe integration of physical activity into routine clinical and community practice.

1.8. Innovation and Sustainability

The innovative character of the PACAP project lies in its integrated approach, combining clinical care, physical activity promotion, education, and community engagement. Rather than focusing exclusively on supervised rehabilitation, PACAP promotes scalable models that connect healthcare services with community-based physical activity opportunities, supporting continuity of care beyond the clinical setting.

By encouraging collaboration between healthcare professionals, exercise specialists, and community organisations, the project facilitates long-term participation and sustainable lifestyle changes. This approach supports patient autonomy, social inclusion, and the maintenance of physical activity after the completion of medical treatment.

Sustainability is further reinforced through capacity-building strategies, including standardised training for professionals and volunteers, as well as adaptable implementation models that can be applied across different healthcare systems and local contexts. Together, these elements contribute to the long-term viability and transferability of the PACAP framework.

1.9. Ethical, Safety, and Quality Considerations

The implementation of physical activity interventions for people living with cancer must always prioritise safety, ethical responsibility, and quality of care. All exercise programs should be preceded by appropriate medical screening and individual assessment, and delivered in accordance with each participant's clinical condition, functional capacity, and treatment phase.

The PACAP Guidelines emphasise respect for individual autonomy, informed consent, and equitable access to physical activity opportunities, regardless of age, gender, or socioeconomic background. Continuous monitoring and professional supervision are essential to minimise risks and to ensure that exercise interventions remain safe, effective, and responsive to changes in health status.

In line with European regulations, the collection and management of personal and health-related data should comply with applicable data protection standards, including the General Data Protection Regulation (GDPR). Together, these principles support the consistent delivery of high-quality, ethical, and patient-centred physical activity programs within cancer care pathways.

1.10. Expected Impact

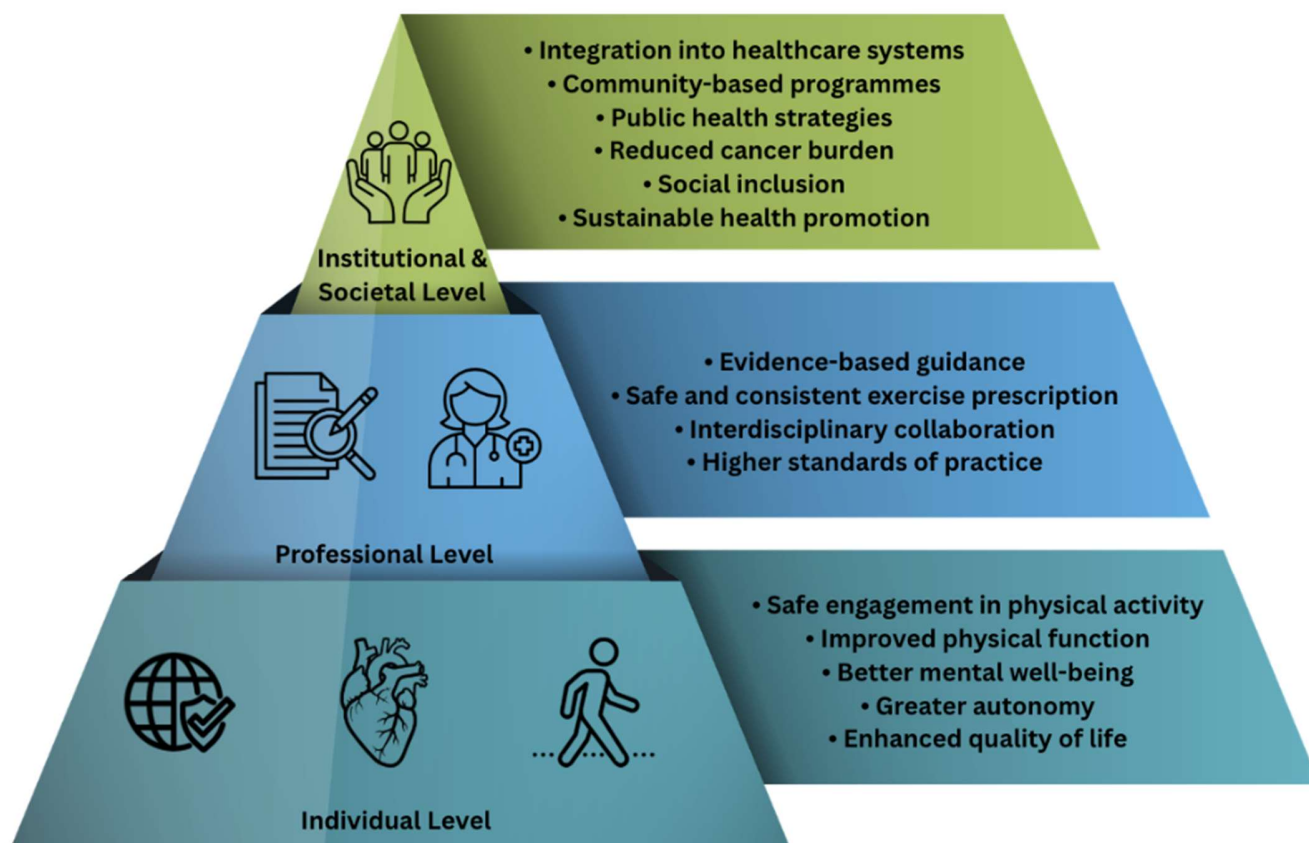
The dissemination and implementation of the PACAP Guidelines Manual are expected to generate impact at multiple and interconnected levels, as illustrated in Figure 5.

At the individual level, the guidelines support people living with and beyond cancer in engaging safely in physical activity, contributing to improved physical function, psychological well-being, autonomy, and overall quality of life.

At the professional level, the manual provides healthcare and exercise professionals with structured, evidence-based guidance to support the consistent, safe, and high-quality integration of physical activity into cancer care pathways. This strengthens interdisciplinary collaboration and promotes higher standards of practice across both clinical and community settings.

At the institutional and societal levels, the PACAP Guidelines contribute to the integration of physical activity into healthcare systems, community-based programmes, and public health strategies. By promoting continuity of care, social inclusion, and sustainable health promotion, the framework supports broader efforts to reduce the cancer burden and embed physical activity as a core component of comprehensive cancer care.

Figure 5. Expected impact of the PACAP Guidelines across individual, professional, and institutional levels.



The pyramid illustrates the multilevel impact of the PACAP framework, highlighting how individual health benefits support improvements in professional practice, which, in turn, contribute to sustainable institutional and societal change.

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CHAPTER 2. SCIENTIFIC BACKGROUND

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2.1 Exercise and Cancer: Prevention, Recovery, and Maintenance

Physical activity plays a key role across the entire cancer continuum, from prevention to treatment and long-term survivorship [9]. Regular exercise is associated with a lower risk of several common cancers, improved tolerance to cancer treatments, reduced fatigue, and better physical and psychological outcomes among survivors [10]. Rather than being limited to a single phase of care, physical activity functions as a continuous, adaptable intervention that supports health, autonomy, and quality of life before, during, and after cancer treatment [11].

2.2 Cancer and Physical Activity: Physiological and Psychological Considerations

Physical activity induces beneficial physiological and psychological adaptations that counteract the negative effects of cancer and its treatments. Improvements in cardiorespiratory fitness, muscle strength, metabolic regulation, immune function, and mental well-being contribute to reduced fatigue, enhanced functional independence, and better quality of life [12,13]. Importantly, physical and psychological benefits are interdependent, reinforcing exercise as a holistic therapeutic strategy in oncology care.

2.3 Contraindications and Safety Precautions

2.3.1 Principles of Safety

Safety is a fundamental principle in exercise oncology [14]. For most people living with cancer, physical activity is safe and beneficial; however, individual health status, treatment-related side effects, and disease characteristics require careful consideration. International guidelines from the American College of Sports Medicine [15] and the World Exercise Guidelines [16] emphasise the importance of individual screening, appropriate medical clearance, and ongoing monitoring.

The guiding principle of the PACAP framework is simple: when uncertainty exists, exercise intensity should be reduced or adjusted rather than eliminated altogether. This approach supports continuity of physical activity while prioritising patient safety.

2.3.2 Pre-Exercise Screening and Medical Clearance

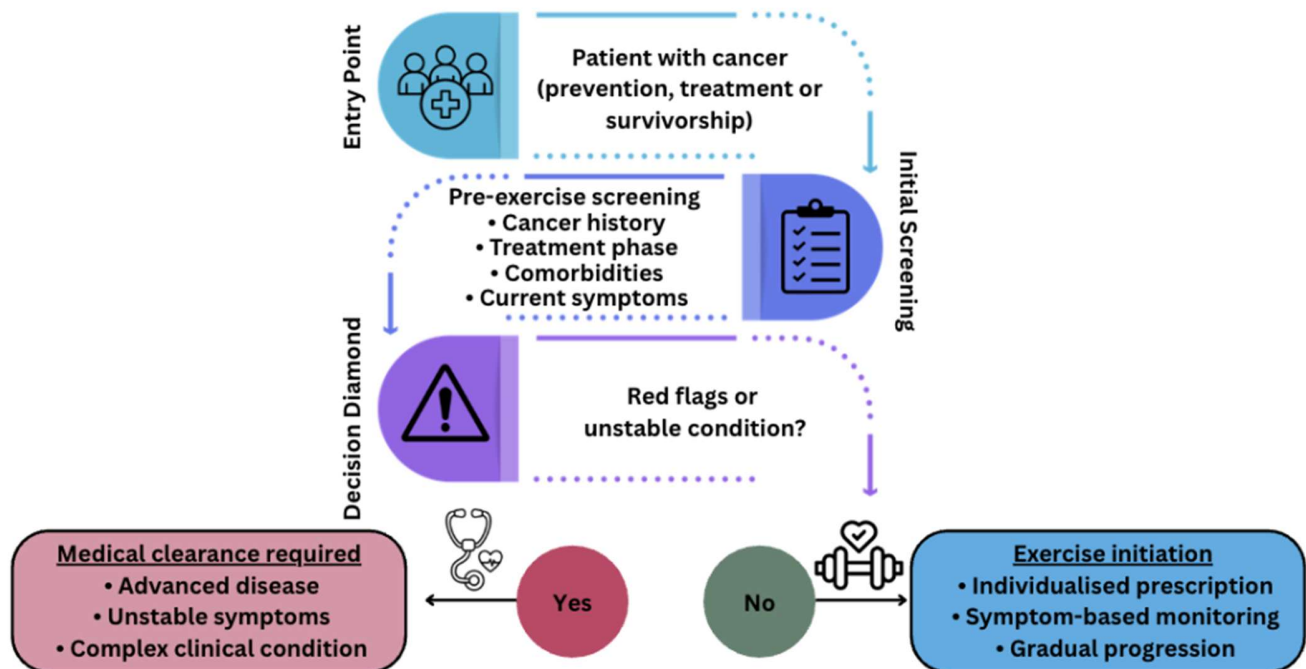
Before initiating any exercise programme, all individuals living with or beyond cancer should undergo a structured pre-exercise screening process, as illustrated in Figure 6. This screening aims to identify potential risks, determine the need for medical clearance, and guide the level of supervision and individualisation required.

The initial screening includes a review of cancer history, current treatment phase, relevant comorbidities, and current symptoms, such as fatigue, pain, dizziness, shortness of breath, lymphedema, or peripheral neuropathy. This information supports informed decision-making regarding exercise feasibility and safety.

When red flags or unstable clinical conditions are identified - including advanced disease, unstable symptoms, or complex medical presentations - medical clearance is required before exercise initiation. In these cases, exercise professionals should collaborate closely with healthcare providers to determine appropriate adaptations, temporary restrictions, or enhanced supervision.

In the absence of red flags, exercise may be initiated using an individualised prescription, guided by symptom-based monitoring and gradual progression. Absolute contraindications to exercise (e.g., acute infection, uncontrolled pain, severe anaemia, unstable bone metastases, or significant cardiorespiratory compromise) require postponement until medical reassessment, whereas relative contraindications are managed through careful monitoring and programme adjustment rather than exclusion from physical activity.

Figure 6. Pre-exercise screening and medical clearance pathway for individuals living with or beyond cancer.



The flowchart illustrates the decision-making process from initial screening to exercise initiation, highlighting red flags that require medical clearance and conditions allowing safe, individualised exercise prescription.

2.3.3 Treatment-Specific Considerations

Cancer treatments can significantly influence exercise tolerance and therefore require treatment-specific adaptations, as summarised in Figure 7 [17]. Exercise prescription should be flexible and responsive to treatment-related side effects, ensuring safety while maintaining continuity of movement whenever possible.

During chemotherapy, common considerations include cancer-related fatigue, cardiotoxicity, increased infection risk, and peripheral neuropathy. These factors may necessitate temporary reductions in exercise intensity, close symptom monitoring, and avoidance of environments with high infection exposure.

Radiotherapy may lead to skin sensitivity, local discomfort, and, in thoracic irradiation, respiratory symptoms. Exercise programmes should be adjusted accordingly, with attention to comfort, breathing tolerance, and temporary modifications in exercise type or intensity when required.

Following surgery, early mobilisation and breathing exercises are prioritised to support recovery and prevent complications. Progressive loading and return to higher-intensity exercise should only occur after appropriate medical clearance and tissue healing.

In individuals receiving hormone therapy, increased risk of bone loss, metabolic alterations, and weight gain highlights the importance of resistance and weight-bearing exercises, adapted to individual tolerance and clinical status.

Across all treatment modalities, close communication between exercise professionals and the oncology team is essential to ensure timely adaptations, safe progression, and continuity of care throughout the cancer pathway.

Figure 7. Treatment-specific considerations for exercise prescription in oncology.



Key exercise-related adaptations associated with chemotherapy, radiotherapy, surgery, and hormone therapy that may influence exercise tolerance and programme design.

2.3.4 Monitoring During Exercise and Environmental and Hygiene Considerations

Ongoing monitoring during exercise sessions is essential to ensure safety. Exercise intensity should initially remain low to moderate and be guided by perceived exertion. Sessions must be interrupted immediately if

warning symptoms occur, such as chest pain, dizziness, sudden shortness of breath, irregular heartbeat, or bone pain.

Regular reassessment allows safe progression over time. Environmental and hygiene conditions should be adapted to the patient's immune status, with preference for well-ventilated spaces, adequate hydration, and avoidance of extreme temperatures or crowded environments when infection risk is high.

2.3.5 Lymphedema and Bone Metastases

Current evidence indicates that progressive resistance training does not exacerbate lymphedema when appropriately prescribed and monitored [18]. The use of compression garments and gradual load progression is recommended. Exercise may also be performed in individuals with stable bone metastases, provided that high-impact activities and excessive loading of affected regions are avoided. Non-impact and low-load exercises are preferred, and close collaboration with medical and rehabilitation professionals is essential.

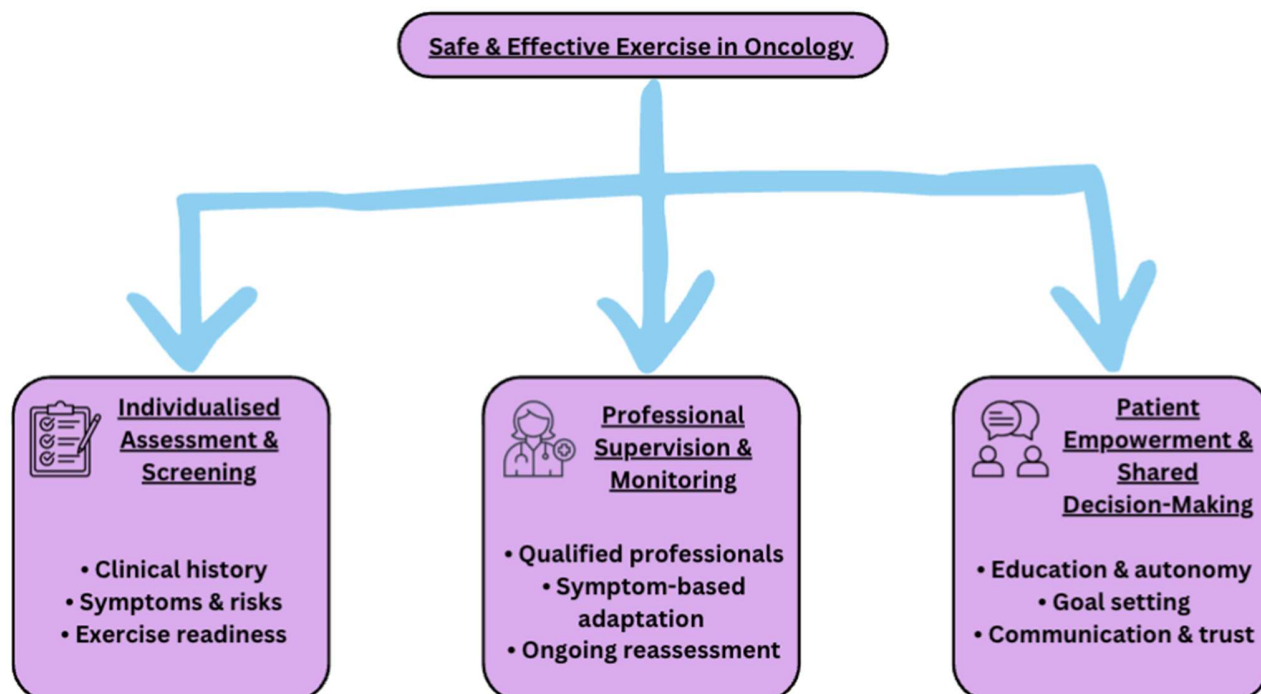
2.3.6 Emergency Preparedness and Professional Competence

All professionals supervising exercise programmes for people with cancer should be trained in basic life support and emergency procedures. Clear referral pathways, documentation of adverse events, and communication with the oncology team are essential components of safe practice. Ongoing professional education supports consistent quality standards across settings and countries.

2.3.7 Summary

When these conditions are met, exercise moves beyond a complementary recommendation and becomes a central, life-enhancing component of cancer prevention, treatment, and survivorship. As illustrated in Figure 8, safe and effective exercise implementation in oncology is grounded in three interdependent principles. First, individualised assessment and screening ensure that exercise prescription is tailored to the patient's clinical history, current symptoms, and readiness for physical activity. Second, professional supervision and continuous monitoring by qualified professionals allow timely adaptation of exercise intensity, volume, and modality in response to symptoms and treatment-related changes. Third, patient empowerment and shared decision-making promote autonomy, trust, and long-term engagement by actively involving patients in goal setting and care decisions. Together, these pillars create a safe, person-centred framework that supports continuity of physical activity across the cancer continuum while minimising risk and maximising therapeutic benefit.

Figure 8. Core principles of safe and effective exercise implementation in oncology.



Individualised assessment and screening, professional supervision with continuous monitoring, and patient empowerment through shared decision-making form the foundation of safe exercise practice across the cancer continuum.

2.4. Systematic review and Meta-Analysis overview

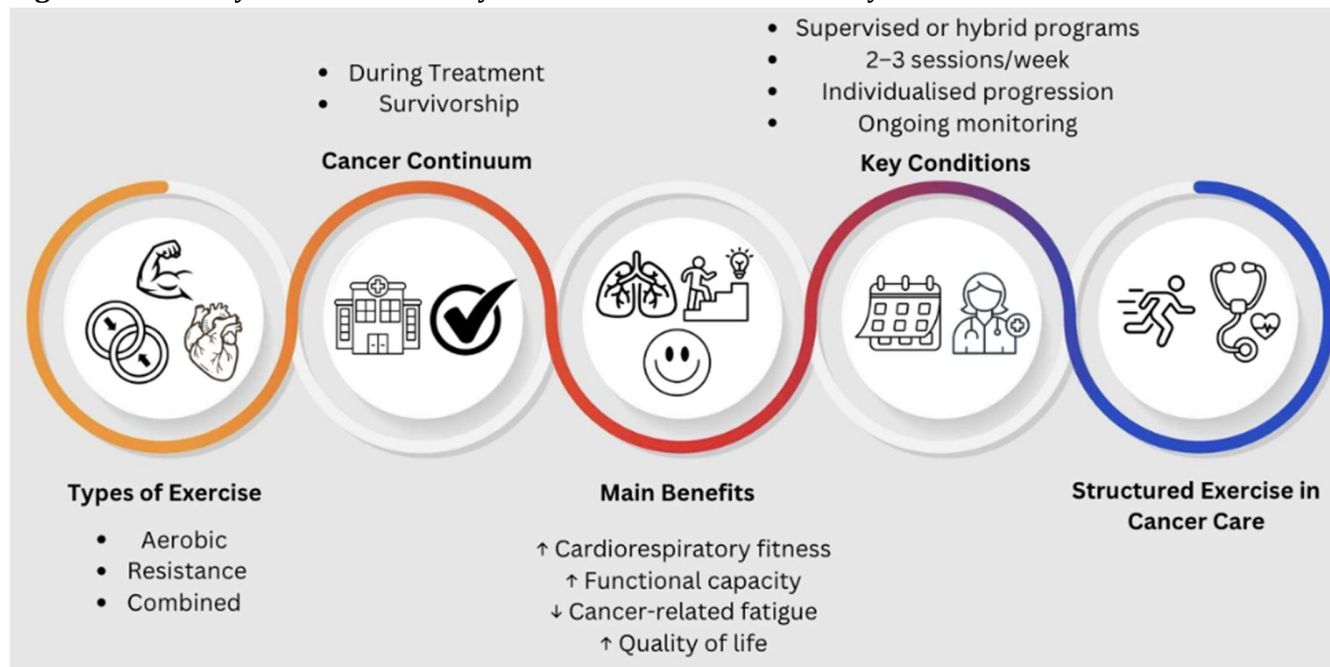
A systematic review and meta-analysis were conducted to synthesise evidence on aerobic, resistance, and combined exercise interventions across the cancer continuum, particularly during active treatment and survivorship. The review included randomised controlled trials involving different cancer types and clinical stages, following established methodological standards.

As summarised in Figure 9, the evidence consistently demonstrates that structured exercise programmes lead to meaningful improvements in key outcomes of oncology care. Across studies, exercise interventions were associated with increased cardiorespiratory fitness and functional capacity, alongside reductions in cancer-related fatigue and improvements in health-related quality of life.

The most consistent benefits were observed in supervised or hybrid programmes, typically delivered 2–3 sessions per week, with individualised progression and ongoing monitoring. Importantly, exercise interventions were feasible across cancer stages, showed high adherence rates, and were not associated with serious adverse events.

Collectively, these findings support the inclusion of appropriately prescribed and supervised exercise as a core component of supportive cancer care and survivorship programmes.

Figure 9. Summary of evidence from systematic review and meta-analysis on exercise in cancer care.



Exercise type, cancer continuum phase, key programme conditions, and main clinical benefits associated with aerobic, resistance, and combined exercise interventions during treatment and survivorship.

2.5. Lifestyle and Cancer

Lifestyle factors are a central determinant of cancer prevention, treatment tolerance, survivorship, and long-term outcomes [19]. As illustrated in Figure 10, behaviours such as physical activity, nutrition, body weight management, smoking-related risk behaviours, and stress regulation interact dynamically and influence shared biological and psychosocial pathways relevant to cancer development and recovery.

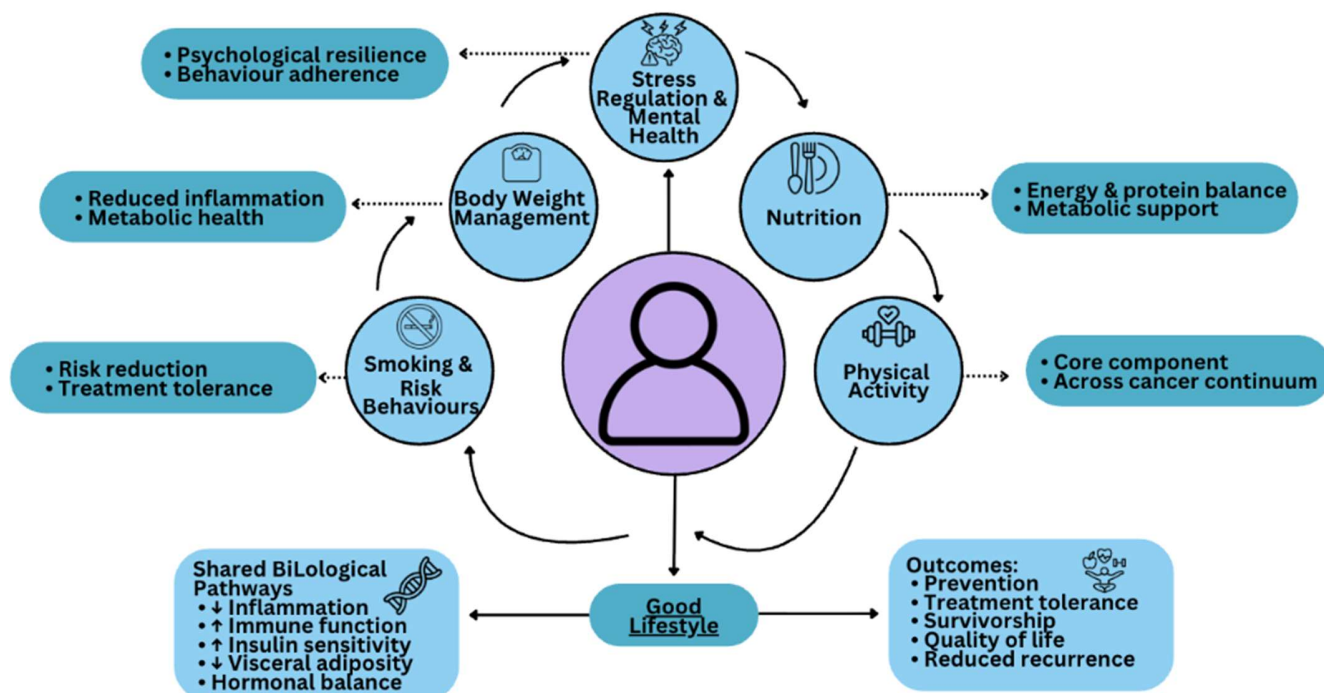
Healthy lifestyle patterns contribute to reduced systemic inflammation, improved metabolic and hormonal balance, enhanced immune function, and greater psychological resilience. In contrast, unhealthy behaviours are associated with chronic inflammation, metabolic dysregulation, and impaired treatment tolerance, all of which may negatively affect disease progression and recovery.

Within this framework, physical activity emerges as a core and cross-cutting component across the cancer continuum, interacting synergistically with nutrition, mental health, and body weight management. Regular exercise is consistently associated with improved functional capacity, reduced fatigue, better quality of life, and enhanced tolerance to oncological treatments across multiple cancer types and stages.

Importantly, lifestyle behaviours act through shared biological mechanisms, including improved insulin sensitivity, reduced visceral adiposity, modulation of sex hormones, and enhanced immune surveillance. When integrated with nutritional support and psychological care, lifestyle interventions contribute to reduced recurrence risk, improved survivorship outcomes, and sustained autonomy.

For these reasons, lifestyle modification should not be addressed in isolation. The PACAP model promotes an integrated, person-centred approach, in which physical activity, nutrition, and psychosocial support are embedded within multidisciplinary oncology care pathways and adapted to both clinical and community settings.

Figure 10. Integrated lifestyle framework within the PACAP model.



Interaction between physical activity, nutrition, body weight management, stress regulation, and risk behaviours, highlighting shared biological pathways and their impact on prevention, treatment tolerance, survivorship, quality of life, and recurrence risk.

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CHAPTER 3. NUTRITION AND DIETARY MANAGEMENT IN CANCER PATIENTS

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Nutrition is a fundamental component of cancer care and must be integrated with physical activity, clinical treatment, and psychosocial support throughout the cancer continuum [20,21]. Within the PACAP framework, nutrition is not limited to energy intake but aims to prevent malnutrition, preserve muscle mass, support immune and metabolic function, and improve treatment tolerance and quality of life [22,23].

Malnutrition and involuntary weight loss are frequent in oncology and are associated with increased complications, reduced functional capacity, and poorer outcomes [22–26]. For this reason, early screening, individualised nutritional support, and continuous monitoring are essential elements of safe and effective cancer care [23,24,31].

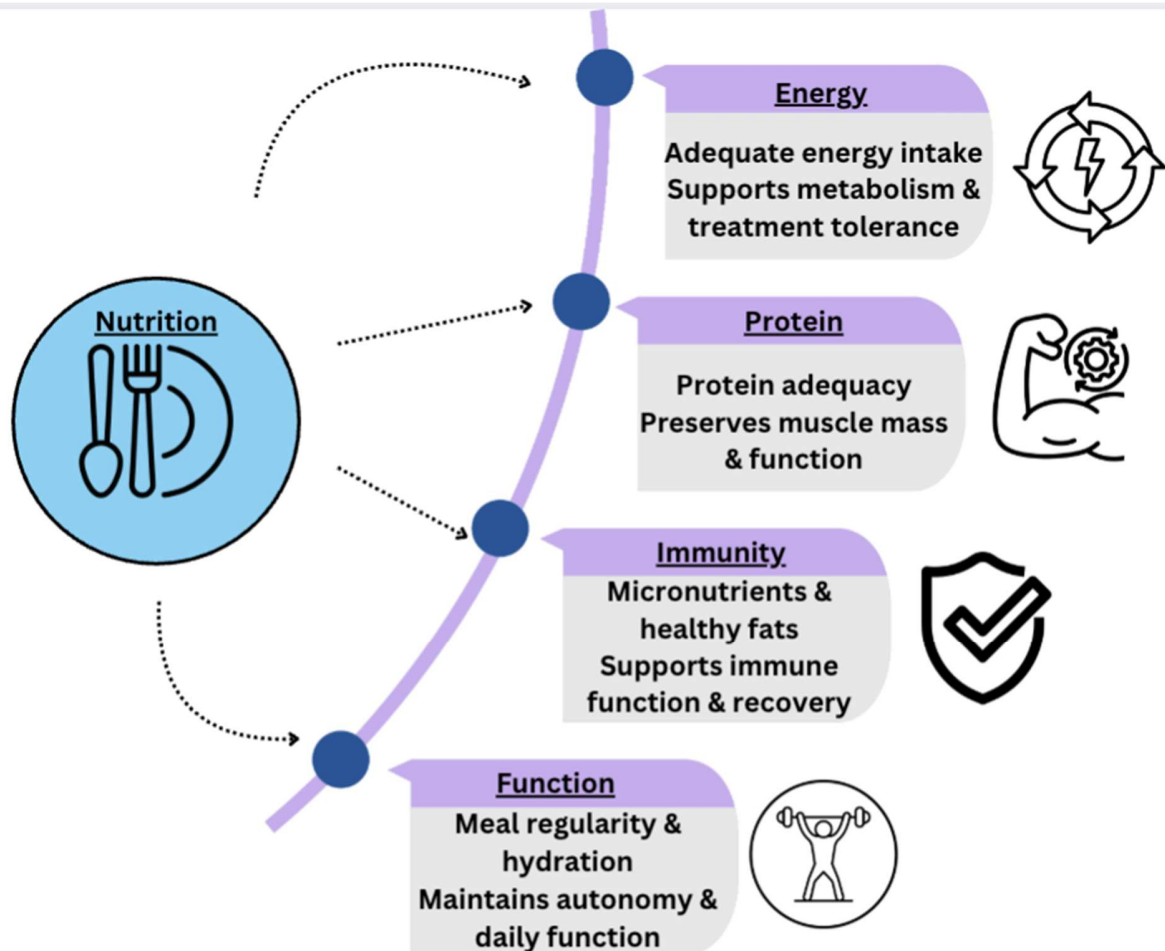
3.1. Core Nutritional Principles

Cancer and its treatments impose significant metabolic stress, inflammatory burden, and alterations in appetite and nutrient utilisation [22,23,25]. As illustrated in Figure 11, nutritional care within the PACAP framework focuses on four interrelated pillars: energy adequacy, protein intake, immune support, and functional maintenance.

Adequate energy intake is essential to sustain metabolic balance and support tolerance to oncological treatments [22,23]. Protein adequacy plays a central role in preserving muscle mass, physical function, and recovery, particularly when combined with structured physical activity [22,23,29]. In parallel, sufficient intake of micronutrients and healthy fats, including omega-3 fatty acids, supports immune function and tissue repair [27,28].

Finally, meal regularity and hydration contribute to maintaining autonomy, daily functioning, and exercise tolerance across the cancer continuum [22,23,30]. Nutritional strategies must remain flexible and responsive to disease stage, treatment phase, and symptom burden, ensuring feasibility and safety in both clinical and community contexts [23,24].

Figure 11. Nutrition as a therapeutic pillar in cancer care.



Core nutritional principles supporting energy balance, muscle preservation, immune function, and functional autonomy across the cancer continuum.

3.2. Immune Function and Nutritional Support

Cancer-related inflammation and treatment toxicity place sustained stress on the immune system. Correcting nutritional deficiencies and ensuring adequate intake of key micronutrients support immune competence and metabolic resilience [22,23]. In selected clinical situations, immunonutrition strategies may contribute to improved recovery and reduced complications, particularly around surgery or intensive treatments [26,27].

3.3. Daily Nutritional Management and Symptom Adaptation

Daily nutritional management should be practical and symptom-oriented [22,23]. Fractionated meals, appropriate food texture, adequate hydration, and individualised adaptations help maintain intake during periods of nausea, mucositis, dysphagia, diarrhoea, or fatigue [22,23,26]. The primary goal is to preserve nutritional status while minimising discomfort and treatment interruptions [23,24].

3.4. Integration of Nutrition and Physical Activity

Nutrition and physical activity are interdependent and must be planned together [20,21,29,30]. Exercise increases energy and protein needs, while adequate nutrition improves training tolerance, recovery, and functional outcomes [22,23,29]. Coordinated monitoring of body weight, muscle mass, strength, symptoms, and quality of life ensures safe progression of both interventions [29–31].

3.5. Nutritional Screening and Monitoring

Routine nutritional screening should occur at diagnosis, before major treatments, during active therapy, and in survivorship [22–24,31]. Simple, validated tools allow early identification of risk and timely referral to specialized care [31]. Ongoing monitoring enables adaptation of nutritional strategies according to clinical evolution [23,31].

3.6. Multidisciplinary Approach

Effective nutritional care requires collaboration between oncologists, dietitians, exercise professionals, nurses, psychologists, and other healthcare providers [21,24,32]. Integrated decision-making and shared monitoring ensure consistency, safety, and continuity within the PACAP pathway [20,21,32].

3.7. Key Messages

- ✓ Nutrition is an active therapeutic component of cancer care [20–24].
- ✓ Early and repeated screening is essential [22–24,31].
- ✓ Adequate energy and protein intake are critical to preserve function [22,23,29].
- ✓ Nutrition and physical activity must be integrated [20,21,29,30].
- ✓ Multidisciplinary collaboration underpins safe and effective care [21,24,32].

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CHAPTER 4. PSYCHOLOGICAL SUPPORT AND EMOTIONAL WELL-BEING IN CANCER CARE

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Psychological support is a core component of comprehensive cancer care and plays a pivotal role in emotional well-being, treatment adaptation, motivation, adherence to healthy lifestyles, and quality of life. Within the PACAP model, psycho-oncological care is integrated with physical activity, nutrition, rehabilitation, and clinical management, promoting resilience, autonomy, and long-term survivorship.

Cancer represents a complex biopsychosocial experience affecting physical, emotional, cognitive, social, occupational, and existential dimensions of life. The psychological impact of diagnosis and treatment may manifest through anxiety, depression, adjustment disorders, fear of recurrence, body image concerns, role disruption, work-related difficulties, and reduced quality of life [33]. Observational studies and meta-analyses indicate that between one-third and one-half of cancer patients experience clinically significant levels of distress during the cancer trajectory [34]. Consequently, structured psychological support is recommended throughout all phases of care, from diagnosis and active treatment to follow-up and survivorship.

4.1. Psychological Support Across the Cancer Pathway

Psychological care helps patients cope with uncertainty, treatment-related stress, symptom burden, altered body image, and life disruption. International evidence demonstrates that psycho-oncological interventions delivered individually, in groups, couples, or family settings significantly reduce anxiety, depression, and distress while improving quality of life [35].

Evidence-based interventions include structured psychoeducation, relaxation techniques, supportive psychotherapy, support groups, couple-based interventions, cognitive-behavioural therapy (CBT), mindfulness-based approaches, and meaning-centred therapies [36,37]. CBT specifically targets dysfunctional illness-related beliefs, pain catastrophising, intolerance of uncertainty, fatigue management, sleep difficulties, and problem-solving skills. Mindfulness-based practices, meditation, yoga, guided imagery, and breathing techniques facilitate emotional regulation, body awareness, and psychological adjustment. Mindfulness-Based Stress Reduction (MBSR) has demonstrated effectiveness in reducing stress, insomnia, and psychophysical distress [38].

Support groups provide opportunities for emotional sharing, normalization of experiences, social belonging, and reduction of isolation. Psychoeducation improves patients' understanding of treatments, side effects, symptom management strategies, communication with healthcare professionals, and healthy lifestyle behaviours, thereby increasing self-efficacy and treatment compliance.

Recent developments in personalized psycho-oncology advocate tailoring the type, intensity, and timing of interventions according to disease stage, symptom burden, psychiatric history, sociodemographic characteristics, and individual preferences, while integrating psychological care with rehabilitation and oncological treatment pathways [39].

4.2. Psychological Care Models and Screening

Current international guidelines recommend routine distress screening as a standard component of cancer care. The National Comprehensive Cancer Network (NCCN) identifies distress as the “sixth vital sign” and recommends systematic assessment using validated instruments such as the Distress Thermometer [40].

A stepped-care model allows interventions to be matched to symptom severity. Patients with mild distress may benefit from psychoeducation and supportive counselling, whereas those with clinically significant symptoms require specialized psychotherapy or psychiatric consultation. Recent holistic psychosocial care guidelines further emphasize the assessment of family needs, social and spiritual support, and close collaboration with nutritionists, physiotherapists, exercise specialists, and other supportive care professionals [41].

Psychological care should also address key transition points, including diagnosis, treatment completion, recurrence, and palliative care, while increasingly incorporating eHealth solutions such as tele-counselling, online platforms, and digital self-monitoring tools.

4.3. The Role of Physical Activity in Emotional Well-Being

Physical activity should be regarded both as a preventive and therapeutic strategy. It mitigates treatment-related side effects, including cancer-related fatigue, muscle weakness, sleep disturbances, and reduced functional capacity, while improving mood, anxiety, depressive symptoms, self-esteem, body image, sexuality, social functioning, cognitive performance, and overall quality of life [42].

Exercise contributes to psychological recovery through multiple mechanisms. It enhances perceived control, self-efficacy, social participation, and motivation, while fostering adaptive coping and resilience. Emerging evidence also indicates beneficial effects on inflammatory pathways, metabolic regulation, immune function, functional recovery, and long-term survival outcomes [42]. A recent systematic review identified self-efficacy, social support, perceived benefits, motivation, reduced depression, and improved quality of life as key psychosocial outcomes associated with sustained physical activity among cancer survivors [43].

4.4. Motivation and Adherence Strategies to Physical Activity

Despite its benefits, adherence to exercise programmes may be hindered by physical barriers (fatigue, pain, neuropathy, dyspnoea), psychological barriers (anxiety, fear of injury, low motivation), environmental barriers (costs, transportation, limited access), and psychosocial factors such as low self-efficacy or insufficient family support [44].

Motivational strategies are grounded in behavioural theories including Self-Determination Theory [45] and the Transtheoretical Model of Change [46]. Personalized goal-setting, continuous monitoring, motivational interviewing, and professional supervision enhance autonomy, competence, and active participation in care.

Evidence suggests that structured exercise programmes adapted to treatment phase significantly improve adherence and reduce inactivity [47]. The most effective interventions combine supervised exercise, behavioural counselling, peer support, periodic feedback, and symptom-adapted training programmes coordinated by multidisciplinary teams. Community-based and group exercise programmes further strengthen long-term participation through social support and shared experiences [48].

4.5. Coping and Adaptation Mechanisms

Adaptation to cancer is a dynamic process involving both personal and social resources. Lazarus and Folkman's transactional model identifies problem-focused coping, emotional coping, social support seeking, and avoidance strategies as key responses to stressful events [49].

Research consistently demonstrates that adaptive coping mechanisms - including acceptance, cognitive reframing, emotional regulation, hope, spirituality, planning, and active problem solving - are associated with lower distress, better psychosocial adjustment, improved quality of life, and greater adherence to treatment [50,51]. In contrast, avoidance, prolonged denial, rumination, catastrophising, self-blame, and emotional dysregulation are associated with poorer outcomes.

Positive psychology interventions focusing on gratitude, hope, personal strengths, resilience, and post-traumatic growth may complement traditional psychotherapeutic approaches and support patients in redefining the meaning of illness while maintaining future-oriented life goals.

Social support from partners, family members, peers, and support groups remains one of the strongest protective factors for psychological adjustment, facilitating adaptive coping and reducing emotional distress.

Particular attention should be given to survivorship. Although treatment completion is often viewed as a return to normality, many survivors experience fear of recurrence, follow-up anxiety, uncertainty, and identity reconstruction challenges. Psychological follow-up programmes, mindfulness interventions, Acceptance and Commitment Therapy (ACT), and survivorship-focused support have demonstrated effectiveness in promoting resilience, identity reconstruction, and social reintegration.

4.6. Integration of Psychological Support, Physical Activity, and Lifestyle Care

Contemporary supportive care models emphasize the integration of psychological interventions with physical activity, nutrition, sleep management, and other lifestyle factors [52]. Psychological support enhances motivation, self-efficacy, and adherence to exercise by addressing fears, dysfunctional beliefs, and behavioural barriers.

Conversely, physical activity functions as a powerful non-pharmacological intervention for emotional symptoms such as anxiety, depression, and fear of recurrence, while simultaneously reducing fatigue and pain and strengthening adaptive coping mechanisms [53].

Supervised group-based exercise programmes offer additional psychosocial benefits by providing social support, normalization of experiences, peer interaction, and opportunities for long-term engagement [48]. Effective multidisciplinary communication ensures coordinated, individualized, and person-centred care throughout the cancer continuum.

4.7. Key Message

1. Psychological support is an essential component of comprehensive cancer care across all phases of the disease trajectory.
2. Routine distress screening and stepped-care models facilitate early identification and appropriate intervention.

3. Evidence-based psycho-oncological approaches - including CBT, mindfulness-based interventions, psychoeducation, and supportive therapies - improve emotional outcomes and quality of life.
4. Physical activity contributes substantially to both psychological and physical health and should be integrated into supportive care programmes.
5. Motivation, self-efficacy, social support, and personalized behavioural strategies are crucial determinants of exercise adherence.
6. Adaptive coping strategies, resilience, and positive psychological resources promote long-term adjustment and survivorship.
7. Integrated multidisciplinary care represents a fundamental principle of the PACAP model.

4.8. Recommendations for evaluating the physical and psychological benefits of Nordic

Walking in future studies and projects aimed at cancer patients.

To provide a methodological framework for future international studies, programs, and research initiatives, we recommend administering a battery of standardized and validated questionnaires in oncology (PDF available in the Appendix). The adoption of shared outcome assessment tools is essential to ensure comparability across different groups, facilitate data collection in multicenter projects, ensure replicability, and strengthen the international dissemination of scientific evidence regarding adapted physical activity.

We recommend administering pre- and post-intervention questionnaires, with data collection structured in ad hoc databases, at two or three specific time points, depending on the duration of the activity. For programs lasting between 2 and 4 months, the following assessment is suggested:

- T0 (Baseline): administered within the week preceding the first Nordic Walking session.
- T1 (Post-surgery): administered within the week following the end of the physical activity program.

For sports activities lasting at least 6 months, an interim assessment at 3 months is recommended.

This timeline would allow us to monitor the evolution of outcomes throughout the intervention and quantify any clinically relevant changes.

1. Brief Fatigue Inventory (BFI) Mendoza, T. R., et al. (1999). The rapid assessment of fatigue severity in cancer patients: use of the Brief Fatigue Inventory. *Cancer*, 85(5), 1186-1196. [Appendix A]

The brief fatigue inventory (BFI) is a self-administered tool consisting of nine items; each item rates the severity of fatigue on a scale of 1–10. The first three items assess current, usual and worst levels of fatigue during the past 24 h. The remaining six assess the extent to which fatigue interferes with daily life, such as the person's activity level, mood or social relationships. To define the levels of fatigue, the following cut-offs have been implied: 0–3 indicating mild levels of fatigue, 4–6 indicating moderate fatigue and scores above 7 indicating severe fatigue. Its use allows us to quantify any improvements associated with the practice of Nordic Walking in terms of reduction of chronic fatigue and increase in perceived energy levels.

2. Brief Pain Inventory – Short Form (BPI-SF) Cleeland, C. S., & Ryan, K. M. (1994). Pain assessment: global use of the Brief Pain Inventory. *Annals of the Academy of Medicine, Singapore*, 23(2), 129-138. [Appendix B]

A multidimensional self-report questionnaire consisting of 15 subitems, designed to assess the prevalence, intensity, and impact of pain related to cancer and its treatments. It also allows for analysis of the degree of pain interference with daily activities, social relationships, work, sleep, and emotional well-being. As part of adapted physical activity programs, it can help document the potential role of Nordic Walking in managing and modulating pain symptoms. Consisting of 15 subitems, the scale generates two independent subscale scores (Severity Score and Interference Score) by calculating the mean of the respective items. Higher scores represent a greater pain burden.

3. Short Form Health Survey (SF-12) Ware, J. E. Jr., Kosinski, M., & Keller, S. D. (1996). A 12-Item Short-Form Health Survey: Construction of Scales and Preliminary Tests of Reliability and Validity. *Medical Care*, 34(3), 220–233. <https://doi.org/10.1097/00005650-199603000-00003> [Appendix C]

The SF-12, a short version of the SF36, includes 12 items and is a measure of QoL to obtain an index for physical functioning (the physical component summary [PCS]) and an index of mental functioning (the mental component summary [MCS]). PCS reflects concepts related to physical morbidity, whereas MCS reflects psychological and mental morbidity and etiology. For both indexes, raw scores were converted in t-scores (with mean=50 and standard deviation=10). Higher values indicate better functioning in both domains.

4. Six-Minute Walk Test (6MWT) / 6-Minute Walking Distance (6MWD) Schmidt, K., et al. (2013). Validity of the six-minute walk test in cancer patients. *International Journal of Sports Medicine*, 34(07), 631-636.

This objective and clinically validated functional performance test is used to assess submaximal aerobic capacity and functional exercise tolerance based on the distance in meters walked in 6 minutes. It assesses the global, integrated responses of the cardiovascular, respiratory, and neuromuscular systems during walking. Thanks to its ease of administration and clinical relevance, it is considered one of the reference tools for monitoring changes in physical performance following structured exercise programs, including Nordic Walking.

Procedure: Participants are instructed to walk as far as possible along a flat, hard, and straight indoor surface (ideally a 30-meter marked corridor) for a period of 6 minutes, self-pacing their pace.

Safety and secondary metrics: Requires pre- and post-test measurement of heart rate, oxygen saturation, and perceived exertion.

Completion time: Approximately 10–15 minutes (including briefing and execution).

The proposed self-report questionnaires can be administered both in traditional paper format and via secure and validated digital platforms for clinical data collection (e.g., Qualtrics, Google Forms, etc.). Digital administration minimizes the risk of missing data by validating mandatory fields and automates database aggregation for subsequent statistical analyses.

From a regulatory perspective, the collection, processing, and storage of all personal and health data must strictly comply with the General Data Protection Regulation (EU Regulation 2016/679 - GDPR), providing for adequate pseudonymization procedures, secure data storage, and management of access to health data.

Functional measures, such as the 6MWT, require the direct supervision of appropriately trained professionals (physiotherapists, kinesiologists, nurses, physicians, or other competent healthcare professionals) and the adoption of security procedures established for the oncology population.

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4.9.1. Appendices

Appendix A:

Brief Fatigue Inventory									
STUDY ID# _____			HOSPITAL # _____						
Date: ____/____/____			Time: _____						
Name _____			_____						
Last			First			Middle Initial			
Throughout our lives, most of us have times when we feel very tired or fatigued. Have you felt unusually tired or fatigued in the last week? Yes ☐ No ☐									
1. Please rate your fatigue (weariness, tiredness) by circling the one number that best describes your fatigue right NOW.									
0 1 2 3 4 5 6 7 8 9 10									
No Fatigue							As bad as you can imagine		
2. Please rate your fatigue (weariness, tiredness) by circling the one number that best describes your USUAL level of fatigue during past 24 hours.									
0 1 2 3 4 5 6 7 8 9 10									
No Fatigue							As bad as you can imagine		
3. Please rate your fatigue (weariness, tiredness) by circling the one number that best describes your WORST level of fatigue during past 24 hours.									
0 1 2 3 4 5 6 7 8 9 10									
No Fatigue							As bad as you can imagine		
4. Circle the one number that describes how, during the past 24 hours, fatigue has interfered with your:									
A. General activity									
0 1 2 3 4 5 6 7 8 9 10									
Does not interfere							Completely Interferes		
B. Mood									
0 1 2 3 4 5 6 7 8 9 10									
Does not interfere							Completely Interferes		
C. Walking ability									
0 1 2 3 4 5 6 7 8 9 10									
Does not interfere							Completely Interferes		
D. Normal work (includes both work outside the home and daily chores)									
0 1 2 3 4 5 6 7 8 9 10									
Does not interfere							Completely Interferes		
E. Relations with other people									
0 1 2 3 4 5 6 7 8 9 10									
Does not interfere							Completely Interferes		
F. Enjoyment of life									
0 1 2 3 4 5 6 7 8 9 10									
Does not interfere							Completely Interferes		
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Appendix B:

Patient Trial No					
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BRIEF PAIN INVENTORY (SHORT FORM)

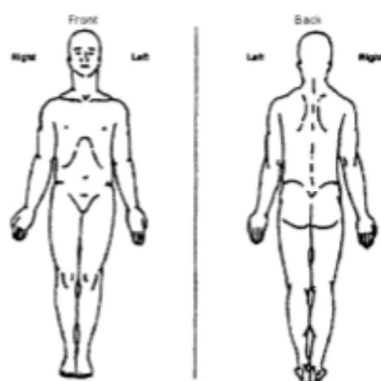
Patient Initials:
Date of Birth(dd,mm,yyyy):
Visit Date (dd,mm,yyyy) :

1. Throughout our lives, most of us have had pain from time to time (such as minor headaches, sprains, and toothaches). Have you had pain other than these everyday kinds of pain during the last week?

☐ Yes

☐ No

2. On the diagram, shade in the areas where you feel pain. Put an X on the area that hurts the most.



3. Please rate your pain by circling the one number that best describes your pain at its **worst** in the last week.

0	1	2	3	4	5	6	7	8	9	10
No										
Pain									Pain as bad as	
									you can imagine	

4. Please rate your pain by circling the one number that best describes your pain at its **least** in the last week.

0	1	2	3	4	5	6	7	8	9	10
No										
Pain									Pain as bad as	
									you can imagine	

5. Please rate your pain by circling the one number that best describes your pain on the **average**.

0	1	2	3	4	5	6	7	8	9	10
No										
Pain									Pain as bad as	
									you can imagine	

6. Please rate your pain by circling the one number that tells how much pain you have **right now**.

0	1	2	3	4	5	6	7	8	9	10
No										
Pain									Pain as bad as	
									you can imagine	

7. What treatments or medications are you receiving for your pain?

Appendix C:

SF-12 Health Survey

This survey asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities. **Answer each question by choosing just one answer.** If you are unsure how to answer a question, please give the best answer you can.

1. In general, would you say your health is:

☐1 Excellent ☐2 Very good ☐3 Good ☐4 Fair ☐5 Poor

The following questions are about activities you might do during a typical day. Does **your health now** limit you in these activities? If so, how much?

	YES, limited a lot	YES, limited a little	NO, not limited at all
2. Moderate activities such as moving a table, pushing a vacuum cleaner, bowling, or playing golf.	☐ 1	☐ 2	☐ 3
3. Climbing several flights of stairs.	☐ 1	☐ 2	☐ 3

During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of your physical health**?

	YES	NO
4. Accomplished less than you would like.	☐ 1	☐ 2
5. Were limited in the kind of work or other activities.	☐ 1	☐ 2

During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of any emotional problems** (such as feeling depressed or anxious)?

	YES	NO
6. Accomplished less than you would like.	☐ 1	☐ 2
7. Did work or activities less carefully than usual.	☐ 1	☐ 2

8. During the **past 4 weeks**, how much **did pain interfere** with your normal work (including work outside the home and housework)?

☐1 Not at all ☐2 A little bit ☐3 Moderately ☐4 Quite a bit ☐5 Extremely

These questions are about how you have been feeling during the **past 4 weeks**.

For each question, please give the one answer that comes closest to the way you have been feeling.

How much of the time during the **past 4 weeks**...

	All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
9. Have you felt calm & peaceful?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
10. Did you have a lot of energy?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
11. Have you felt down-hearted and blue?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

12. During the **past 4 weeks**, how much of the time has your **physical health or emotional problems** interfered with your social activities (like visiting friends, relatives, etc.)?

☐1 All of the time ☐2 Most of the time ☐3 Some of the time ☐4 A little of the time ☐5 None of the time

Patient name:	Date:	PCS:	MCS:
Visit type (circle one)			
Preop	6 week	3 month	6 month
12 month	24 month	Other: _____	

CHAPTER 5. EXERCISE PRESCRIPTION FRAMEWORK IN ONCOLOGY

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Physical exercise is a core therapeutic component of cancer prevention, treatment, and survivorship [54]. Within the PACAP model, exercise is prescribed as a structured, individualized, and monitored intervention, integrated with medical care, nutrition, and psychological support. Its primary goals are to preserve functional capacity, reduce treatment-related side effects, improve quality of life, and support long-term health and autonomy.

A substantial body of evidence demonstrates that regular physical activity improves cardiorespiratory fitness, muscle strength, fatigue, mood, self-esteem, and multiple dimensions of quality of life in people living with and beyond cancer. Physically active survivors also show lower risk of recurrence and cancer-related mortality compared with inactive individuals.

5.1. Core Concepts and Training Principles

Exercise prescription in oncology differs from general health promotion. While increasing overall physical activity is a population-level strategy, prescribing structured exercise is an individualized clinical intervention that requires assessment, adaptation, and monitoring.

Within PACAP, exercise is guided by basic training principles: individualisation, gradual progression, specificity, safety, and regular reassessment. Exercise intensity should be adapted to symptoms, treatment phase, and functional capacity, prioritising continuity of movement rather than interruption.

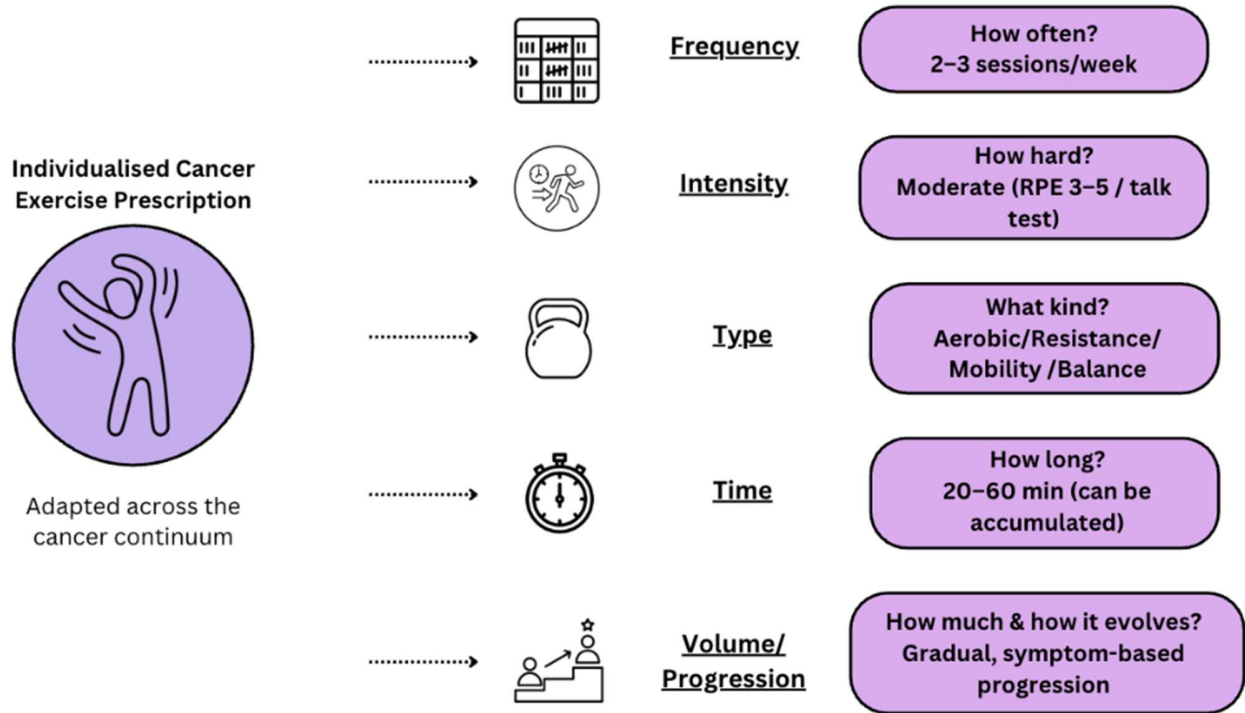
5.2. FITT-VP Framework

Exercise prescription within the PACAP framework follows the FITT-VP principle, ensuring that frequency, intensity, time, type, volume, and progression are individually adapted across the cancer continuum [55]. As illustrated in Figure 12, effective oncology exercise programmes combine aerobic, resistance, mobility, and balance components, delivered in a structured and progressive manner.

Moderate-intensity exercise constitutes the cornerstone of cancer exercise prescription and is defined by a perceptible yet comfortable increase in breathing and heart rate, commonly assessed using the rating of perceived exertion (RPE) or the talk test. When fatigue or treatment-related symptoms limit tolerance, exercise volume may be safely accumulated in shorter bouts while maintaining weekly targets.

This flexible, symptom-responsive approach supports continuity of movement, safety, and long-term adherence, reinforcing exercise as a therapeutic intervention rather than a rigid prescription.

12. FITT-VP framework for individualized exercise prescription in oncology.



Exercise frequency, intensity, type, time, volume, and progression are adapted according to symptoms, treatment phase, and functional capacity across the cancer continuum.

5.3. Safety and Pre-Participation Screening

Before initiating exercise, basic safety screening is required to identify contraindications and guide adaptations. Symptoms such as severe fatigue, pain, dizziness, shortness of breath, infection, or unstable clinical conditions require temporary modification rather than complete cessation.

A key pacap principle is when uncertainty exists, reduce intensity or simplify the session instead of cancelling exercise, maintaining behavioural rhythm and preventing deconditioning. In complex cases, exercise planning should involve the multidisciplinary team.

5.4. Exercise Across the Cancer Continuum

Exercise prescription within the PACAP framework is phase-specific and must be adapted according to the individual's position along the cancer care pathway. As illustrated in Figure 13, exercise plays distinct but complementary roles across prevention, prehabilitation, treatment, and survivorship.

In the prevention phase, regular moderate physical activity combined with basic strength training contributes to cancer risk reduction and the promotion of an active lifestyle.

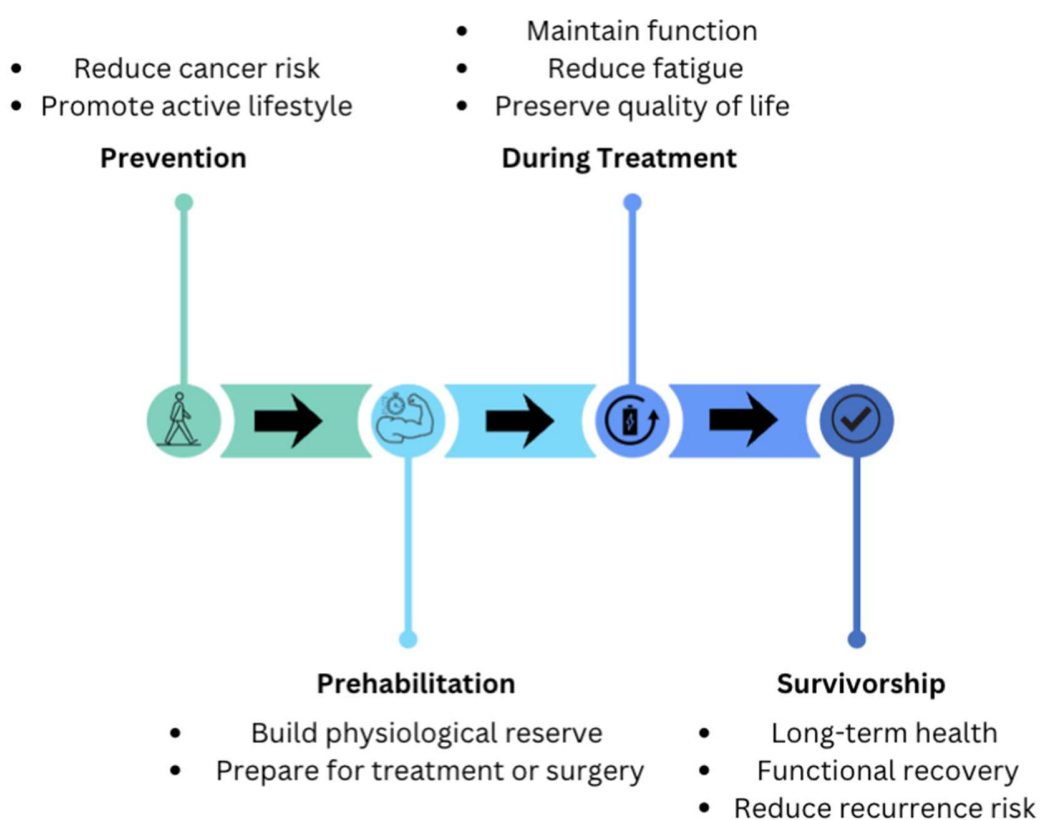
During prehabilitation, exercise aims to build physiological reserve and prepare individuals for upcoming surgery or systemic treatment, enhancing treatment tolerance and recovery potential.

Throughout active treatment, the primary goal is to maintain functional capacity, reduce fatigue, and preserve quality of life using low-to-moderate intensity, symptom-adapted exercise.

In survivorship, exercise supports long-term health, functional recovery, management of comorbidities, and reduction of recurrence risk.

This continuum-based approach reinforces exercise as a dynamic, adaptable intervention across all stages of cancer care.

Figure 13. Exercise prescription across the cancer care continuum.



Key objectives of exercise in prevention, prehabilitation, during treatment, and survivorship, highlighting the evolving role of physical activity from risk reduction to long-term recovery and health maintenance.

5.5. Core Exercise Modalities

Effective oncology exercise programmes combine:

- Aerobic exercise to improve cardiorespiratory fitness and fatigue
- Resistance training to preserve muscle mass, strength, and bone health
- Mobility, flexibility, and balance exercises to support movement quality, posture, and fall prevention

These components should be adjusted according to symptoms, treatment effects, and individual goals.

5.6. Special Clinical Considerations

Exercise can be safely performed in the presence of fatigue, peripheral neuropathy, lymphedema, ostomies, or metastatic disease when appropriately adapted and supervised. Progressive loading, symptom-based adjustment, and avoidance of high-risk movements ensure safety while maintaining benefits.

5.7. Monitoring, Progression, and Delivery Formats

Exercise progression should be gradual and guided by tolerance, symptoms, and functional outcomes. Regular reassessment supports safe progression and reinforces motivation by making improvements visible. Exercise programmes may be delivered through supervised in-person sessions, live online formats, or structured home-based models. Technology and wearables can support adherence when combined with professional guidance and behavioural strategies.

5.8. Key Messages

- Exercise is a therapeutic intervention in oncology care.
- Structured, individualized prescription is essential.
- Continuity of movement is prioritised over intensity.
- Exercise must be adapted across the cancer pathway.
- Safety, monitoring, and multidisciplinary integration are fundamental.

5.9. Rationale for Including Nordic Walking as a Recommended Aerobic Modality

Nordic Walking is included in the PACAP Guidelines as a recommended aerobic modality based on its biomechanical characteristics, documented feasibility in oncology populations, and compatibility with community-based implementation models. The purpose of this section is not to claim superiority over other aerobic exercises, but to justify its inclusion as a particularly suitable and scalable option within the PACAP framework.

5.9.1 Whole-Body Engagement and Functional Relevance

Unlike conventional walking or cycling, Nordic Walking actively involves both upper and lower limbs through coordinated pole use. This increases muscle activation in the arms, shoulders, trunk, and lower extremities, resulting in greater overall muscular engagement compared with walking alone.

For people living with and beyond cancer, this whole-body involvement is clinically relevant. Treatment-related side effects frequently include reductions in muscle strength, particularly in the upper body following surgery or systemic therapies. By integrating arm propulsion and trunk rotation into an aerobic task, Nordic Walking provides combined cardiovascular and neuromuscular stimulation within a single activity.

Systematic evidence suggests that Nordic Walking interventions in oncology settings are associated with improvements in overall muscle strength and self-reported physical activity levels, while maintaining high feasibility and safety profiles.

5.9.2 Low Mechanical Impact and Enhanced Stability

Nordic Walking is characterised by low joint impact and improved postural support due to the additional contact points provided by the poles.

This feature is particularly relevant for individuals who may experience:

- joint discomfort,
- balance impairment,
- peripheral neuropathy,
- reduced bone density, or
- general deconditioning.

Biomechanical studies in rehabilitation populations show improved gait stability and walking performance when poles are used compared to conventional walking. Although not cancer-specific, these findings support the suitability of Nordic Walking for individuals with heterogeneous functional capacity. Compared with higher-impact aerobic modalities (e.g., running, group aerobics), Nordic Walking offers a safer and more adaptable option for many patients across the cancer continuum.

5.9.3 Feasibility, Adherence, and Safety

Adherence is a central determinant of effectiveness in oncology exercise programmes. Evidence from cancer-specific interventions indicates that Nordic Walking programmes demonstrate:

- high adherence rates,
- low dropout levels,
- absence of serious adverse events when appropriately supervised.

Several practical characteristics likely contribute to this feasibility:

- outdoor setting and natural movement pattern,
- self-regulated intensity using RPE or talk test,
- minimal equipment requirements,
- social group delivery potential.

These elements align with PACAP principles of accessibility, sustainability, and continuity beyond supervised clinical care.

5.9.4 Alignment with European Physical Activity Initiatives

The inclusion of Nordic Walking also aligns with broader European initiatives promoting outdoor and community-based physical activity within cancer care and survivorship frameworks. Multiple EU-funded projects emphasise structured physical activity as part of comprehensive cancer management and lifestyle support. While not exclusive to Nordic Walking, these initiatives reinforce the importance of:

- scalable outdoor exercise models,
- community integration,
- long-term behavioural sustainability,
- accessible modalities requiring limited infrastructure.

Within this policy and implementation context, Nordic Walking represents a modality that is both evidence-informed and operationally transferable across diverse European settings.

5.9.5 Position Within the PACAP Framework

Nordic Walking was selected for detailed protocol development (Chapter 6) because it combines:

- Aerobic stimulus with whole-body muscular engagement;

- Low mechanical impact with enhanced stability;
- High feasibility and adherence in oncology populations;
- Strong compatibility with community-based implementation models.

Other aerobic modalities remain appropriate and may be prescribed according to individual preference, clinical condition, and local availability. However, Nordic Walking provides a balanced combination of functional relevance, safety, accessibility, and scalability, making it particularly suitable as a structured aerobic option within the PACAP pathway.

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CHAPTER 6. NORDIC WALKING PROTOCOL

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Nordic Walking is walking with poles. The poles help you move forward, improve posture, and engage the upper body. Follow the steps below in order. Practice slowly first, then increase your rhythm.

6.1. Posture

GOAL: Start in a tall, relaxed, “ready-to-walk” position.

DO THIS: Stand with feet hip-width apart. Spread your weight evenly on both feet. Keep your knees slightly soft (not locked). Grow tall through your spine. Keep your hips neutral and gently tighten your abdominal muscles. Drop your shoulders away from your ears. Keep your chin level and look forward.

COMMON MISTAKES: Leaning back on the heels, locking the knees, shrugging the shoulders, lifting the chin.

CHECK OUT THE VIDEO: <https://www.youtube.com/watch?v=At8jyRnqyHc>

6.2. Lean Forwards

GOAL: Create forward movement in a safe way.

DO THIS: Lean forward very slightly as one unit (from ankles to head). Do not bend at the waist. Push gently from the front of your feet to start moving. Keep looking ahead.

COMMON MISTAKES: : Bending at the waist, hunching, looking down, staying too upright.

CHECK OUT THE VIDEO: <https://www.youtube.com/watch?v=Iz1xsya3uEU&t=14s>

6.3 Walk

GOAL: Walk naturally with good foot and arm coordination.

DO THIS: Step on the ground with your heel first, then roll through the foot, then push off with the front of the foot. Swing your arms naturally from the shoulders. Keep a comfortable bend in your elbows. Your right arm moves with your left leg (and vice versa). Let your trunk rotate slightly.

COMMON MISTAKES: Looking down, stiff arms, short steps, poor coordination.

CHECK OUT THE VIDEO: <https://www.youtube.com/watch?v=ua6srgNNkCE>

6.4 Rotate

GOAL: Connect upper body and lower body.

DO THIS: Keep your spine tall and let your chest rotate gently as you move forward. Your shoulders stay relaxed and low. Your arms swing forward and back (not across your body).

COMMON MISTAKES: Bending sideways instead of rotating, stiff trunk, arms crossing the body.

CHECK OUT THE VIDEO: <https://www.youtube.com/watch?v=2Ed37h-R2m8>

6.5 Drag

GOAL: Find rhythm and pole angle (without pushing yet).

DO THIS: Put the straps on. Keep your hands relaxed and slightly open. Walk as normal and let the poles drag lightly behind you. Keep swinging your arms from the shoulders. Notice the pole angle (it should point backward, not straight down).

COMMON MISTAKES: No arm swing, stiff shoulders, trying to pull with the poles

CHECK OUT THE VIDEO: <https://www.youtube.com/watch?v=1sxIbGgdTPY>

6.6 Place

GOAL: Place the pole at the right time.

DO THIS: Keep the pole angled backward. As your arm starts to move back, let the tip of the pole touch the ground. Close your hand gently around the handle (like a friendly handshake). The pole plant happens when the opposite heel hits the ground (right pole with left heel, left pole with right heel).

COMMON MISTAKES: Planting the pole too far in front, planting too vertical, moving from the elbow instead of the shoulder, losing coordination.

CHECK OUT THE VIDEO: <https://www.youtube.com/watch?v=FM-L8Xb78tA>

6.7 Push

GOAL: Use the pole to help move forward.

DO THIS: Push the pole down and back. Use smooth pressure. As your arm goes back, your grip becomes lighter. Keep shoulders relaxed and keep the pole angle backward.

COMMON MISTAKES: Pole too vertical, stiff elbows, gripping too hard, lifting shoulders.

CHECK OUT THE VIDEO: <https://www.youtube.com/watch?v=OuL7lFWEbhg>

6.8 Extend Fully

GOAL: Finish the push with a long arm swing.

DO THIS: Keep the pole tip on the ground as long as possible. Let your hand move past your hip. Straighten your arm at the end of the swing. Your hand relaxes as you finish the push.

COMMON MISTAKES: Elbow stays bent, letting go too early, hand too tense, palm not facing the thigh.

CHECK OUT THE VIDEO: <https://www.youtube.com/watch?v=8NGEH6ny0ZE>

6.9 Release Actively

GOAL: Send the pole forward smoothly.

DO THIS: At the end of the push, open your hand. Press gently into the strap so the pole “springs” forward. Keep fingers together and relaxed. Guide the pole forward without twisting your shoulder inward.

COMMON MISTAKES: Lifting the pole too early, not using the strap, losing the spring effect.

CHECK OUT THE VIDEO: <https://www.youtube.com/watch?v=8BUtXMiydFE>

6.10 Swing Forwards

GOAL: Bring the pole forward with control to prepare the next plant.

DO THIS: Let the pole swing forward like a pendulum. Lift it with a relaxed hand (the little finger helps guide the pole). The arm swings from the shoulder and the elbow bends naturally. Prepare to “place” the pole again.

COMMON MISTAKES: Swinging only from the elbow, loose grip, poor coordination.

CHECK OUT THE VIDEO: <https://www.youtube.com/watch?v=l6TqfLX4v2s>

6.11 Quick Check

IF YOU FEEL PAIN OR DISCOMFORT: slow down, shorten the session, and speak to your healthcare team.

YOUR TECHNIQUE IS GOOD WHEN: you feel taller, your shoulders stay relaxed, and you can keep a steady rhythm.

CHAPTER 7. IMPLEMENTATION IN CLINICAL AND COMMUNITY SETTINGS

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7.1 Overview

This chapter focuses on how to implement PACAP-aligned physical activity services in real settings [56-66]. The scientific rationale, safety precautions, and exercise prescription principles are presented in Chapters 2–5. Here, the priority is operational: who does what, how patients enter the pathway, how programs run, and how the transition to community maintenance is ensured.

7.2 Core Implementation Principles

Successful implementation across Europe tends to share the same operational foundations:

1. **Multidisciplinary governance (not “extra service”)** - Physical activity must be treated as a routine supportive-care component, with defined clinical ownership and communication routes (oncology/rehabilitation/exercise/nutrition/psychology).
2. **Clear referral and triage pathway** - Patients need a simple “door” into the program (who refers, how, and when), plus an agreed triage decision (eligible now / eligible with adaptations / defer and re-check).
3. **Program standardisation with local flexibility** - A standard minimum structure (assessment → supervised phase → transition) is kept, while delivery adapts to local resources (hospital gym, community clubs, hybrid/online).
4. **Adherence support embedded in delivery** - The program design must reduce friction: scheduling, transport options, symptom-adaptation, and regular feedback loops to keep engagement stable.
5. **Planned transition from clinical to community** - Maintenance is not improvised at discharge; it is planned early, with a handover process, contacts, and a “next-step plan”.
6. **Quality assurance and safety monitoring** - Basic data on attendance, adverse events, progression, and outcomes must be captured consistently (detailed monitoring framework is developed in Chapter 9).
7. **Equity and accessibility** - Offer formats that work for different realities (urban/rural; low income; low digital literacy), including low-cost community options and home-based alternatives.

7.3. The PACAP Implementation Pathway

A practical pathway that can be applied in most settings:

Referral → Triage/Safety Check → Baseline Assessment → Supervised Program (8–12 weeks) → Transition Plan → Community Maintenance → Follow-up & Re-entry if needed

Implementation note: safety screening and contraindications follow Chapter 2.3 / 5.3. This chapter defines how the pathway is organised and delivered.

7.4 Clinical Setting Delivery Model

Clinical settings include oncology outpatient clinics, rehabilitation units, hospital-based exercise services, or medically supervised centres.

7.4.1 Minimum Operational Steps (Clinical)

- 1) Service set-up and buy-in:
 - a) Identify clinical lead (oncology/rehabilitation) + operational lead (exercise/physio).
 - b) Define referral criteria and clinical responsibility.
 - c) Establish a shared communication channel (EMR note, referral form, shared report template).
- 2) Referral triggers

Common triggers can include: diagnosis visit, start of systemic therapy, pre-surgical planning (prehab), discharge planning, survivorship follow-up.
- 3) Triage and baseline assessment:
 - a) Confirm eligibility and supervision level (low/moderate/high monitoring need).
 - b) Baseline outcomes selected from Chapter 9 indicators (e.g., 6MWT/strength/fatigue/QoL).
- 4) Supervised program delivery (typical 8–12 weeks):
 - a) Frequency and content (follow Chapter 5 principles).
 - b) Sessions are symptom-adapted; if uncertainty exists, simplify rather than cancel (Chapter 5).
- 5) Mid-program check and progression review

Short reassessment points (e.g., week 4–6) to adjust the plan and sustain adherence.
- 6) Transition planning (starts early, not at the end):
 - a) Identify community options in week 1–2 (walking groups, Nordic walking, clubs, municipal classes, hybrid support).
 - b) Prepare a patient-friendly “activity plan” and next contacts.
- 7) Discharge summary and handover:
 - a) Provide: achieved level, adaptations needed, warning signs, and the community plan.
 - b) Handover contact person for the next phase.

7.4.2 Staffing and Roles (Clinical)

Oncology team: endorses activity as part of care, triggers referrals, flags risks.

Physio/exercise specialist: assessment, prescription delivery, symptom-based adaptation, safety monitoring.

Nutrition/psychology (as needed): referral and integration when malnutrition risk or distress impacts adherence (Chapters 3-4).

Coordinator/case manager (if available): scheduling, attendance tracking, transition logistics.

7.5 Community Setting Delivery Model

Community settings include sports clubs, walking groups, municipalities, NGOs/patient associations, fitness centres, and structured home-based programs.

7.5.1 Minimum Operational Steps (Community)

- 1) Partnership mapping - Identify local delivery partners: clubs, Nordic walking groups, municipal programs, charities, primary care resources.
- 2) Instructor qualification and boundaries:
 - a. Basic oncology-specific training required (Chapter 8).
 - b. Clear boundaries: what can be handled in community vs what requires clinical review.
- 3) Entry route and handover from clinical care:
 - a. Formal handover is preferred (short referral note + safety recommendations + contact person).
 - b. If entry is direct from community, require medical clearance as defined by the pathway rules.
- 4) Program structure:
 - a. Offer a consistent schedule, simple progression, and options for low-symptom days.
 - b. Use group formats to strengthen social support (without depending on it as the only strategy).
- 5) Adherence supports - Regular attendance check, simple self-monitoring, short motivational touchpoints, and barrier-solving (transport, timing, fatigue peaks).
- 6) Feedback loop to clinical care - A clear route to refer back if symptoms worsen, red flags occur, or function declines.

7.6 Clinical-to-Community Transition

Transition is the “bridge” that prevents drop-off after supervised care.

Practical transition package (recommended):

- A. A one-page patient-friendly plan (what to do weekly, intensity cues, when to stop).
- B. Community contact: instructor name + schedule + location.
- C. Safety reminders and escalation rules (reference Chapter 2.3).
- D. Next reassessment date (e.g., 3–6 months).

7.7 Illustrative European Implementation Examples

These are examples of delivery models, not a repeat of evidence. Practical examples from different European countries help illustrate how the PACAP framework can be implemented in real-world settings

7.7.1 Clinical example: Guideline-to-workflow - hospital pathway

A hospital integrates exercise via: oncology referral triggers → standardized triage → supervised 8–12 week program → discharge summary → formal transition to a community partner.

7.7.2 Multi-country example: implementation recommendations for metastatic breast cancer care pathways

Projects developing practical implementation recommendations highlight the same operational needs: referral structures, feasible supervision models, barrier reduction, and integration into routine care management.

7.7.3 Community example: Nordic Walking groups for survivors

Nordic walking is often feasible as a community-based option because it is low-cost, scalable, social, and adaptable. The patient protocol is provided in Chapter 6; community delivery requires trained instructors and a clinical handover process when needed.

7.7.4 European Case Example: Integrated Nordic Walking and Yoga Model (“Vital Steps”)

The “Vital Steps” initiative represents an example of an integrated, group-based physical activity pathway for oncology patients undergoing treatment. The model combines Nordic Walking and yoga within a structured rehabilitation framework delivered in partnership with a hospital-based oncology centre.

Programme Structure

The intervention targeted adult oncology patients (18–75 years) undergoing active treatment and medically cleared for participation. Participants were allocated to small groups (10–15 individuals), based on clinical evaluation and functional status.

The programme consisted of:

- 2 sessions per week
- 90 minutes per session
- Total duration: 8–9 months
- Mixed indoor and outdoor settings (hospital spaces and public parks)

Each session included:

- Initial muscle activation and breathing exercises (10 minutes)
- Nordic Walking (approximately 45 minutes)
- Yoga-based balance, flexibility, and relaxation work (remaining time)

Monthly outdoor sessions in natural environments were incorporated to strengthen engagement with nature-based physical activity and enhance psychosocial well-being.

Multidisciplinary Integration

The programme was delivered by:

- A certified Nordic Walking and Yoga instructor (with nutrition background),
- Psycho-oncology psychologists,
- A music therapist,
- Support volunteers.

Psychological assessment was integrated at three time points (baseline, mid-intervention, post-intervention), using validated instruments assessing quality of life, fatigue, body image, and perceived social support.

This integration of physical, psychological, and social components aligns with the PACAP model of multidisciplinary care and patient-centred rehabilitation.

Monitoring and Evaluation

Outcome measures included:

- Body composition parameters (e.g., DXA-derived body composition, bioelectrical impedance analysis),
- Anthropometric measures (e.g., body weight, body mass index, waist circumference),
- Dietary habits Dietary habits (e.g., Mediterranean Diet Adherence Screener – MEDAS, European Prospective Investigation into Cancer and Nutrition [EPIC]-based dietary questionnaires),
- Psychological well-being indicators Psychological well-being indicators (e.g., Hospital Anxiety and Depression Scale [HADS], Distress Thermometer, European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire [EORTC QLQ-C30] emotional functioning domain),
- Fatigue and quality of life metrics (e.g., Functional Assessment of Chronic Illness Therapy–Fatigue [FACIT-F], EORTC QLQ-C30, and EuroQol-5 Dimensions [EQ-5D]).

The structured evaluation model illustrates how community-based or hospital-linked programmes can incorporate simple but meaningful monitoring systems, consistent with the PACAP monitoring framework described in Chapter 9.

Relevance to the PACAP Framework

This case illustrates several key PACAP principles:

- Structured referral and clinical screening prior to exercise;
- Integration of aerobic, strength, mobility, and mind–body components;
- Group-based delivery to enhance adherence and social support;
- Planned monitoring and multidisciplinary coordination;
- Use of outdoor environments to promote sustainability and long-term behaviour change.

While Nordic Walking represents the core aerobic modality (see Chapter 6), the inclusion of yoga demonstrates how complementary modalities may enhance balance, relaxation, and psychosocial outcomes within oncology exercise pathways.

7.7.5 European Best Practice Example: Slovenia

Several initiatives in Slovenia illustrate how physical activity can be effectively integrated into cancer care across clinical and community settings.

Adapted group-based exercise programmes, such as the “Optimistke” initiative, provide tailored sessions for breast cancer survivors, focusing on improving physical function, psychological well-being, and peer support.

In addition, the “Movement on Prescription” model represents a structured approach in which healthcare professionals formally prescribe physical activity as part of patient care, encouraging inactive individuals to adopt healthier lifestyles.

Accessible delivery formats are also highlighted through online interventions, including yoga and kinesiologist-led exercise sessions, which support patients during and after treatment by improving quality of life, reducing fatigue, and enhancing overall well-being.

Community-based programmes further combine both local and digital approaches, ensuring flexibility, accessibility, and long-term engagement in physical activity.

These examples align with the PACAP framework by demonstrating key implementation principles, including individualisation, professional supervision.

7.8 Practical Activity Examples

Example A – Clinical supervised mixed session (short format) - A structured session combining moderate aerobic work + basic resistance stations + cool-down, delivered with symptom-based adaptations and a simple progression plan.

Example B – Community Nordic Walking group (structured) - Two weekly sessions outdoors, technique aligned with Chapter 6, plus simple attendance tracking and monthly check-ins.

Example C – Hybrid home-based model - Initial supervised onboarding + a home plan + weekly remote check-in + monthly booster session.

Example D – Municipal “Cancer Survivors Fitness” class - Evening class in a community facility, adapted intensity options, cost reduction strategies, and a referral link with local oncology services.

7.9 Implementation Tools

Minimum tools that make delivery consistent:

- A. Referral form (clinical → program) and a short discharge/handover form (program → community).
- B. Attendance/adverse-event log.
- C. A standard “transition plan” template.
- D. A local directory of community options (updated regularly).

7.10 Key Messages

- ✓ This chapter operationalises implementation; the scientific rationale and safety rules are detailed in Chapters 2–5.
- ✓ Strong implementation depends on referral pathways, defined roles, and planned transitions, not only on program content.
- ✓ Clinical delivery should include triage, supervised phase, and a structured handover to community maintenance.
- ✓ Community programs require trained instructors, safety boundaries, and a feedback route back to clinical care.
- ✓ Sustainability comes from standardisation + local flexibility, continuous quality improvement, and equity-focused access.

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CHAPTER 8. TRAINING FOR PROFESSIONALS

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This chapter defines the training framework for professionals involved in the PACAP pathway. Its purpose is to ensure the safe, evidence-based, and standardised delivery of physical activity interventions for people living with and beyond cancer, across clinical and community settings. Training content complements the scientific principles (Chapters 2–5), the Nordic Walking protocol (Chapter 6), and the implementation pathways (Chapter 7), without repeating them. The focus here is on professional competencies, operational flow, and quality assurance. The training framework was developed with contributions from the National University of Ukraine on Physical Education and Sport (NUUPES) within the Erasmus+ PACAP project. Although NUUPES is not a medical institution, its contributions align with internationally accepted principles of adapted physical activity, screening, safety, and patient education. All individuals with a current or previous cancer diagnosis must obtain medical clearance before initiating structured exercise, in order to define feasibility, safe dosage, movement restrictions, and necessary adaptations based on treatment history and current symptoms.

8.1 Flow-Based Professional Training Structure

PACAP adopts a unified operational logic for professional practice:

REFERRAL → ASSESSMENT → SUPERVISED DELIVERY → COMMUNITY TRANSITION → MAINTENANCE

Training prepares professionals to act competently within each phase, ensuring clear role definition, effective communication with healthcare teams, and continuity of care.

8.1.1 Referral Pathway

Referral is initiated by oncologists, family physicians, rehabilitation specialists, or physiotherapists. Professionals must be able to explain benefits, safety principles, and realistic expectations of physical activity. Programme entry requires confirmation of medical authorisation and absence of contraindications.

8.1.2 Assessment

Professionals must be competent in conducting and interpreting basic assessments to guide exercise adaptation.

Core assessment components:

1. Risk screening (PAR-Q+ and cancer-specific precautions).
2. Functional assessment using feasible tools (e.g., 6MWT, handgrip or sit-to-stand, basic balance, fatigue scales).
3. Goal setting using the SMART framework.

Clinical escalation: Exercise must not begin, or must be interrupted, when symptoms requiring medical review are identified (e.g., unexplained pain, severe fatigue, dizziness, infection signs, acute bone pain).

8.1.3 Supervised Delivery

Typical programme duration: 8–12 weeks.

Sessions follow structured progression including Nordic Walking, aerobic exercise, mobility, coordination, and strength training, as defined in previous chapters.

Professionals monitor symptoms, perceived exertion, treatment side effects, and adherence on a weekly basis. Exercise dose is adapted according to tolerance, prioritising continuity rather than interruption.: load adjustments must follow clinical status, functional performance, and patient feedback.

8.1.4 Transition to Community

Professionals are responsible for planning and managing transition beyond supervised care:

- a. Gradual increase in autonomy and self-management.
- b. Structured referral to community-based physical activity options.
- c. Education in self-monitoring strategies (talk test, RPE, symptom awareness).

8.1.5 Maintenance Phase

Development of a 6–12-month physical activity plan aligned with long-term health goals.

Periodic follow-up (in person or online).

Reinforcement of physical activity as a sustained lifestyle behaviour.

8.2 European Mini Case-Boxes

This section may include short professional practice examples from partner institutions, illustrating referral pathways, delivery formats, and transition strategies. Each case should follow a concise structure to avoid repetition and support transferability.

8.3 Ten-Step Implementation Checklist

To ensure fidelity and safety across PACAP sites:

1. Medical clearance confirmed.
2. Risk screening completed.
3. Baseline functional assessment performed.
4. SMART goals documented.
5. Individualised activity plan defined.
6. Qualified professional supervision ensured.
7. Weekly symptom and progress monitoring.
8. Transition-to-community strategy activated.
9. Long-term follow-up plan established.
10. Data integrated into monitoring and quality improvement (Chapter 9).

8.4 Competency Framework for Professionals and Volunteers

Core competencies

- A. Understanding treatment-related physiological effects relevant to exercise.
- B. Identification of contraindications and warning signs.
- C. Ability to adapt exercise dose, modality, and progression.
 - a. Technical proficiency in Nordic Walking and functional exercise.

Safety competencies

- a. Continuous symptom monitoring.
- b. Recognition of acute risk situations.

- c. Ability to interrupt sessions and activate referral pathways.

Behaviour-change competencies

1. Support for motivation and self-efficacy.
2. Management of common barriers (fatigue, fear of movement).
3. Facilitation of long-term adherence and community integration.

8.5 Modular Training Programme (for Professionals)

Training may be delivered through 4–6 modules, depending on local needs:

Module 1: Exercise oncology fundamentals and safety

Module 2: Nordic Walking technique and clinical adaptation

Module 3: Strength and functional exercise prescription

Module 4: Monitoring, documentation, and risk management

Module 5: Behaviour-change support and communication

Module 6: Community transition and long-term planning

Assessment should prioritise practical competence, not theoretical volume.

8.6 Supervision Ratios and Escalation Protocol

Recommended supervision ratios:

- a. 1 professional : 6–10 participants (initial phase)
- b. 1 professional : 10–15 participants (transition phase)

IMMEDIATE INTERRUPTION AND MEDICAL REFERRAL ARE REQUIRED IF:

- ⊗ Chest pain or unexplained tachycardia
- ⊗ Shortness of breath at rest
- ⊗ Severe dizziness or near-syncope
- ⊗ Fever or signs of infection
- ⊗ Sudden unilateral limb swelling
- ⊗ Uncontrolled pain or extreme exhaustion
- ⊗ Acute deterioration following chemotherapy

CHAPTER 9. MONITORING AND EVALUATION

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Monitoring and evaluation (M&E) are essential to ensure that physical activity interventions delivered within the PACAP framework are implemented as intended, remain safe and effective, and can be continuously improved and sustained. Rather than duplicating clinical or scientific content presented in previous chapters, this section focuses on the operational role of M&E in supporting quality assurance, decision-making, and programme scalability.

Within PACAP, M&E is understood as a practical management tool, embedded in routine delivery, that links professional practice to accountability, learning, and long-term integration into health and community systems.

9.1 Purpose of Monitoring and Evaluation in PACAP

The primary purpose of M&E in PACAP is to create a structured feedback loop between programme delivery and outcomes. Monitoring answers the question “Are we delivering the programme as planned and safely?”, while evaluation addresses “Is the programme producing meaningful and sustainable results?”

Specifically, M&E within PACAP aims to:

1. verify fidelity of implementation across sites and contexts;
2. document adherence, retention, and safety during programme delivery;
3. track meaningful change over time in priority outcomes;
4. identify barriers, facilitators, and areas requiring adaptation;
5. support decision-making related to continuation, scaling, or redesign;
6. generate credible evidence for institutional and policy-level integration.

M&E is therefore not an external audit, but an integral component of professional practice and programme governance.

9.2 Core Monitoring Domains

To avoid redundancy, PACAP adopts a minimal and focused monitoring structure, centred on four complementary domains that apply across settings:

1. Implementation fidelity - Was the programme delivered according to the intended structure, frequency, and supervision model?

2. Participation and adherence - Did participants attend and complete the programme as planned?
3. Safety and feasibility - Were adverse events recorded and managed appropriately? Were adaptations required due to symptoms or clinical changes?
4. Outcome change – Did participants show meaningful improvement or maintenance in predefined functional, psychosocial, or lifestyle-related outcomes?

Each PACAP site may expand this framework, but these domains represent the minimum common standard.

9.3 Selection of Indicators

Indicator selection should follow three principles: relevance, feasibility, and consistency. Only indicators that directly inform programme decisions should be prioritised.

PACAP recommends limiting routine monitoring to:

- a. a small set of functional outcomes aligned with programme goals;
- b. at least one patient-reported outcome (e.g. fatigue or quality of life);
- c. process indicators (attendance, completion, adverse events).

Indicators should be collected at baseline and programme completion, with optional follow-up when feasible. Over-collection of data should be avoided to minimise burden on participants and professionals.

9.4 Data Collection and Management

Data collection within PACAP should rely on simple, standardised procedures integrated into routine workflows. Monitoring responsibilities must be clearly assigned to trained professionals.

Key operational principles include:

- a. use of validated tools already familiar to professionals;
- b. consistent timing of assessments across participants;
- c. secure data storage and controlled access;
- d. anonymisation or pseudonymisation of personal data;
- e. compliance with national and European data protection regulations (GDPR).

Where digital tools are used, low-tech alternatives should always be available to ensure inclusiveness.

9.5 Use of Monitoring Data for Programme Improvement

The value of M&E lies not in data collection itself, but in data use. PACAP encourages regular review of monitoring data to inform adaptive decision-making.

Examples include:

- a. adjusting session frequency or intensity when adherence declines;
- b. modifying delivery format in response to access or transport barriers;
- c. reinforcing supervision when safety concerns arise;
- d. strengthening behaviour-change support when drop-out increases.

Short internal reports or dashboards are sufficient and preferable to extensive documentation.

9.6 Evaluation, Reporting and Knowledge Transfer

Evaluation findings should be communicated in formats appropriate to the target audience:

1. concise summaries for programme teams and managers;
2. structured reports for funders or institutional partners;
3. aggregated data for dissemination and policy dialogue.

Clear reporting of both successes and limitations supports transparency, learning, and credibility. Where possible, results should inform future programme planning, professional training needs, and resource allocation.

9.7 Quality Assurance, Ethics and Sustainability

Quality assurance in PACAP relies on:

1. consistent monitoring procedures across sites;
2. professional competence in assessment and documentation;
3. routine review of safety incidents and adaptations.

Ethical practice requires informed consent for data use, proportional data collection, and respect for participant autonomy. For sustainability, M&E systems should be embedded into routine practice, rather than treated as time-limited project activities. Simple tools that can be maintained over time are preferred to complex research-driven systems.

9.8 Key Messages

- ✓ Monitoring and evaluation are operational tools, not research add-ons.
- ✓ Data collection should be purposeful, minimal, and feasible.
- ✓ M&E supports quality, safety, adaptation, and sustainability.
- ✓ Continuous feedback strengthens programme delivery and impact.
- ✓ Consistent monitoring enables integration of physical activity into standard cancer care pathways.

9.9 Data Management and Reporting

Data management within PACAP programmes should follow standardized procedures to ensure data quality, confidentiality, and regulatory compliance. All data must be collected and stored securely in accordance with applicable data protection legislation, including the GDPR.

Reporting should be proportionate to programme scope and intended audience. Regular summaries of participation, adherence, safety, and outcome trends support programme refinement, accountability, and communication with stakeholders. Monitoring results should be actively used to inform decision-making, adaptation, and long-term sustainability of PACAP-aligned interventions.



Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

Project Reference: 101183633 - Promotion of physical activity for cancer patients (PACAP)

PACAP Consortium Disclosure

Before engaging in any activities shown in this video, please consult your physician or healthcare provider and ensure you have medical clearance to participate in physical exercise. During the activity, stop immediately if you experience pain, dizziness, unusual shortness of breath, irregular heartbeat, nausea, faintness, or any other concerning symptom, and seek medical assistance if symptoms persist.

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