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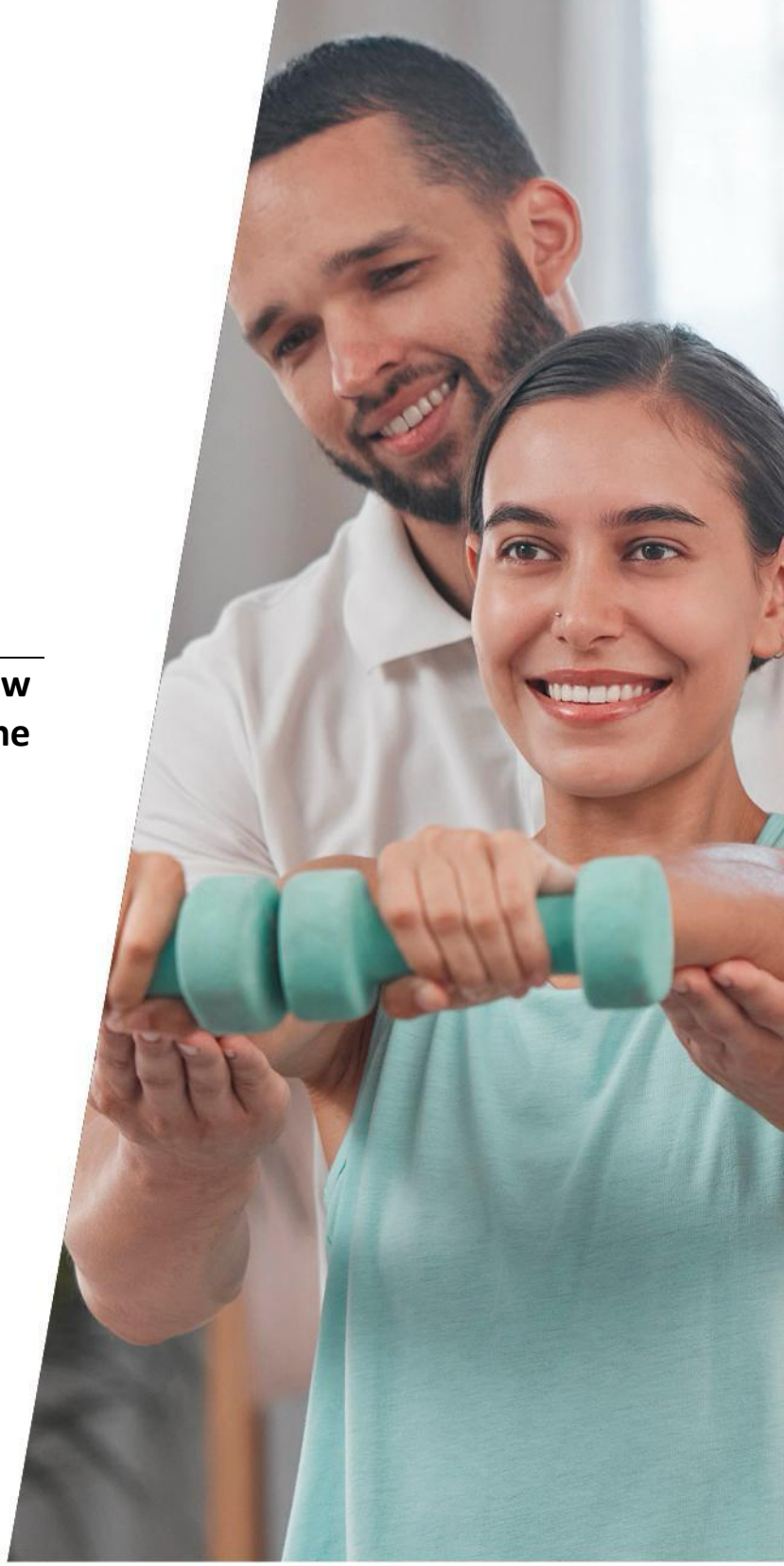

A2.1 - Study Analysis, critical review of the best practice concerning the exercise in cancer patients

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1. Introduction

The primary objective of Activity A2.1 is to conduct a comprehensive analysis and critical review of best practices concerning exercise for cancer patients, with a specific focus on scientific evidence and effective methodologies. This task involves examining clinical and sports-related best practices, peer-reviewed papers, and recent clinical studies.

To achieve this, the consortium gathered key scientific evidence across the most common cancer types. This process resulted in a detailed analysis of methodologies and clinical practices, which will serve as the foundation for the educational content of the upcoming pilot course.

To facilitate data collection, FPG developed an Excel database, which was uploaded to Google Drive on December 15, 2025. The database serves as a repository for the following data points:

- Study Types: Clinical trials, reviews, meta-analyses, clinical guidelines, Cochrane Central Register of Controlled Trials (CENTRAL), PubMed/MEDLINE, and Scopus.
- Cancer Types: Breast, colon, prostate, urothelial, gynecological, lung, pancreatic, gastrointestinal (GI), and hematological cancers.
- Clinical Outcomes: Fatigue, cardiotoxicity, cachexia, sarcopenia, peripheral neuropathy, cognitive impairment, arthralgia, sleep disorders, quality of life, depression, and anxiety.
- Patient Demographics: Disease stage, training period, and the type/number of patients included.
- Exercise Parameters: Duration, frequency, intensity, and setting.
- Assessment Tools: Validated tests and questionnaires.

Each partner was responsible for identifying and uploading at least 12 articles relevant to specific cancer types, as categorized in Table 1 (FPG, Foro Italico, Maison de l'Après Cancer, and Alexandru Ioan Cuza University).

Upon completion of the database, a total of 65 articles were collected, covering all tumor types defined in the project scope. Table 1 summarizes the distribution of studies by cancer type, contributing partner, and the total number of patients involved.

Table 1- Distribution of studies by cancer type and partner

Number of studies	Type of cancer	Partner	Number of patients included
13	Breast	FPG	5863
3	Gynecological	FPG	950
4	Lung	UAIC	958

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4	Hematological	UAIC	1080
6	Colon	Foro Italico	1061
7	GI Tumors	Foro Italico	352
6	Pancreas	Foro Italico	842
14	Prostate	IR	3429
7	Urothelial/Bladder	IR	1270
2	Guidelines	UAIC/Foro Italico	Not applicable 1 all types of cancer 1 colon cancer type

Furthermore, various clinical and physical outcomes were investigated.

Table 2 - Detailed breakdown of these outcomes, categorized by cancer type

Outcomes	Lung	Hematological	Prostate	Bladder	Breast	Gynecological	Pancreas	Colon	GI	Tot studies/outcome
QoL	3	4	8	4	8	3	3	3	4	40
Fatigue	1	2	6	1	6	2	2	1	0	21
Psychological (anxiety/depression/anxiety	2	2	0	2	2	2	2	1	0	13
Sleep disturbance	1	1	0	1	3	0	0	1	0	7
Physical activity	1	1	0	3	0	0	0	0	0	5
Respiratory	1	0	0	0	0	0	0	0	0	1
Nutrition/body composition	1	0	0	4	2	1	0	1	1	10
Inflammatory markers	0	0	2	0	0	0	2	0	0	4
Sexual function	0	0	1	0	0	0	0	0	0	1
CIPN	0	0	0	0	0	2	0	0	0	2
Lymphedema	0	0	0	0	2	0	0	0	0	2
Survival/mortality	0	0	0	0	0	1	2	1	0	4
Gastrointestinal	0	0	0	0	1	0	0	1	0	2

2. Breast and Gynecological Cancer

2.1 Search process description

A literature search was performed using the PubMed database to identify studies on breast and gynecological cancers. The search strategy employed combinations of keywords, including 'physical activity' or 'exercise' paired with 'breast cancer' and 'gynecological cancer'. The selection was restricted to publications from the last decade to ensure the inclusion of contemporary evidence.

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2.2 Synthesis of results

2.2.1 Total number of articles identified by disease type

The search identified a total of 16 relevant articles, comprising 13 studies on breast cancer and 3 on gynecological cancers (specifically, two focused on ovarian cancer and one on endometrial cancer). While four studies were published between 2018 and 2020, the vast majority of the evidence (12 articles) emerged between 2022 and 2025.

2.2.2 Study designs included

The majority of the articles (11) are Randomized Controlled Trials (RCTs). The remaining evidence includes two Systematic Reviews and Meta-analyses of RCTs, one Systematic Review, and one Scoping Review. Additionally, one Study Protocol for an RCT was identified.

Table 3 - Characteristics of included studies on breast and gynecological cancers

Study	Study Design	Number of Participants
1_Breast_Medeiros Torres et al_2022	Systematic review and meta-analysis of RCT	20 RCT involving 1793 participants
2_Breast_Bettariga et al_2025	Systematic review and meta-analysis of RCT	22 studies (968 patients)
3_Breast_Dieli-Conwright_2018	RCT	100 patients
4_Breast_Scott et al_2023	RCT	158 participants
5_Breast_Ficarra et al_2022	Systematic review of RCT	22 studies/2013 participants
6_Breast_Bettariga et al_2025	RCT	32 patients
7_Breast_Dieli-Conwright_2018	RCT	100 patients
8_Breast_Min et al_2024	RCT	56 patients
9_Breast_Mavropalias et al_2022	Randomized Trial	106 patients
10_Breast_Basha et al_2022	Randomised Trial	60 patients
11_Breast_Hiensch et al_2024	RCT	357 patients
12_Gyne_Cao et al_2023	RCT	134 patients
13_Breast_Soriano-Maldonado et al_2019	Study protocol for the EFICAN	60 patients
14_Breast_Soriano-Maldonado et al_2023	RCT	60 patients
15_Gyne_Jones et al_2020	Systematic Review	34 studies/333 patients

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Study	Study Design	Number of Participants
16_Gyne_Shearsmith et al_2025	Scoping review	22 studies, 483 patients

2.2.3 Disease stages

The included studies examined a broad spectrum of disease stages, ranging from Stage 0 to Stage IV, as well as patients in the follow-up phase. The distribution was characterized as follows:

- Follow-up: 2 articles
- Not reported: 3 articles
- All stages: 1 article
- Stages 0 to III: 1 article
- Stages I to III: 5 articles
- Stages I to IV: 3 articles
- Stage IV: 1 article

2.2.4 Intervention timing

Across the 16 identified articles, exercise programs were implemented at various stages of the oncological continuum, distributed as follows:

- During oncological treatment (chemotherapy, radiotherapy, surgery): 4 articles
- Follow-up: 9 articles
- Mixed timeline (both during treatment and follow-up): 3 articles

2.2.5 Characterization of exercise protocols

2.2.5.1 Duration

The duration of the exercise protocols analyzed in the 16 articles showed significant variability, ranging from a single acute session to one year (52 weeks).

The programs are categorized as follows:

- Single bout: 1 article
- 4–8 weeks (1–2 months): 2 articles
- 12–16 weeks (3–4 months): 5 articles
- 6–9 months: 2 articles
- Variable range: 5 articles

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- Mixed: 1 article

2.2.5.2 Type

The characteristics of the exercise programs identified across all 16 articles are summarized in the table below:

Table 4 - Types of exercise programs identified in the included studies on breast and gynecological cancers

EXERCISE PROGRAM	Aerobic training (AT)	Resistance training (RT)	Combined (AT + RT)	Mind body (yoga, QiGong, pilates)	Other (stretching, balance)
1_Breast_Medeiros Torres et al_2022	●	●	●	●	
2_Breast_Bettariga et al_2025	●	●	●		
3_Breast_Dieli-Conwright_2018			●		
4_Breast_Scott et al_2023	●				
5_Breast_Ficarra et al_2022	●	●	●	●	
6_Breast_Bettariga et al_2025		●			
7_Breast_Dieli-Conwright_2018	●	●			
8_Breast_Min et al_2024		●			●
9_Breast_Mavropalias et al_2022	●	●			
10_Breast_Basha et al_2022		●			
11_Breast_Hiensch et al_2024	●	●			●
12_Gyne_Cao et al_2023	●				
13_Breast_Soriano-Maldonado et al_2019		●			●

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14_Breast_Soriano-Maldonado et al_2023		●			●
15_Gyne_Jones et al_2020	●			●	
16_Gyne_Shearsmith et al_2025	●				

2.2.5.3 Delivery method

The delivery methods for physical activity interventions identified across the 16 included studies are summarized in the table below:

Table 5 - Physical activity delivery methods in breast and gynecological cancer studies

PHYSICAL ACTIVITY DELIVERY METHODS	Supervised (Gym, or clinical setting) - Individual	Supervised (Gym, or clinical setting) - Group	Supervised (Unspecified)	Unsupervised (home-based, or telephone-based)	Unsupervised (Unspecified)
1_Breast_Medeiros Torres et al_2022			●		●
2_Breast_Bettariga et al_2025			●		
3_Breast_Dieli-Conwright_2018	●				
4_Breast_Scott et al_2023	●				
5_Breast_Ficarra et al_2022	●			●	
6_Breast_Bettariga et al_2025	●				
7_Breast_Dieli-Conwright_2018	●				
8_Breast_Min et al_2024			●	●	

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9_Breast_Mavropalias et al_2022				●	
10_Breast_Basha et al_2022		●			
11_Breast_Hiensch et al_2024	●				●
12_Gyne_Cao et al_2023				●	
13_Breast_Soriano-Maldonado et al_2019	●	●			
14_Breast_Soriano-Maldonado et al_2023	●	●			
15_Gyne_Jones et al_2020				●	
16_Gyne_Shearsmith et al_2025	●			●	

2.2.6 Assessment parameters

2.2.6.1 Comorbidities

Of the 16 studies analyzed, only 6 examined the presence of patient comorbidities. Specifically, these included:

- **Metabolic syndrome**: 2 articles
- **Cardiovascular disease**: 1 article
- **Obesity/overweight**: 2 articles
- **Lymphedema**: 1 article

2.2.6.2 Anthropometric data

Out of a total of 16 articles, only 10 incorporated anthropometric assessments such as BMI, BIA, DEXA, or circumferences (hip and waist).

2.2.6.3 Functional tests

Various functional tests were employed across the included studies to assess physical performance; these assessment parameters and the specific tests used in each article are summarized in the table below:

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Table 6 - Summary of functional tests in breast and gynecological cancer studies

FUNCTIONAL TESTS	Aerobic Capacity (VO2, 6MWT, CPET)	Muscular Strength (1RM, Dynamometer)	Mobility (Sit-to-stand, ROM, MVPA)	Not reported
1_Breast_Medeiros Torres et al_2022				●
2_Breast_Bettariga et al_2025	●	●		
3_Breast_Dieli-Conwright_2018	●	●		
4_Breast_Scott et al_2023	●			
5_Breast_Ficarra et al_2022	●	●	●	
6_Breast_Bettariga et al_2025	●	●		
7_Breast_Dieli-Conwright_2018	●	●	●	
8_Breast_Min et al_2024		●	●	
9_Breast_Mavropalias et al_2022			●	
10_Breast_Basha et al_2022		●	●	
11_Breast_Hiensch et al_2024	●	●		
12_Gyne_Cao et al_2023				●
13_Breast_Soriano-Maldonado et al_2019	●	●		
14_Breast_Soriano-Maldonado et al_2023	●	●		
15_Gyne_Jones et al_2020	●		●	
16_Gyne_Shearsmith et al_2025	●		●	

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2.2.6.4 Administered questionnaires

From the analysis of the 16 included articles, the use of multiple validated questionnaires emerged, allowing for the investigation of various aspects of patient health and well-being. These instruments can be classified into the following categories:

- **Health-Related Quality of Life (HRQoL):** Assessment of general and specific quality of life using tools such as **EORTC QLQ-C30 / QLQ-BR23**, the **FACT series (G, B, O, B+4)**, **SF-36 (RAND)**, **EQ-5D-5L / EQ-VAS**, and the **SWLS** scale.
- **Fatigue, Pain, and Toxicity:** Investigation of debilitating symptoms via **FACIT-F / FACT-F**, **BFI**, **Fatigue Assessment Questionnaire / (QLQ)-FA12**, and **FACT-An** for anemia. Additionally, the **Brief Pain Inventory (BPI)** and the **VAS** scale were employed for pain, the **FACT/GOG-Ntx** scale for treatment-induced neurotoxicity, and the **Memorial Symptoms Assessment Scale – Physical Symptoms Subscale** for general physical symptoms.
- **Upper Limb Function:** Monitoring of disability and pain in the arm, shoulder, and hand—particularly relevant in breast cancer—through the **DASH (Disabilities of the Arm, Shoulder, and Hand)** and **SPADI (Shoulder Pain and Disability Index)** questionnaires.
- **Psychological Well-being and Sleep:** Screening for anxiety and depression using **HADS** and **CES-D**, alongside the analysis of sleep quality via the **PSQI (Pittsburgh Sleep Quality Index)**.
- **Diet and Physical Activity:** Lifestyle assessment through the **Godin Leisure-Time Exercise Questionnaire** (including modified versions), the **Korean Global Physical Activity Questionnaire**, and the **Paffenbarger Physical Activity Questionnaire**. Furthermore, the **Stanford 7-Day Physical Activity Recall**, **3-day dietary records / AHEI-2010**, self-efficacy scales (**Exercise/Eating Self-efficacy**), and **validated physical activity history** were utilized.
- **Clinical Parameters and Other Measures:** Evaluation of concomitant pathologies using the **Charlson Comorbidity Index** and functional physical performance through the **Short Physical Performance Battery (SPPB)**.

2.2.6.5 Clinical outcomes

Various clinical outcomes were identified across the 16 analyzed studies; specifically, these included:

- **Fatigue**: 8 articles

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- **Serum biomarkers and inflammation**: 3 articles
- **Quality of Life (QoL):** 11 articles
- **Mental health (Depression, anxiety, and life satisfaction):** 4 articles
- **Sleep quality:** 3 articles
- **Chemotherapy-induced peripheral neuropathy (CIPN):** 2 articles
- **Changes in body composition**: 3 articles
- **Lymphedema:** 2 articles
- **Gastrointestinal Symptoms (Nausea, vomiting, constipation, and diarrhea):** 1 article

2.2.6.6 Physical outcomes

Various physical outcomes were identified across the 16 analyzed studies; these have been categorized and summarized in the table below:

Table 7 - Summary of physical outcomes in breast and gynecological cancer studies

PHYSICAL OUTCOMES	Cardiorespiratory fitness	Physical function	Muscular strength	Not reported
1_Breast_Medeiros Torres et al_2022				●
2_Breast_Bettariga et al_2025				●
3_Breast_Dieli-Conwright_2018				●
4_Breast_Scott et al_2023	●	●		
5_Breast_Ficarra et al_2022	●		●	
6_Breast_Bettariga et al_2025				●
7_Breast_Dieli-Conwright_2018	●		●	
8_Breast_Min et al_2024		●		
9_Breast_Mavropalias et al_2022		●		

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10_Breast_Basha et al_2022		●		
11_Breast_Hiensch et al_2024		●		
12_Gyne_Cao et al_2023				●
13_Breast_Soriano-Maldonado et al_2019	●		●	
14_Breast_Soriano-Maldonado et al_2023	●		●	
15_Gyne_Jones et al_2020				●
16_Gyne_Shearsmith et al_2025		●		

3. Lung and hematological cancer

3.1 Search process description

A literature search was performed using the PubMed database to identify studies on exercise/physical activity interventions in lung cancer and hematological malignancies. The search strategy employed combinations of keywords including 'physical activity' OR 'exercise' paired with 'lung cancer' OR 'non-small cell lung cancer' and 'hematologic cancer' OR 'hematological malignancy' OR 'multiple myeloma' OR 'stem cell transplant'. Publications from the last decade were prioritized to capture contemporary evidence.

3.2 Synthesis of results

3.2.1 Total number of articles identified by disease type

The search identified a total of 9 relevant sources: 4 focused on lung cancer, 4 on hematological cancers, and 1 cross-cutting exercise guideline covering multiple cancer types. The evidence spans 2017–2025, with publications in 2017, 2019, 2020, 2021, 2022, 2024, and two sources in 2025.

3.2.2 Study designs included

Study designs included across the nine sources comprised a range of primary and secondary research approaches in oncology exercise science. Five sources were **randomized controlled trials**

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(RCTs) (three in lung cancer: Yu et al., 2024; Ferreira et al., 2021; Rutkowska et al., 2019; and two in hematological cancer: Dreyling et al., 2025; Koutoukidis et al., 2020).
Two sources were **systematic reviews and meta-analyses** (Hu et al., 2025 in advanced lung cancer; Xu et al., 2022 in hematological malignancies). **One study was a single-arm feasibility cohort** examining exercise after allogeneic stem cell transplantation (Abo et al., 2017). One additional source was an **expert guideline/consensus** statement on exercise in oncology (Campbell et al., 2019), synthesizing evidence from multiple trials and reviews.

Table 8 - Characteristics of included studies on lung and hematological cancers

Study	Study Design	Number of Participants
1. Hematologic cancer – Dreyling et al., 2025	RCT	32 patients (analyzed)
2. Lung cancer – Yu et al., 2024	RCT	84 randomized (72 completed)
3. Lung cancer – Hu et al., 2025 (SR/MA)	Systematic review / Meta-analysis	749 total participants (687 advanced lung cancer)
4. Hematologic cancer – Xu et al., 2022 (SR/MA)	Systematic review / Meta-analysis	874 total participants (15 RCTs included)
5. Lung cancer – Ferreira et al., 2021	RCT	95 analyzed (124 randomized)
6. Hematologic cancer – Koutoukidis et al., 2020	RCT	131 randomized
7. Lung cancer – Rutkowska et al., 2019	RCT	40 randomized (30 completed)
8. All cancer types – Campbell et al., 2019	Guideline / Consensus	Not applicable (evidence synthesis)
9. Hematologic cancer – Abo et al., 2017	Single-arm feasibility study	43 participants

Legend: RCT = Randomized Controlled Trial; SR/MA = Systematic Review/Meta-analysis. For SR/MA studies, the number reflects the total pooled participants from included trials. For primary studies, both randomized and analyzed samples are indicated when reported.

3.2.3 Disease stages

Across the included evidence, disease staging was variably reported and depended on the cancer type. For lung cancer, both surgically resectable disease and advanced/metastatic disease were represented. For hematological cancers, patients were primarily described by disease status and treatment phase (e.g., newly diagnosed multiple myeloma during induction, survivors, or post-transplant). The distribution can be summarized as follows:

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- **Early-stage / surgically resectable NSCLC (pre-/peri-operative): 2 articles (Yu et al., 2024; Ferreira et al., 2021).**
- **Advanced NSCLC (stage III/IV or IIIB/IV; during systemic therapy): 2 sources (Rutkowska et al., 2019; Hu et al., 2025).**
- **Lung cancer stage not specified: 0 additional primary studies beyond the above.**
- **Hematological malignancies (non-TNM staging; mixed diagnoses or myeloma-specific cohorts): 4 sources (Dreyling et al., 2025; Koutoukidis et al., 2020; Xu et al., 2022; Abo et al., 2017).**
- **All cancer types (guideline; includes lung and hematologic populations among others): 1 source (Campbell et al., 2019).**

3.2.4 Intervention timing

Across the included evidence, exercise programs were implemented at different points along the care continuum:

- **During active oncological treatment (e.g., chemotherapy/induction therapy, peri-operative period): 4 primary studies (Yu et al., 2024; Rutkowska et al., 2019; Ferreira et al., 2021; Dreyling et al., 2025).**
- **Follow-up / survivorship (post-treatment or post-transplant): 2 primary studies (Koutoukidis et al., 2020; Abo et al., 2017).**
- **Evidence syntheses and guideline sources covered mixed timelines across treatment and follow-up: 3 sources (Hu et al., 2025; Xu et al., 2022; Campbell et al., 2019).**

3.2.5 Characterization of exercise protocols

3.2.5.1 Duration

The duration of exercise protocols varied from 2 weeks to 6 months in primary studies, while the systematic reviews and guideline covered wider ranges.

The programs are categorized as follows:

- **≤2 weeks: 1 article (Yu et al., 2024).**
- **6–8 weeks (≈1.5–2 months): 2 articles (Rutkowska et al., 2019; Abo et al., 2017).**
- **9–12 weeks (≈2–3 months): 2 articles (Dreyling et al., 2025; Ferreira et al., 2021).**
- **6 months: 1 article (Koutoukidis et al., 2020).**
- **Variable range (systematic reviews/guideline): 3 sources (Hu et al., 2025; Xu et al., 2022; Campbell et al., 2019).**

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3.2.5.2 Type

The characteristics of the exercise programs identified across all 9 articles are summarized in the table below:

Table 9 - Types of exercise programs identified in the included studies on lung and hematological cancers

Study	Aerobic training (AT)	Resistance training (RT)	Combined (AT + RT)	Mind–body (yoga, QiGong, pilates)	Other (stretching, balance, respiratory, relaxation)
1. Hematologic cancer – Dreyling et al., 2025	✓	✓	✓	—	✓
2. Lung cancer – Yu et al., 2024	✓	—	—	—	—
3. Lung cancer – Hu et al., 2025 (SR/MA)	(✓)	(✓)	(✓)	✓	(✓)
4. Hematologic cancer – Xu et al., 2022 (SR/MA)	(✓)	(✓)	(✓)	(✓)	(✓)
5. Lung cancer – Ferreira et al., 2021	✓	✓	✓	—	✓ (relaxation, breathing)
6. Hematologic cancer – Koutoukidis et al., 2020	✓	✓	✓	—	—
7. Lung cancer – Rutkowska et al., 2019	✓	✓	✓	—	✓ (respiratory training, Nordic walking)
8. All cancer types – Campbell et al., 2019 (Guideline)	✓	✓	✓	✓	(✓)
9. Hematologic cancer – Abo et al., 2017	✓	✓	✓	—	✓

Legend: ✓ Clearly reported and explicitly used in that specific study; (✓) Partially reported or inconsistently included; — = not reported

3.2.5.3 Delivery method

The delivery methods for physical activity interventions identified across the 9 included studies are summarized in the table below:

Table 10 - Physical activity delivery methods in lung and hematological cancer studies

Study	Supervised (Gym/Clinical) – Individual	Supervised (Gym/Clinical) – Group	Supervised (Unspecified)	Unsupervised (Home/Telephone-based)	Unsupervised (Unspecified)

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1. Hematologic cancer – Dreyling et al., 2025	✓	—	—	✓	—
2. Lung cancer – Yu et al., 2024	✓	—	—	—	—
3. Lung cancer – Hu et al., 2025 (SR/MA)	✓	✓	✓	✓	—
4. Hematologic cancer – Xu et al., 2022 (SR/MA)	✓	✓	✓	✓	✓
5. Lung cancer – Ferreira et al., 2021	—	—	—	✓	—
6. Hematologic cancer – Koutoukidis et al., 2020	✓	—	—	✓	—
7. Lung cancer – Rutkowska et al., 2019	✓	—	—	—	—
8. All cancer types – Campbell et al., 2019 (Guideline)	✓	✓	✓	✓	✓
9. Hematologic cancer – Abo et al., 2017	—	✓	—	✓	—

Legend: ✓ = delivery method clearly reported in the study; — = delivery method not reported;

3.2.6 Assessment parameters

3.2.6.1 Comorbidities

Comorbidities were commonly reported across the included studies and varied by cancer type, treatment phase, and survivorship stage. In hematological populations, transplant- and disease-related complications were prominent. The alloSCT cohort study by Abo et al. reported transplant-related morbidity, hospitalisation burden, and treatment complications as key clinical considerations influencing participation in exercise, alongside diagnostic heterogeneity (e.g., acute leukaemias, myelofibrosis, myeloma). Similarly, Koutoukidis et al. identified bone disease, pain, and ongoing maintenance therapy in multiple myeloma survivors as relevant comorbidity factors affecting exercise capacity and adherence. In the REAL-FITNESS RCT in newly diagnosed multiple myeloma, comorbidity burden was formally assessed using the Revised Myeloma Comorbidity Index and included anaemia, osteolytic lesions, fatigue, depression, and infection risk. Across broader

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hematologic malignancies, Xu et al. highlighted treatment-related symptoms such as chemotherapy-associated fatigue and reduced functional status as common clinical burdens considered in exercise trials.
In lung cancer studies, comorbidities were largely respiratory and cardiometabolic. Yu et al. focused specifically on patients with non-small cell lung cancer and coexisting COPD, while also documenting cardiovascular disease, hypertension, and diabetes as background conditions influencing postoperative rehabilitation outcomes. Rutkowska et al. similarly reported COPD, coronary artery disease, diabetes, and smoking history as baseline comorbidities in patients undergoing chemotherapy-phase exercise interventions. Ferreira et al. included cardiometabolic disease, COPD, nutritional risk, and functional impairment among surgical candidates participating in multimodal prehabilitation. In advanced lung cancer meta-analysis data, Hu et al. described symptom clusters such as dyspnea, sleep disturbance, anxiety, and depression as clinically relevant comorbid burdens affecting fatigue and quality-of-life outcomes. Finally, the ACSM consensus synthesis by Campbell et al. emphasized broader survivorship comorbidities—including cardiovascular risk, neuropathy, bone fragility, and treatment toxicities—as key modifiers of exercise prescription across cancer populations.

3.2.6.2 Anthropometric data

Anthropometric data were routinely collected across the included hematological cancer studies to describe baseline characteristics and support exercise prescription. In the alloSCT cohort by Abo et al., demographic and anthropometric variables such as age, sex, and body mass index were recorded alongside clinical transplant characteristics. Similarly, the multiple myeloma survivorship trial by Koutoukidis et al. reported detailed body composition measures, including body weight, BMI, body fat percentage, and muscle mass, to evaluate changes associated with exercise participation. The REAL-FITNESS trial in newly diagnosed multiple myeloma also included anthropometric indicators such as weight and BMI as baseline descriptors and monitoring variables. Across broader hematologic malignancies, Xu et al. extracted standard demographic and anthropometric characteristics (e.g., age, sex, and baseline clinical characteristics) from included RCTs to contextualize exercise outcomes.
In lung cancer studies, anthropometric data were consistently used to characterize participants and inform functional assessment. Yu et al. reported age, sex, BMI, and COPD history duration as key baseline descriptors in postoperative rehabilitation research. Rutkowska et al. similarly documented age, sex, BMI, and tumour characteristics to describe patients undergoing exercise during chemotherapy. In surgical populations, Ferreira et al. expanded anthropometric assessment to include weight, BMI, fat-free mass, body fat percentage, and pulmonary function parameters to guide prehabilitation planning. The meta-analysis by Hu et al. primarily reported demographic and baseline patient characteristics such as age and disease stage across included trials, reflecting variability in anthropometric reporting. Finally, the ACSM consensus synthesis by Campbell et al.

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emphasized the importance of body composition, weight, and lean mass evaluation as part of standard assessment for exercise programming across cancer survivorship.

3.2.6.3 Functional tests

Various functional tests were employed across the included studies to assess physical performance; these assessment parameters and the specific tests used in each article are summarized in the table below:

Table 11 - Summary of functional tests in lung and hematological cancer studies

Study	Aerobic Capacity (VO_2, 6MWT, CPET, ISWT)	Muscular Strength (1RM, Dynamometer)	Mobility / Functional Performance (Sit-to-stand, TUG, ROM)	Balance / Coordination	Pulmonary Function (FEV1, FVC)	Physical Activity Monitoring (steps, accelerometer, MVPA)	Performance Status (KPS, ECOG)
1. Hematologic cancer – Dreyling et al., 2025	✓	✓	✓ (TUG)	—	—	✓	✓
2. Lung cancer – Yu et al., 2024	✓ (CPET, 6MWT)	—	✓	—	✓	✓	—
3. Lung cancer – Hu et al., 2025 (SR/MA)	(✓)	(✓)	(✓)	—	(✓)	(✓)	—
4. Hematologic cancer – Xu et al., 2022 (SR/MA)	(✓)	(✓)	(✓)	—	—	(✓)	✓
5. Lung cancer – Ferreira et al., 2021	✓ (6MWT)	—	✓	—	✓	✓ (CHAMPS)	—
6. Hematologic cancer – Koutoukidis et al., 2020	✓ (VO_2 peak)	✓ (10RM, grip)	✓	—	—	✓ (accelerometer)	—

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7. Lung cancer – Rutkowska et al., 2019	✓ (6MWT)	✓	✓ (Sit-to-stand, Up-and-Go)	✓ (Fullerton battery components)	✓	—	✓
8. All cancer types – Campbell et al., 2019 (Guideline)	(✓)	(✓)	(✓)	(✓)	(✓)	(✓)	(✓)
9. Hematologic cancer – Abo et al., 2017	✓ (ISWT)	✓ (quadriceps, grip)	✓	—	—	✓ (Fitbit, IPAQ)	—

Legend: ✓ = clearly measured and reported in that specific study; **(✓)** = mentioned, included, or used in some of the studies inside a systematic review/guideline; — = not reported

3.2.6.4 Administered questionnaires

Outcome assessment across studies was multidimensional, with quality-of-life and fatigue questionnaires most frequently used, while psychological, dyspnea, and physical activity instruments varied according to cancer type, treatment phase, and intervention focus.

Table 12 - Summary of administered questionnaires in lung and hematological cancer studies

Questionnaire	1. Hematologic cancer – Dreyling et al., 2025	2. Lung cancer – Yu et al., 2024	3. Lung cancer – Hu et al., 2025 (SR/MA)	4. Hematologic cancer – Xu et al., 2022 (SR/MA)	5. Lung cancer – Ferreira et al., 2021	6. Hematologic cancer – Koutoukidis et al., 2020	7. Lung cancer – Rutkowska et al., 2019	8. All cancer types – Campbell et al., 2019 (Guideline)	9. Hematologic cancer – Abo et al., 2017
Quality of Life (QoL)									
SF-12	✓	—	—	—	—	—	—	—	—
SF-36	—	—	—	(✓)	✓	—	—	—	—
EORTC QLQ-C30	—	✓	(✓)	(✓)	—	—	—	—	—
FACT-G	—	—	(✓)	(✓)	—	✓	—	—	—
FACT-L	—	—	—	—	✓	—	—	—	—
FACT-BMT	—	—	—	—	—	—	—	—	✓
Fatigue									

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FACIT-F / FACT-F	—	—	(✓)	(✓)	—	✓	—	—	—
Brief Fatigue Inventory (BFI)	—	—	(✓)	—	—	—	—	—	—
MFSI-SF	—	—	(✓)	—	—	—	—	—	—
Psychological Outcomes (Anxiety, Depression, Stress)									
HDRS-17	✓	—	—	—	—	—	—	—	—
HADS	—	—	(✓)	—	✓	✓	—	—	—
DASS	—	—	(✓)	—	—	—	—	—	—
Sleep / Symptom Burden									
PSQI	—	—	(✓)	—	—	—	—	—	—
ESAS	—	—	—	(✓)	—	—	—	—	—
Physical Activity Behaviour									
IPAQ	—	—	—	—	—	—	—	—	✓
PAAI	—	—	—	—	—	—	—	—	✓
CHAMPS	—	—	—	—	✓	—	—	—	—
Dyspnea / Respiratory Symptoms									
mMRC	—	—	—	—	—	—	✓	—	—
BDI	—	—	—	—	—	—	✓	—	—
Borg scale	—	—	—	—	—	—	✓	—	—
Nutrition / Clinical Screening									
PG-SGA	—	—	—	—	✓	—	—	—	—
Guideline Recommendations (not primary measurement)									
QoL / fatigue / psychological scales recommended	—	—	—	—	—	—	—	(✓)	—

Legend: ✓ = questionnaire administered in that study; (✓) = reported within some trials included in SR/guideline; — = not reported

3.2.6.5 Clinical outcomes

Clinical outcomes across the included studies were multidimensional and encompassed patient-reported outcomes, functional performance measures, treatment-related indicators, and healthcare utilization variables.

Fatigue was one of the most frequently assessed outcomes and was reported in six sources (Dreyling et al., 2025; Koutoukidis et al., 2020; Abo et al., 2017; Hu et al., 2025; Xu et al., 2022; Campbell et

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al., 2019). **Quality of life (QoL/HRQoL)** was the most consistently evaluated patient-reported outcome, appearing in eight sources (Dreyling et al., 2025; Yu et al., 2024; Ferreira et al., 2021; Koutoukidis et al., 2020; Abo et al., 2017; Hu et al., 2025; Xu et al., 2022; Campbell et al., 2019). **Mental health outcomes, including anxiety and depression,** were assessed in four studies (Dreyling et al., 2025; Ferreira et al., 2021; Koutoukidis et al., 2020; Hu et al., 2025).

Pulmonary function and dyspnea-related outcomes were reported exclusively in lung cancer populations (Yu et al., 2024; Rutkowska et al., 2019; Ferreira et al., 2021; Hu et al., 2025). **Cardiorespiratory fitness, measured via VO_2 peak, 6-minute walk test (6MWT), or incremental shuttle walk test (ISWT), was assessed in seven sources** (Dreyling et al., 2025; Yu et al., 2024; Ferreira et al., 2021; Koutoukidis et al., 2020; Rutkowska et al., 2019; Abo et al., 2017; Xu et al., 2022). **Muscle strength was evaluated in five sources** (Dreyling et al., 2025; Koutoukidis et al., 2020; Rutkowska et al., 2019; Abo et al., 2017; Xu et al., 2022). **Body composition outcomes** were reported in three primary studies (Dreyling et al., 2025; Koutoukidis et al., 2020; Ferreira et al., 2021).

More objective clinical endpoints were less frequently examined. **Biomarkers or disease progression indicators**, including treatment tolerance and event-free survival, were reported only in the myeloma induction RCT (Dreyling et al., 2025). **Physical activity behavior** (e.g., step count, accelerometry, self-reported physical activity) was reported in four primary studies (Dreyling et al., 2025; Yu et al., 2024; Ferreira et al., 2021; Abo et al., 2017) and synthesized in both systematic reviews (Hu et al., 2025; Xu et al., 2022). Peri-operative recovery and healthcare utilization outcomes, including length of hospital stay, discharge timing, and postoperative complications, were examined exclusively in the lung surgery prehabilitation trial (Ferreira et al., 2021).

Feasibility and safety outcomes, including adherence, tolerability, and adverse events, were reported across all primary intervention studies and were further summarized in both systematic reviews and the guideline consensus (Dreyling et al., 2025; Yu et al., 2024; Ferreira et al., 2021; Koutoukidis et al., 2020; Rutkowska et al., 2019; Abo et al., 2017; Xu et al., 2022; Hu et al., 2025; Campbell et al., 2019).

3.2.6.6 Physical outcomes

Exercise interventions in cancer populations primarily target cardiorespiratory fitness and functional performance, with muscular strength outcomes more commonly reported in structured resistance-based or survivorship programs.

Table 13 - Summary of physical outcomes in lung and hematological cancer studies

Study	Cardiorespiratory fitness	Physical function	Muscular strength	Not reported
1. Hematologic cancer – Dreyling et al., 2025	✓	✓	✓	—
2. Lung cancer – Yu et al., 2024	✓	✓	—	—

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3. Lung cancer – Hu et al., 2025 (SR/MA)	(✓)	(✓)	(✓)	—
4. Hematologic cancer – Xu et al., 2022 (SR/MA)	(✓)	(✓)	(✓)	—
5. Lung cancer – Ferreira et al., 2021	✓	✓	—	—
6. Hematologic cancer – Koutoukidis et al., 2020	✓	✓	✓	—
7. Lung cancer – Rutkowska et al., 2019	✓	✓	✓	—
8. All cancer types – Campbell et al., 2019 (Guideline)	(✓)	(✓)	(✓)	—
9. Hematologic cancer – Abo et al., 2017	✓	✓	✓	—

Legend: ✓ = outcome clearly reported in the study; (✓) = outcome reported in some studies within a systematic review/guideline; — = outcome not reported.

4. Colon cancer

4.1 Search process description

A literature search was conducted using the PubMed database to identify studies investigating the effects of physical activity and structured exercise interventions in patients with colon cancer. The search strategy combined keywords such as *"colon cancer"*, *"colorectal cancer"*, *"exercise"*, *"physical activity"*, and *"training"*.

The search was limited to studies published within the last decade to capture the most recent scientific evidence regarding exercise interventions in colon cancer patients.

Eligible studies included randomized controlled trials, intervention studies, feasibility studies, and systematic reviews evaluating the impact of structured exercise programs on clinical, physical, or patient-reported outcomes.

4.2 Synthesis of results

4.2.1 Total number of articles identified by disease type

The literature search identified 6 relevant articles investigating the effects of exercise interventions in patients with colon or colorectal cancer.

The included studies were published between 2016 and 2025, reflecting the growing interest in the role of physical activity in cancer survivorship and treatment outcomes.

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4.2.2 Study designs included

Among the six included studies, the following study designs were identified:

- Randomized Controlled Trials (RCTs): 3 studies
- Pilot RCT: 1 study
- Feasibility intervention study: 1 study
- Phase III Randomized Controlled Trial: 1 study
- Systematic review and meta-analysis: 1 study

Notably, the large phase III randomized trial by Courneya et al. (2025) included 889 patients with stage II-III colon cancer and represents the highest level of evidence, demonstrating improved disease-free and overall survival following structured exercise after adjuvant chemotherapy.

Table 14 - Characteristics of included studies on colon cancer

Study	Study Design	Number of Participants
Van Vulpen 2016	RCT	33
Devin 2018	RCT	57
Zopf 2022	RCT	59
Latini 2025	Pilot RCT	23
Courneya 2025	RCT	889
Singh 2020	Systematic review + meta-analysis	

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4.2.3 Disease stages

The included studies examined patients across different stages of colon cancer.

The distribution of disease stages was as follows:

- Stages I-IV: 1 article
- Stages I-III: 1 article
- Stages II-III: 2 articles
- Not reported: 1 article
- Mixed stages included in systematic review: 1 article

Most intervention studies focused on patients with stage II-III colon cancer, which is the population most commonly receiving adjuvant chemotherapy and survivorship interventions.

4.2.4 Intervention timing

Exercise interventions were implemented at different time points along the cancer care pathway.

The distribution was as follows:

- During chemotherapy: 2 studies
- After completion of chemotherapy: 1 study
- Post-surgery: 1 study
- Survivorship / follow-up phase: 1 study
- Mixed phases (systematic review): 1 study

This indicates that exercise interventions are applied both during active treatment and during survivorship phases.

4.2.5 Characterization of exercise protocols

4.2.5.1 Duration

The duration of exercise programs varied across the studies, ranging from 12 weeks to 3 years.

The distribution was as follows:

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- 12 weeks: 3 studies
- 18 weeks: 1 study
- 3-year intervention: 1 study
- Variable durations across trials (systematic review): 1 study

The long-term exercise intervention reported in the phase III trial by Courneya et al. represents the longest exercise program identified, with structured supervised exercise performed for three years after chemotherapy.

4.2.5.2 Type

Different types of exercise interventions were identified across the studies.

Table 15 - Types of exercise programs identified in the included studies on colon cancer

Study	Aerobic	Resistance	Combined
Van Vulpen 2016	●	●	●
Devin 2018	●		
Zopf 2022	●		
Latini 2025	●	●	●
Courneya 2025	●	●	●
Singh 2020	●	●	●

Overall distribution:

- Aerobic training only: 2 studies
- Combined aerobic and resistance training: 4 studies

Combined training programs were therefore the most frequently used intervention modality in colon cancer populations.

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4.2.5.3 Delivery method

Exercise interventions were delivered using several modalities:

Table 16 - Physical activity delivery methods in colon cancer studies

Study	Supervised individual	Home-based	Mixed
Van Vulpen 2016	●		
Devin 2018	●		
Zopf 2022	●		
Latini 2025	●	●	
Courneya 2025	●		
Singh 2020	mixed across trials		

Most exercise programs were supervised and individually delivered, often within clinical or exercise facilities.

The feasibility study by Latini et al. implemented a supervised home-based program, highlighting the potential for remote exercise interventions in postoperative patients.

4.2.6 Assessment parameters

4.2.6.1 Comorbidities

Assessment of comorbidities was limited across the included studies.

Only three studies reported baseline comorbidity assessment, while the remaining studies did not specifically report comorbid conditions.

When evaluated, comorbidities were mainly assessed at baseline clinical evaluation.

4.2.6.2 Anthropometric data

Anthropometric and body composition parameters were evaluated in several studies using different methods:

- Body Mass Index (BMI): 4 studies

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- DEXA body composition analysis: 1 study

These measures were primarily used to evaluate body composition changes and baseline physical status.

4.2.6.3 Functional tests

Several functional tests were used to evaluate physical performance.

The main tests included:

Cardiorespiratory fitness

- VO_2 peak assessment
- Cardiopulmonary exercise testing (CPET)

Functional capacity

- 6-Minute Walk Test
- Short Physical Performance Battery (SPPB)

Muscle strength

- Handgrip strength

These tests were commonly used to evaluate the impact of exercise interventions on aerobic capacity and overall physical function.

4.2.6.4 Administered questionnaires

Several validated questionnaires were used to assess patient-reported outcomes.

The most commonly used instruments included:

Quality of life

- EORTC QLQ-C30
- SF-36

Fatigue

- Multidimensional Fatigue Inventory (MFI)
- Fatigue Quality List (FQL)

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Psychological well-being

- Hospital Anxiety and Depression Scale (HADS)

Sleep quality

- Pittsburgh Sleep Quality Index (PSQI)

These questionnaires allowed evaluation of quality of life, fatigue, psychological well-being, and sleep disturbances.

4.2.6.5 Clinical outcomes

Several clinical outcomes were evaluated across the included studies:

- Chemotherapy completion rate: 1 study
- Chemotherapy tolerance: 1 study
- Feasibility and safety of exercise interventions: 1 study
- Disease-free survival: 1 study
- Overall survival: 1 study

The phase III randomized trial demonstrated that structured exercise following adjuvant chemotherapy was associated with improved disease-free survival and overall survival in patients with stage II–III colon cancer.

4.2.6.6 Physical outcomes

Physical outcomes assessed across the studies included:

Table 17 - Summary of physical outcomes in colon cancer studies

Physical outcome	Number of studies
Cardiorespiratory fitness	3
General physical fitness	1
Body composition	1
Not reported	1

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Overall, the evidence suggests that structured exercise programs may contribute to improving cardiorespiratory fitness, physical function, and potentially long-term oncological outcomes in colon cancer patients.

5. Gastrointestinal cancer

5.1 Search process description

A literature search was conducted using PubMed to identify studies evaluating the role of physical exercise interventions in patients with gastrointestinal cancers, particularly oesophageal and gastric cancer.

The search strategy included combinations of keywords such as *"gastrointestinal cancer"*, *"gastric cancer"*, *"esophagogastric cancer"*, *"exercise"*, *"physical activity"*.

The search focused on studies evaluating structured exercise programs implemented before or after surgery or during oncological treatments. Randomized controlled trials, pilot studies, feasibility studies, and systematic reviews were included.

5.2 Synthesis of results

5.2.1 Total number of articles identified

The literature search identified 6 relevant studies investigating the effects of exercise interventions in patients with gastrointestinal cancers, mainly gastric and esophagogastric tumours.

The included articles were published between 2018 and 2025, indicating a relatively recent development of research focusing on exercise interventions in this cancer population.

5.2.2 Study designs included

Among the seven included studies, the following study designs were identified:

- Randomized Controlled Trials (RCTs): 2 studies
- Pilot randomized controlled trial: 1 study
- Cross-sectional study: 1 study

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- Study protocol / feasibility intervention: 1 study
- Scoping review: 1 study

Most studies focused on evaluating feasibility, safety, and short-term functional outcomes of exercise programs in gastrointestinal cancer patients.

Table 18 - Characteristics of included studies on gastrointestinal cancer

Study	Study Design	Number of Participants
Minnella 2018	RCT	68
Cho 2018	Feasibility study	20
Lee 2021	Cross-sectional study	126
Bausys 2023	RCT	128
Sawada 2024	Pilot RCT	10
Monticone 2025	Scoping review	

5.2.3 Disease stages

The included studies investigated patients across several stages of gastrointestinal cancers.

The distribution was:

- Stages I-III: 1 study
- Stages I-IV: 1 study
- Post-surgical populations: 2 studies

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- Mixed stages (review studies): 2 studies

Most exercise interventions targeted patients undergoing surgical treatment, particularly gastrectomy or esophagogastric surgery.

5.2.4 Intervention timing

Exercise programs were implemented at different stages of the clinical pathway.

The distribution was as follows:

- Prehabilitation before surgery: 2 studies
- Postoperative recovery: 2 studies
- Postoperative rehabilitation phase: 1 study
- Mixed phases (review): 1 study

Prehabilitation programs were particularly common in gastrointestinal cancer due to the high physiological stress associated with major abdominal surgery.

5.2.5 Characterization of exercise protocols

5.2.5.1 Duration

The duration of exercise interventions varied across studies.

The distribution was:

- 4 weeks: 1 study
- 4-6 weeks: 1 study
- 8-12 weeks: 3 studies
- Variable durations across studies: 1 study

Most prehabilitation interventions were relatively short-term programs implemented before surgery.

5.2.5.2 Type

Exercise interventions varied across studies and often involved multimodal programs.

Table 19 - Types of exercise programs identified in the included studies on gastrointestinal cancer

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Study	Aerobic	Resistance	Other
Minnella 2018	●	●	Inspiratory muscle training
Cho 2018	●	●	Rehabilitation exercises
Lee 2021	●		
Bausys 2023	●	●	
Sawada 2024		●	Nutritional supplementation
Monticone 2025	●	●	

Overall distribution:

- Aerobic exercise: 5 studies
- Resistance training: 5 studies
- Inspiratory muscle training or rehabilitation exercises: 2 studies

Multimodal exercise programs were therefore the most commonly implemented intervention strategy.

5.2.5.3 Delivery method

Exercise interventions were delivered through different modalities:

Table 20 - Physical activity delivery methods in gastrointestinal cancer studies

Study	Supervised	Home-based	Mixed
Minnella 2018	●		
Cho 2018	●		
Lee 2021		●	
Bausys 2023		●	●

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Study	Supervised	Home-based	Mixed
Sawada 2024	●		
Monticone 2025	mixed		

Overall:

- Supervised interventions: 3 studies
- Home-based interventions: 2 studies
- Mixed approaches: 1 study

Home-based exercise interventions were frequently used to improve accessibility and adherence, particularly during chemotherapy or recovery phases.

5.2.6 Assessment parameters

5.2.6.1 Comorbidities

Comorbidities were assessed in a limited number of studies.

One randomized trial evaluated comorbidity burden using the Charlson Comorbidity Index, while other studies reported baseline clinical characteristics without standardized comorbidity scores.

5.2.6.2 Anthropometric data

Anthropometric measurements were assessed in several studies, including:

- Body Mass Index (BMI)
- Body weight changes
- Muscle mass assessment

These measures were particularly relevant in gastrointestinal cancer patients due to the high risk of weight loss and sarcopenia following gastrectomy.

5.2.6.3 Functional tests

Several functional tests were used to evaluate physical performance.

The most commonly used tests included:

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Functional capacity

- 6-Minute Walk Test

Muscle strength

- Handgrip strength
- Lower limb strength assessments

Cardiorespiratory fitness

- VO_2 peak measurements

These tests were mainly used to evaluate functional recovery following surgery or chemotherapy.

5.2.6.4 Administered questionnaires

Patient-reported outcome measures were used to evaluate quality of life and psychological status.

The most commonly used questionnaires included:

- SF-36
- EORTC QLQ-C30
- Fatigue questionnaires
- Psychological well-being scales

These instruments allowed assessment of health-related quality of life, fatigue, and emotional well-being.

5.2.6.5 Clinical outcomes

Several clinical outcomes were evaluated across the included studies.

The main outcomes included:

- Postoperative complication severity
- Feasibility and adherence to exercise programs
- Postoperative recovery
- Functional recovery after surgery

Unlike colon cancer trials, no randomized controlled trials have demonstrated an effect of exercise interventions on overall survival or disease-free survival in gastric cancer populations.

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5.2.6.6 Physical outcomes

Physical outcomes evaluated across the studies included:

Table 21 - Summary of physical outcomes in gastrointestinal cancer studies

Physical outcome	Number of studies
Functional capacity	3
Muscle strength	2
Cardiorespiratory fitness	1
Not reported	1

Overall, the available evidence suggests that exercise interventions may contribute to improving functional recovery, maintaining muscle mass, and reducing fatigue in gastrointestinal cancer patients, particularly in the postoperative period.

6. Pancreatic cancer

6.1 Search process description

A literature search was conducted using the PubMed database to identify studies investigating the role of physical activity and structured exercise interventions in patients with pancreatic cancer. The search strategy included combinations of keywords such as *"pancreatic cancer"*, *"exercise"*, *"physical activity"*, and *"training"*.

The selection was restricted to articles published in the last decade in order to include the most recent scientific evidence regarding exercise interventions in pancreatic cancer patients. Only studies evaluating structured exercise programs and reporting clinical or physical outcomes were considered eligible for inclusion.

6.2 Synthesis of results

6.2.1 Total number of articles identified by disease type

The literature search identified 6 relevant articles investigating the relationship between physical activity and pancreatic cancer.

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These included:

- 3 randomized controlled trials (RCTs)
- 1 longitudinal cohort study
- 2 systematic reviews with meta-analysis

The included articles were published between 2019 and 2025, highlighting the relatively recent emergence of evidence concerning exercise interventions and physical activity in pancreatic cancer.

6.2.2 Study designs included

Among the six included studies, were identified 3 Randomized Controlled Trials (RCTs), 1 longitudinal cohort study and 2 systematic reviews and meta-analyses.

The systematic reviews synthesized evidence from multiple intervention trials evaluating exercise therapy in pancreatic cancer patients.

In particular, the systematic review and meta-analysis by Sekino et al. (2025) included six randomized controlled trials, assessing the impact of exercise therapy on quality of life and physical function.

Table 22 - Characteristics of included studies on pancreatic cancer

Study	Study Design	Number of Participants
Wiskemann 2019	RCT	65
Neuzillet 2023	RCT	313
Ngo-Huang 2023	RCT	151
Bos 2024	Systematic review + meta-analysis	

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Study	Study Design	Number of Participants
Parent 2025	RCT	313
Sekino 2025	Systematic review + meta-analysis	

6.2.3 Disease stages

The included studies investigated patients across different stages of pancreatic cancer, ranging from early stages to metastatic disease, as well as studies examining risk and mortality in the general population.

The distribution was as follows:

- Risk and all stages: 1 article
- Stages I–II–IV: 1 article
- Stages I–III: 1 article
- Stages III–IV: 2 articles
- Mixed stages included in systematic reviews: 1 article

Overall, most intervention studies focused on patients undergoing chemotherapy or neoadjuvant therapy, while one review addressed population-level associations between physical activity and pancreatic cancer incidence and mortality.

6.2.4 Intervention timing

Exercise interventions were implemented at various phases of the oncological trajectory:

- During chemotherapy: 2 articles
- During neoadjuvant therapy: 1 article
- During treatment and follow-up: 1 article
- Mixed treatment phases (systematic review): 1 article

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- Risk and mortality analysis in the general population: 1 article

The systematic review and meta-analysis by Sekino et al. included exercise interventions implemented during chemotherapy, chemoradiotherapy, or after surgery, reflecting different stages of treatment.

6.2.5 Characterization of exercise protocols

6.2.5.1 Duration

Among the interventional studies, exercise program duration ranged from 6 to 24 weeks.

The distribution was as follows:

- 6 weeks: 1 article
- 16 weeks: 2 articles
- 24 weeks: 1 article
- Not applicable (systematic reviews/meta-analyses): 2 articles

The studies included in the Sekino et al. meta-analysis involved interventions of varying durations implemented during or after cancer treatment.

6.2.5.2 Type

Different exercise modalities were reported across the studies:

Table 23 - Types of exercise programs identified in the included studies on pancreatic cancer

Study	Aerobic	Resistance	Combined
Wiskemann 2019		●	
Neuzillet 2023	●		●
Ngo-Huang 2023	●	●	●
Bos 2024	●		
Parent 2025	●	●	●
Sekino 2025	●	●	●

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Overall distribution:

- Aerobic physical activity (observational epidemiology): 1 study
- Resistance training: 1 study
- Combined aerobic and resistance training: 4 studies

In the meta-analysis by Sekino et al., half of the included trials used resistance training alone, while the remaining trials implemented combined aerobic and resistance exercise programs.

6.2.5.3 Delivery method

Exercise interventions were delivered using different modalities:

Table 24 - Physical activity delivery methods in pancreatic cancer studies

Study	Supervised	Home-based	Online
Wiskemann et al., 2019	●	●	
Neuzillet et al., 2023		●	●
Ngo-Huang et al., 2023		●	
Parent et al., 2025	●		

Most interventions were delivered through individual home-based programs, sometimes supported by supervision or remote monitoring.

This approach may increase feasibility and adherence, particularly in patients undergoing intensive cancer treatments.

6.2.6 Assessment parameters

6.2.6.1 Comorbidities

The evaluation of patient comorbidities was limited across the included studies.

Among the four articles:

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- Diabetes: reported in 1 study
- Sarcopenia and comorbidity score: reported in 1 study
- Not reported: 2 studies

This indicates that comorbidity assessment was not systematically incorporated into exercise intervention studies in pancreatic cancer populations.

6.2.6.2 Anthropometric data

Anthropometric and body composition parameters were evaluated in four studies, including:

- Body Mass Index (BMI)
- CT-derived body composition measurements
- Skeletal Muscle Index (SMI)

In epidemiological studies included in the systematic review by Bos et al., BMI was frequently considered as a covariate in the statistical analyses investigating the association between physical activity and pancreatic cancer risk.

6.2.6.3 Functional tests

Functional assessments used across the intervention studies included:

- **Cardiorespiratory fitness**
  - VO_2 peak
  - Cardiopulmonary Exercise Testing (CPET)
  - 6-Minute Walk Test
- **Muscle strength**
  - Isokinetic strength testing
  - Handgrip strength
  - Arm curl repetitions
- **Functional mobility**
  - 5-chair stand test
  - Sit-to-stand test

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- Walking tests

The systematic review by Sekino et al. reported that physical function was mainly evaluated through muscle strength measurements and functional capacity tests such as the 6-minute walk test and the chair stand test.

6.2.6.4 Administered questionnaires

Patient-reported outcome measures were used in a limited number of studies.

The questionnaires identified included:

- **Health-Related Quality of Life**
  - EORTC QLQ-C30
- **Physical functioning**
  - PROMIS Physical Function Score
- **Cancer-specific quality of life**
  - FACT-Hep

However, two of the included studies did not report the use of questionnaires, indicating variability in the assessment of patient-reported outcomes.

6.2.6.5 Clinical outcomes

The following clinical outcomes were reported across the included studies:

- Pancreatic cancer incidence and mortality: 1 study
- Quality of life: 3 studies
- Survival outcomes: 1 study
- Body composition changes: 2 studies
- Exercise adherence: 2 studies

The epidemiological meta-analysis by Bos et al. investigated the association between physical activity levels and both pancreatic cancer risk and mortality.

6.2.6.6 Physical outcomes

Physical outcomes evaluated across the studies included:

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Table 25 - Summary of physical outcomes in pancreatic cancer studies

Physical outcome	Number of studies
Muscular strength	3
Functional capacity	2
Cardiorespiratory fitness	1
Not reported	1

The meta-analysis by Sekino et al. demonstrated significant improvements in upper and lower limb muscle strength and physical quality of life following exercise interventions, although no significant effects were observed for the 6-minute walk test.

7. Prostate Cancer

7.1 Search process description

A literature search was performed using the PubMed database to identify studies on prostate cancers. The search strategy employed combinations of keywords, including **'physical activity'** or **'exercise'** paired with **'prostate cancer'.**

The selection was restricted to publications from the last decade to ensure the inclusion of contemporary evidence.

7.2 Synthesis of results

7.2.1 Total number of articles identified by disease type

A total of 14 RCTs were identified focusing on prostate cancer. The studies include patients at different stages: localized, high-risk, recurrent, and patients on active surveillance or undergoing ADT, radiotherapy, or combined therapies. The remaining evidence includes 2 Systematic Reviews and Meta-analyses of RCTs.

7.2.2 Study designs included

All included studies were Randomized Controlled Trials (RCTs), with sample sizes ranging from 26 to 154 participants.

Table 26 - Characteristics of included studies on prostate cancer

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Study	Study Design	Number of Participants
1_Prostate_Taaffe_2025	RCT	102 randomized: (IMEX; n = 54) vs (DEL; n = 48)
2_Prostate_Newton_2020	RCT	104 randomized: (IMX, n = 54) vs (DEL, n = 50)
3_Prostate_Hojan_2016	RCT, 2-arm	54 randomized: EX=27 vs CON=27
4_Prostate_Newton_2019	RCT	104 randomized: (ImpRes, n = 57) vs (aerobic + resistance training, n = 50) vs (DelAer, n = 47)
5_Prostate_Harrison_2022	RCT	26 randomized: EX=13 vs CON=13
6_Prostate_Houben_2023	RCT	96 randomized: (EX + PROTEIN, n = 30) vs (EX + Placebo, n = 30) vs CON= 36
7_Prostate_Djurhuus et al._2022	RCT	30 randomized: EX (n = 20) vs CON (n = 10)
8_Prostate_Piraux et al._2021	RCT	72 randomized: CON (n = 24) vs HIIT (n = 24) vs RT (n=24)
9_Prostate_Kang et al._2021	RCT	52 randomized: HIIT (n = 26) or usual care (n = 26)
10_Prostate_Alibhai et al. 2019	Phase II RCT	34 randomized: EX-Supervised (n = 16) vs EX-Home-Based (n = 18)
11_ Prostate_Murphy et al._2025	RCT, 2-arm, feasibility	n=24 randomized: AT (n=12) vs RT (n=12); those who completed AT (n = 9) RT (n = 10)
12_Prostate_Moon et al._2022	RCT, 2-arm, pilot	n=27 randomized: EX n=15 vs CON= 12
13_Prostate_Galvão et al. 2025	RCT, 3-arm, single-blinded	n=112 randomized: EX+PESM n=36 brief psychosexual education and self-management intervention (PESM) vs EX= 39 vs Usual Care=37
14_Prostate_ Rantaniemi et al. 2025	RCT	n=44 randomized: EX n=24 vs CON n=15
15_Prostate_Kempin et al. 2024	Systematic review + meta-analysis	N=2216; 30 RCT included

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16_Prostate_Lee et al. 2024	Systematic review + meta-analysis	N=332; 6 RCT included

7.2.3 Disease stages

- Localized / pre-surgery: 3 articles
- High-risk localized / locally advanced: 1 article
- Recurrent / castration-sensitive: 1 article
- Patients on ADT: 4 articles
- Active surveillance: 2 articles
- Mixed treatments / multiple stages: 2 articles

7.2.4 Intervention timing

Across the 14 identified articles, exercise programs were implemented at various stages of the oncological continuum, distributed as follows:

- **Prehabilitation (before treatment):** 2 articles
- **During oncological treatment (ADT, radiotherapy, surgery):** 8 articles
- **Active surveillance / follow-up:** 2 articles
- **Mixed:** 2 articles

7.2.5 Characterization of exercise protocols

7.2.5.1 Duration

The duration of the exercise protocols analyzed in the 14 articles showed significant variability, ranging from one trial focused on a single acute exercise bout, whereas others implemented programs from 5 weeks to 12 months.

The programs are categorized as follows:

- **Single bout:** 1 article
- **4–8 weeks:** 3 articles
- **12–16 weeks:** 6 articles
- **20 weeks:** 1 article
- **6–12 months: 3** articles

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7.2.5.2 Type

The characteristics of the exercise programs identified across all 14 articles are summarized in the table below:

Table 27 - Types of exercise programs identified in the included studies on prostate cancer

EXERCISE PROGRAM	Aerobic training (AT)	Resistance training (RT)	Combined (AT + RT)	Mind body (yoga, QiGong, pilates)	Other (stretching, balance)
1_Prostate_Taaffe_2025			●		
2_Prostate_Newton_2020			●		
3_Prostate_Hojan_2016			●		
4_Prostate_Newton_2019			●		
5_Prostate_Harrison_2022			●		
6_Prostate_Houben_2023		●			
7_Prostate_Djurhuus et al._2022	● (HIIT)				
8_Prostate_Piraux et al._2021	● (HIIT)	●			
9_Prostate_Kang et al._2021	● (HIIT)				
10_Prostate_Alibhai et al. 2019			●		
11_ Prostate_Murphy et al._2025	●	●			
12_Prostate_Moon et al._2022			●		
13_Prostate_Galvão et al. 2025			●		
14_Prostate_ Rantaniemi et al. 2025		●			

7.2.5.3 Delivery method

The delivery methods for physical activity interventions identified across the 13 included studies are summarized in the table below:

Table 28 - Physical activity delivery methods in prostate cancer studies

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PHYSICAL ACTIVITY DELIVERY METHODS	Supervised (Gym, or clinical setting) - Individual	Supervised (Gym, or clinical setting) - Group	Supervised (Unspecified)	Unsupervised (home-based, or telephone-based)	Unsupervised (Unspecified)
1_Prostate_Taaffe_2025		●			
2_Prostate_Newton_2020		●			
3_Prostate_Hojan_2016	●	●			
4_Prostate_Newton_2019		●		●	
5_Prostate_Harrison_2022	●				
6_Prostate_Houben_2023		●			
7_Prostate_Djurhuus et al._2022	●				
8_Prostate_Piraux et al._2021	●				
9_Prostate_Kang et al._2021	●				
10_Prostate_Alibhai et al. 2019	●	●		●	
11_ Prostate_Murphy et al._2025	●	●			
12_Prostate_Moon et al._2022				●	
13_Prostate_Galvão et al. 2025		●			
14_Prostate_ Rantaniemi et al. 2025	●			●	

7.2.6 Assessment parameters

7.2.6.1 Comorbidities

Only 4 studies reported comorbidities (e.g., cardiovascular risk factors, metabolic conditions).

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7.2.6.2 Anthropometric data

Body composition and anthropometric measures were reported in 7 studies, using DEXA, BMI, or CT scans.

7.2.6.3 Functional tests

Various functional tests were employed across the included studies to assess physical performance; these assessment parameters and the specific tests used in each article are summarized in the table below:

Table 29 - Summary of functional tests in prostate cancer studies

FUNCTIONAL TESTS	Aerobic Capacity (VO2, 6MWT, CPET)	Muscular Strength (1RM, Dynamometer)	Mobility (Sit-to-stand, ROM, MVPA)	Not reported
1_Prostate_Taaffe_2025				●
2_Prostate_Newton_2020	●	●	●	
3_Prostate_Hojan_2016	●			
4_Prostate_Newton_2019		●		
5_Prostate_Harrison_2022	●		●	
6_Prostate_Houben_2023	●	●	●	
7_Prostate_Djurhuus et al._2022				●
8_Prostate_Piraux et al._2021	●			
9_Prostate_Kang et al._2021	●	●	●	
10_Prostate_Alibhai et al. 2019	●	●	●	
11_Prostate_Murphy et al._2025		●	●	
12_Prostate_Moon et al._2022	●			
13_Prostate_Galvão et al. 2025		●	●	
14_Prostate_ Rantaniemi et al. 2025	●	●		

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7.2.6.4 Administered questionnaires

From the analysis of the 14 included articles, the use of multiple validated questionnaires emerged, allowing for the investigation of various aspects of patient health and well-being. These instruments can be classified into the following categories:

- Fatigue: FACT-F, FACIT-F
- Quality of Life: FACT-P, FACT-G, EORTC QLQ-C30
- Sleep / psychological status: CES-D, ISI, PSQI
- Physical activity / lifestyle: Godin Leisure-Time Exercise Questionnaire
- International Index of Erectile Function, PR25 (sexual activity/function, urinary, bowel, hormonal, incontinence)

7.2.6.5 Clinical outcomes

Various clinical outcomes were identified across the 13 analyzed studies; specifically, these included:

- **Fatigue / cancer-related fatigue:** 6 studies
- **PSA levels / biochemical progression:** 2 studies
- **Quality of Life:** 8 studies
- **Sexual function:** 1 study
- **Inflammatory markers:** 2 studies

7.2.6.6 Physical outcomes

Various physical outcomes were identified across the 13 analyzed studies; these have been categorized and summarized in the table below:

Table 30 - Summary of physical outcomes in prostate cancer studies

PHYSICAL OUTCOMES	Cardiorepiratory fitness	Physical function	Muscular strength	Not reported
1_Prostate_Taaffe_2025				●
2_Prostate_Newton_2020		●	●	
3_Prostate_Hojan_2016		●		
4_Prostate_Newton_2019			●	
5_Prostate_Harrison_2022	●	●		
6_Prostate_Houben_2023	●	●	●	

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7_Prostate_Djurhuus et al._2022				●
8_Prostate_Piraux et al._2021		●		
9_Prostate_Kang et al._2021	●			
10_Prostate_Alibhai et al. 2019	●	●	●	
11_ Prostate_Murphy et al._2025		●		
12_Prostate_Moon et al._2022		●		
13_Prostate_Galvão et al. 2025		●	●	
14_Prostate_ Rantaniemi et al. 2025		●	●	

8. Urothelial/Bladder cancer

8.1 Search process description

A literature search was performed using the PubMed database to identify studies on prostate cancers. The search strategy combined the terms **“physical activity” OR “exercise”** with **“bladder cancer” OR “urothelial cancer”**.

The search was restricted to studies published in the last ten years in order to include the most recent evidence.

Eligible studies included randomized controlled trials (RCTs) evaluating exercise interventions at different stages of the bladder cancer care pathway. Relevant systematic reviews and meta-analyses were also screened to contextualize the available evidence.

The selection was restricted to publications from the last decade to ensure the inclusion of contemporary evidence.

8.2 Synthesis of results

8.2.1 Total number of articles identified by disease type

A total of 7 RCTs investigating exercise interventions in bladder cancer patients were identified. Among these, 1 article represented a secondary analysis of a previously published randomized trial, therefore it was not considered an additional independent study. The studies included patients

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undergoing radical cystectomy, patients awaiting surgery, and patients with bladder cancer experiencing treatment-related symptoms (e.g., sleep disturbances).

The remaining evidence includes 2 Systematic Reviews and Meta-analyses of RCTs.

8.2.2 Study designs included

Sample sizes varied considerably across studies, ranging from 14 to more than 100 participants, reflecting the exploratory nature of exercise interventions in this patient population.

A literature search identified systematic reviews and meta-analyses investigating the role of exercise or prehabilitation interventions in patients with bladder cancer, particularly in those undergoing radical cystectomy. These studies aimed to synthesize available evidence on the impact of exercise programs on postoperative outcomes, quality of life, and functional recovery.

Two articles were identified:

- 1 systematic review and meta-analysis of randomized controlled trials
- 1 systematic review and meta-analysis including mixed study designs (RCTs, cohort studies, and case reports)

The total number of primary studies included across the reviews ranged from 5 to 10 studies, with sample sizes between 282 and 564 patients.

Table 31 - Characteristics of included studies on urothelial/bladder cancer

Study	Study Design	Number of Participants
1_Bladder_ Porserud et al., 2024	RCT	90 randomized: (EX n=47 vs CON n=43)
2_Bladder_Banerjee et al., 2018	RCT, Feasibility	60 randomized: (EX n=30 vs CON n=30)
3_Bladder_Arthuso et al., 2026	RCT Feasibility	25 randomized: (HIIT n=13 vs usual care n=12)

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4_ Bladder_Porserud et al., 2024° (secondary analysis)	RCT (secondary analysis)	90 randomized: (exercise program vs active control)
5_ Bladder_ Jensen et al., 2016	RCT	107 randomized (EX=50 vs CON=57)
6_ Bladder_ Wang et al., 2024	RCT cross-over trial	12 participants (cross-over design; same participants in EX and control conditions)
7_Bladder_Blackwell et al. 2020	RCT	40 randomized (HIIT n=19 vs CON n=21)
8_Bladder_Steffens et al. 2024	Systematic review + metanalysis	282 patients (5 trials included)
9_Bladder_Güney et al. 2025	Systematic review + metanalysis	564 patients (10 studies included)

8.2.3 Disease stages

The included studies involved patients at different stages of the bladder cancer treatment pathway:

- **Pre-surgery (prehabilitation before radical cystectomy):** 3 studies
- **Postoperative rehabilitation after radical cystectomy:** 1 study
- **Mixed urological cancer populations including bladder cancer:** 1 study
- **Symptom-management studies in bladder cancer survivors:** 1 study

Most studies focused on patients with muscle-invasive bladder cancer undergoing radical cystectomy, which represents the standard treatment for localized advanced disease.

For Review and Metanalysis:

Both reviews focused primarily on patients undergoing radical cystectomy for bladder cancer, generally corresponding to muscle-invasive bladder cancer (MIBC) requiring surgical treatment.

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8.2.4 Intervention timing

Across the included studies, exercise interventions were implemented at different points in the cancer care continuum:

- **Prehabilitation (before surgery):** 2 studies
- **Postoperative rehabilitation:** 2 study
- **Perioperative / mixed urological cancer population:** 1 study
- **Symptom-targeted intervention in survivors:** 1 study

Mixed: 2 reviews

These findings indicate that exercise interventions are primarily investigated around the surgical phase, particularly in preparation for or recovery after radical cystectomy.

8.2.5 Characterization of exercise protocols

8.2.5.1 Duration

The duration of exercise interventions varied widely across the included RCTs. The identified durations can be summarized as follows:

- **Single bout intervention**: 1 study
- **Short prehabilitation (2 weeks)**: 1 study
- **Short-term preoperative programs (<4 weeks)**: 1 study
- **Postoperative rehabilitation programs (12 weeks)**: 2 studies
- **Structured rehabilitation program (6–12 weeks)**: 1 study
- **Mixed:** 2 reviews

Overall, most programs were short-term interventions aligned with the surgical timeline.

8.2.5.2 Type

The characteristics of the exercise programs identified across all 6 articles are summarized in the table below:

Table 32 - Types of exercise programs identified in the included studies on urothelial/bladder cancer

EXERCISE PROGRAM	Aerobic training (AT)	Resistance training (RT)	Combined (AT + RT)	Mind body (yoga,	Other (stretching, balance)

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				QiGong, pilates)	
1_Bladder_ Porserud et al., 2024			● abdominal muscle training, including pelvic floor exercises		● (daily walking)
2_Bladder_Banerjee et al., 2018	●(HIIT)				
3_Bladder_Arthuso et al., 2026	●(HIIT)				
4_ Bladder_Porserud et al., 2024° (secondary analysis)			● abdominal muscle training, including pelvic floor exercises		
5_ Bladder_ Jensen et al., 2016		●			● (daily walking)
6_ Bladder_ Wang et al., 2024	● (Light-intensity treadmill walking)				
7_Bladder_Blackwell et al. 2020	●(HIIT)				

8.2.5.3 Delivery method

The delivery methods for physical activity interventions identified across the 13 included studies are summarized in the table below:

Table 33 - Physical activity delivery methods in urothelial/bladder cancer studies

PHYSICAL ACTIVITY DELIVERY METHODS	Supervised (Gym, or clinical setting) - Individual	Supervised (Gym, or clinical setting) - Group	Supervised (Unspecified)	Unsupervised (home-based, or telephone-based)	Unsupervised (Unspecified)

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1_Bladder_ Porserud et al., 2024	•			•	
2_Bladder_Banerjee et al., 2018	•				
3_Bladder_Arthuso et al., 2026	•				
4_ Bladder_Porserud et al., 2024° (secondary analysis)	•				
5_ Bladder_ Jensen et al., 2016				•	
6_ Bladder_ Wang et al., 2024			•		
7_Bladder_Blackwell et al. 2020	•				

8.2.6 Assessment parameters

8.2.6.1 Comorbidities

Few studies explicitly reported participants' comorbidities.

When reported, screening procedures included medical evaluation before exercise participation, particularly in studies involving high-intensity exercise protocols or cardiopulmonary testing.

8.2.6.2 Anthropometric data

Anthropometric and body composition measures were reported 4 studies and included:

- **Body mass index (BMI):** 4 studies
- **Body composition analysis using DXA:** 3 studies
- **Muscle architecture assessments via ultrasonography:** 1 study
- **Mixed:** 2 reviews

8.2.6.3 Functional tests

Various functional tests were employed across the included studies to assess physical performance; these assessment parameters and the specific tests used in each article are summarized in the table below:

Table 34 - Summary of functional tests in urothelial/bladder cancer studies

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FUNCTIONAL TESTS	Aerobic Capacity (VO2, 6MWT, CPET)	Muscular Strength (1RM, Dynamometer)	Mobility (Sit-to-stand, ROM, MVPA)	Not reported
1_Bladder_ Porserud et al., 2024	●	●	●	
2_Bladder_Banerjee et al., 2018	●			
3_Bladder_Arthuso et al., 2026	●		●	
4_ Bladder_Porserud et al., 2024° (secondary analysis)	●	●	●	
5_ Bladder_ Jensen et al., 2016		●		
6_ Bladder_ Wang et al., 2024				●
7_Bladder_Blackwell et al. 2020	●			

8.2.6.4 Administered questionnaires

From the analysis of the 6 included articles, the use of multiple validated questionnaires emerged, allowing for the investigation of various aspects of patient health and well-being. These instruments can be classified into the following categories:

- **Fatigue:** Piper Fatigue Scale — 1 study
- **Psychological wellbeing:** Hospital Anxiety and Depression Scale (HADS), Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS) — 2 studies
- **Quality of Life:** EORTC QLQ-C30, EuroQol 5-Dimension 5-Level (EQ-5D-5L) — 3 studies
- **Bladder-specific QoL:** EORTC BLM30 — 1 study
- **Pain:** Numeric Rating Scale (NRS) — 1 study
- **Physical activity levels:** Godin Leisure-Time Exercise Questionnaire (GLTEQ), PAR-Q, Duke Activity Status Index (DASI) — 3 studies
- **Sleep:** Pittsburgh Sleep Quality Index (PSQI) — 1 study

8.2.6.5 Clinical outcomes

Various clinical outcomes were identified across the 6 analyzed studies; specifically, these included:

- **Postoperative complications / hospital outcomes:** 1 article

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- **Sleep quality / sleep parameters:** 1 article
- **Laboratory parameters (Hb, leukocytes, BP):** 2 articles

8.2.6.6 Physical outcomes

Various physical outcomes were identified across the analyzed studies; these have been categorized and summarized in the table below:

Table 35 - Summary of physical outcomes in urothelial/bladder cancer studies

PHYSICAL OUTCOMES	Cardiorepiratory fitness	Physical function	Muscular strength	Not reported
1_Bladder_ Porserud et al., 2024		●	●	
2_Bladder_Banerjee et al., 2018				
3_Bladder_Arthuso et al., 2026	●	●		
4_ Bladder_Porserud et al., 2024a (secondary analysis)		●	●	
5_ Bladder_ Jensen et al., 2016			●	
6_ Bladder_ Wang et al., 2024				●
7_Bladder_Blackwell et al. 2020	●			

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