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# The rehabilitation of cancer patients and the role of nurses: a scoping review

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## ABSTRACT

**Introduction.** Cancer survivors represent a growing population with very specific physical and psychosocial needs. The nurse's intervention is focused on the management of symptom burden and challenges due to cancer, treatment-related morbidities, the maximization of independence, and the improvement of the quality of life of cancer patients. The purpose of this scoping review is to identify different specific rehabilitation interventions delivered by nurses in response to physical, psychological, and cognitive impairments that may be experienced by cancer patients and to understand whether these interventions should be implemented at a specific phase of cancer care.

**Methods.** A scoping review was performed (Joanna Briggs Institute, 2019) and multiple databases and Google Scholar were searched from January 2016 to August 2021. Articles published in English, Spanish or Portuguese, which included nurses who provided evidence-based rehabilitation interventions and psychosocial support, patient education, and health promotion to adult cancer patients, were considered for inclusion.

**Results.** A total of 59 studies were included yielding 3 nurse-led intervention categories: exercise, psychoeducation, complementary and alternative medicine therapies. Most nurse-led interventions were delivered after cancer surgery or during treatment. Outcomes were mostly symptom-focused and frequently included quality of life. Many interventions provided beneficial physical and psychological outcomes or showed a positive trend.

**Conclusions.** Scientific publications concerning nurses as cancer rehabilitation providers still come as a relatively new approach. Further research and tailored interventions are needed to help nurses in decision-making and evidence-based practice.

**Key words:** cancer rehabilitation; rehabilitation nursing; oncology nursing; exercise therapy; psychological techniques; complementary therapies

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## Introduction

Today, cancer is a major public health problem [1] and the second leading cause of death worldwide, following cardiovascular diseases [2]. The number of new cases is expected to rise from 14 million to

22 million by 2030; this is about a 70% increase in only two decades [3]. Nevertheless, the advances made in early diagnosis and medical and surgical care, such as targeted therapies and new exacting procedures, have led to increased life expectancy following cancer [2].

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Cancer treatment requires careful consideration of evidence-based options, which can include more than one of the most common therapeutic modalities, such as surgery, radiotherapy, and systemic therapy [4]. While lifesaving, these interventions are often inevitably aggressive and invasive, triggering a variety of symptoms that can limit patients' function and participation [5, 6], and significantly impact health-related quality of life (QoL). These morbidities may become evident in a pre-diagnostic stage or through many years after cancer treatment, leading to the necessity for further complex physical and psychological demanding treatments [6]. Several treatment-related morbidities or symptoms are amenable to rehabilitation interventions, such as fatigue, cognitive impairment, pain, sexual dysfunction, balance and gait problems, lymphedema, swallowing, and communication difficulties, among others [7]. The variety of symptoms that can be addressed may be the reason behind the growing interest in this area.

Rehabilitation is considered an essential health service focused on the functioning of individuals with a variety of health conditions, not only in disease, but during all phases of life-course, and throughout all stages of acute, sub-acute, and long-term care [4]. Targeted rehabilitation interventions may decrease the incidence and/or the severity of upcoming impairments, which leads to reduced surgical complications and diminished hospitalizations or readmissions [6]. Furthermore, cancer rehabilitation is a multidisciplinary and multimodal approach that provides assessment, treatment, and support focusing on individuals' needs, which consequently has the ability to improve physical and psychological health outcomes. This enhancement is obtained by reducing disability and by improving the patient's capacity to fully participate in work activities and enjoy leisure time, substantially increasing their QoL [4, 6–8].

Despite all these benefits, nowadays most delivery models of care do not integrate comprehensive cancer rehabilitation services into the oncology care continuum [8, 9], and when present, rehabilitation services are significantly underused in all phases of cancer care [7].

A cancer rehabilitation team comprises interdisciplinary providers that must work together to design tailored interventions, with the intention of restoring function, enhancing participation, and/or preventing a later effect of the treatments [7]. This multidisciplinary approach to quality care for cancer survivors requires competency in assessment, decision-making, coordination, and communication skills, indispensable in every discipline, including nursing [9].

The theoretical framework for this review incorporates elements of Orem's Self-care deficit nursing theory [10], which is based on the assumption that people with knowledge and information are enabled to participate in self-care activities that facilitate the management

of physical and psychological problems, leading to the improvement of their health results. Orem's theory is composed of three interconnected theories: (1) the theory of self-care, (2) the self-care deficit theory, and (3) the theory of nursing systems. The Nursing Process presents a system that helps determine self-care deficits at any stage of the patient's life and aids to define their roles and the role of nurses involved in meeting self-care demands, whether in the maintenance of well-being, recuperation of health, prevention of illness, or rehabilitation [10].

Scientific publications in cancer rehabilitation are growing at a faster rate, but the field of nurse-led interventions is still relatively new, and the literature has not yet been sufficiently synthesized to assist health professionals and researchers in decision-making and to provide the best evidence-based practice. We conducted a preliminary electronic search for existing scoping or systematic reviews on the subject in the JBI Database of Systematic Reviews and Implementation Reports, Cochrane Database of Systematic Reviews, CINAHL®, and PubMed®, up to August 2021. The existent summarized evidence regarding nurse-led rehabilitation programs, normally only approaches a specific phase of the cancer care continuum (e.g., post-operative period or palliative phase).

The objective of this review is to map the available evidence that identifies different rehabilitation interventions delivered by nurses in response to physical, psychological, and cognitive impairments that may be experienced by cancer patients and to understand whether these interventions should be implemented at a specific phase of cancer care.

## Methods

The guidelines of the Joanna Briggs Institute Reviewer's Manual [11] were followed to conduct this scoping review. The final report should comprise different components and, following this process, a pertinent review question was identified:

“What specific nurse-led rehabilitation care is provided to cancer patients?”

### Inclusion criteria

This review considered studies including nurses who specialize in oncology or rehabilitation nursing or provided evidence-based rehabilitation interventions and psychosocial support, patient/family education, care coordination, and health promotion to adult cancer patients, regardless of diagnosis and across the continuum of care. Articles including intervention studies with a nurse as the primary investigator were also considered.

Studies comprising nurse-led interventions with a physical component, a psychosocial component, and/or a complementary and alternative module (e.g., music) were considered. These interventions could be provided individually or in group sessions, in person or via telephone/internet, and in any setting (e.g., hospital, rehabilitation units, home). Eligible studies could comprise control groups, that did not receive a nurse-led intervention or that underwent standard care, rehabilitation programs with different levels of intensity or length, or different delivery settings.

This scoping review included any type of study, especially meta-analyses, systematic or integrative reviews, randomized controlled trials (RCTs) including quasi-RCTs, evidence-based clinical practice guidelines, and observational, descriptive, or qualitative studies.

### Search strategy

A comprehensive three-step search strategy was developed to find both published and unpublished primary studies and reviews. First, an initial limited search of PubMed® and CINAHL® was performed, followed by an analysis of words in the title, abstract, and index terms used in articles. A second examination using all identified keywords and index terms was undertaken across all included databases. Thirdly, the reference lists of all reports and articles of the studies that have been included in this review were searched for further studies.

Articles published in English, Spanish or Portuguese were considered for inclusion. Databases were searched from January 2016 to August 2021, due to the scarcity of articles regarding rehabilitation interventions provided by nurses to cancer patients. Databases searched included: PubMed®, CINAHL Complete®, SciELO®, and BVS. The search for grey literature included Google Scholar.

### Study selection

All results from the searches were uploaded into a reference manager database (Mendeley®) and duplicates were removed. Titles and abstracts were independently reviewed by two authors and inclusion decisions were made by consensus. The full texts were retrieved and assessed against the inclusion criteria.

### Data extraction

The data retrieved from the papers were extracted by two independent reviewers, using an adapted results extraction tool from JBI [11]. The disagreements that arose between the reviewers were resolved through discussion, or with a third reviewer. The study material collected includes standard article information (author,

year of publication, country), study design, intervention details, duration of the intervention, target population, sample size, and key findings.

### Presentation of results

Data analysis using the data collection instrument provided an overview of the obtained evidence from the conducted research concerning the nurse's intervention in the rehabilitation of cancer patients. Search results and article selection were summarized in a flowchart adapted from the Preferred Reporting Items for Systematic reviews and MetaAnalyses (PRISMA) flowchart developed by Moher et al. [12].

Results were presented in a visual form with tables, and a narrative summary accompanied tabulated results. The quality and risk of bias evaluations were not performed because this study did not aim to provide an answer to a specific issue but to provide an overview of existing rehabilitation interventions.

## Results

The databases searches yielded a total of 1125 studies. An additional 3 articles were found through other sources. After duplicates were eliminated ( $n = 21$ ), the titles and abstracts of 1107 studies were screened and 177 were considered for further detailed evaluation. A total of 118 full-text articles were eliminated as they did not meet the inclusion criteria, yielding a total of 59 studies for inclusion in the review. A flowchart showing the number of studies considered at each stage is presented in detail below (Fig. 1).

Three major nurse-led intervention categories were found after a detailed analysis of the studies included in this review: exercise ( $n = 31$ ), psychoeducational intervention and/or counseling meetings ( $n = 22$ ), and complementary and alternative medicine (CAM) therapies ( $n = 6$ ).

This study presents interventions for the management of cancer-related fatigue (CRF), pain, distress, physical impairment, sexual and cognitive function, QoL, depression, sleep disturbances, and other symptoms and challenges (e.g., work limitations).

As cited previously, the theoretical framework for this scoping review incorporates elements of Orem's Self-care deficit nursing theory [10]. One of the three interconnected concepts is the theory of nursing systems, which is further classified into wholly or partly compensatory or supportive-educative. From the analyses of the studies, it was clear that the role of nurses in cancer rehabilitation is mainly supportive-educative (88.1%) and only 11.9% of the nurse intervention was partially compensatory for self-care deficits.

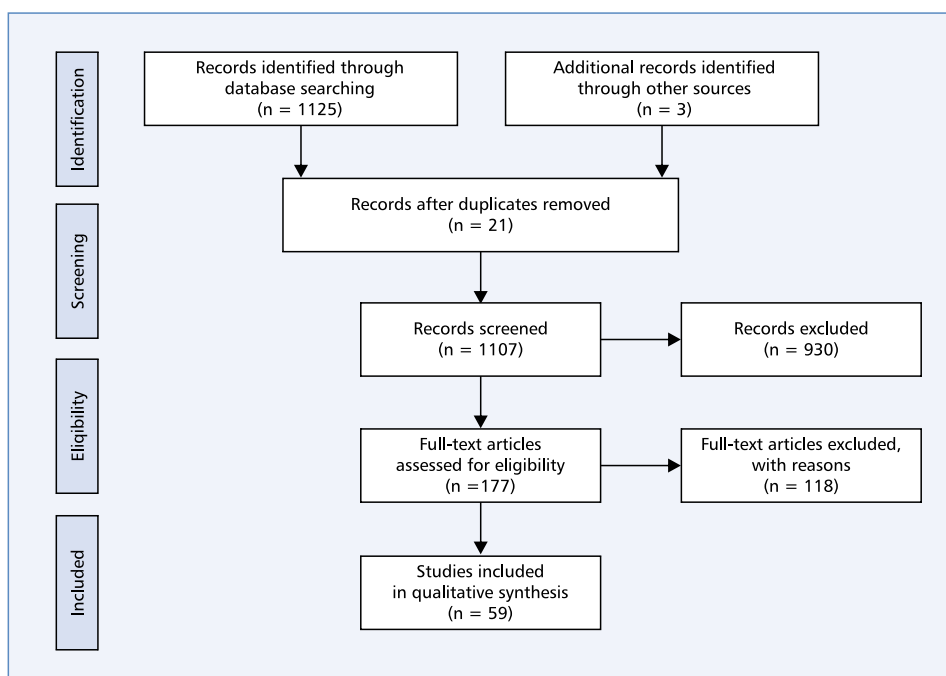


Figure 1. Flowchart of study selection and inclusion process [12]

Most articles were published from 2019 to 2020 ( $n = 31$ ; 52.5%), and the studies were carried out in the following countries: China ( $n = 14$ ), the United States of America (USA;  $n = 11$ ), Turkey ( $n = 7$ ), Brazil, the United Kingdom, Australia, Iran and Denmark ( $n = 3$ ), the Netherlands, Sweden, and Taiwan ( $n = 2$ ).

This scoping review comprises studies with a wide range of study designs: RCT ( $n = 19$ ); literature, systematic or integrative reviews ( $n = 15$ ); meta-analysis ( $n = 7$ ), pre-to-post design ( $n = 6$ ), qualitative ( $n = 5$ ), mixed-methods ( $n = 1$ ), and others.

Most of the articles did not specify cancer location or reported mixed cancer diagnosis ( $n = 19$ ). However, some studies were conducted only on women with breast cancer ( $n = 13$ ) or comprised breast cancer among other cancer types ( $n = 4$ ). The remaining analyzed studies also included the diagnosis of lung cancer ( $n = 7$ ), gynecological cancer ( $n = 5$ ), esophageal cancer ( $n = 3$ ), colorectal, prostate cancer, head and neck cancer ( $n = 2$ ), lymphoma, leukemia, and high-grade glioma.

All studies were conducted only in adults who were diagnosed with any type and stage of cancer throughout the cancer continuum of care. Nurse-led interventions were delivered after cancer surgery ( $n = 16$ ), except in two studies, where these interventions were initiated in the pre-operative period. Other research, included cancer patients undergoing active treatment ( $n = 16$ ), radiation or chemotherapy, or in survivorship ( $n = 10$ ). Many articles did not specify the phase of cancer treatment ( $n = 16$ ), and only 1 study was conducted on patients receiving palliative care exclusively.

The outcomes measured across studies included a physical and/or psychosocial component, but the majority were symptom-focused. The number of outcomes evaluated ranged from 1 to 9, with a mean of 3 outcomes per study.

It was found that QoL is one of the most highlighted outcomes assessed either in the overall analysis of studies (35.6%) or in the exercise category specifically. CRF was the most frequently targeted symptom, arising as an outcome assessed in 27.1% of the studies, followed by physical functioning (20.3%) and anxiety (16.9%).

#### Exercise/physical activity

Exercise interventions delivered by nurses in response to problems that may be experienced by cancer patients have been analyzed in several studies (Tab. 1).

Regarding interventions to improve CRF, al Maqbali et al. [13] conducted a systematic review including 5 studies with gynecologic cancer patients, and the evidence suggests that exercise results in a significant reduction in fatigue despite variations observed between studies (intensity, frequency, duration, and length). The current literature also recommends physical exercise with a multimodal approach, and that includes progressive resistance training with adjustable intensities of aerobic fitness to address CRF [14], leading to an overall improved QoL [15, 16]. A meta-analysis that included 113 RCTs with exercise, psychological, and exercise plus psychological interventions, demonstrated an improvement in CRF during and after primary treatment,

**Table 1. Nurse-led exercise interventions**

Author and location	Design	Intervention Details	Population	Findings
Huether et al. [16], 2016, USA	Pre-to-post design	Energy Through Motion (ETM): low-to-moderate intensity exercise and/or resistance exercise. Regular personal connections. Follow-up phone calls. Duration: 3 months	50 adults living with/after cancer: UC (n = 30) and EG (n = 20)	ETM participants reported increased activity levels, decreased fatigue and an improved QoL
McGowan [14], 2016, USA	Literature review	Physical exercise to address CRF in inpatient setting, with a variety of intervention dimensions (timing, duration) and exercise dimensions (frequency, intensity, type and time)	Cancer patients	7 articles included. Current literature supports NCCN exercise guidelines, a multimodal approach and progressive resistance training with varying intensities of aerobic fitness
Mustian et al. [17], 2017, USA	Meta-analysis	Exercise (aerobic, anaerobic or strength, or both), psychological (CBT, psychoeducational or eclectic), the combination of exercise and psychological, and pharmaceutical interventions. Mean duration: 14 weeks (range, 1–60)	11 525 unique participants: women with breast cancer (46.9%) and patients with other cancer types	113 RCTs included. Exercise, psychological, and exercise plus psychological interventions improved CRF during and after primary treatment, but pharmaceutical interventions did not
Scott & Posmontier [15], 2017, EUA	Integrative Review	Exercise interventions: aerobic or resistance exercise, cardiovascular exercise, strength training, flexibility exercises, resistive exercise and psychosocial support, walking or a combination of cycling, resistance or strength training, relaxation, basic yoga-type cooldown exercises	Cancer patients under/after treatment	7 studies were selected. Exercise can decrease the effects of CRF, leading to an overall improved QoL. No negative results on the effects of exercise on CRF were reported
McDonald et al. [20], 2018, USA	Pre-to-post design (single-group)	6-week home-based personalized behavioural PA intervention with fitness graded motion exergames (PAfitME): Wii Fit exergames. 1h visit from an oncology nurse and 10-min weekly calls for 3 weeks after the 6-week. Duration: 9 weeks	8 Head and neck cancer patients after cancer treatment	ADL dependence and CRF were significantly reduced. Balance, muscle strength, shoulder forward flexion and cardiorespiratory fitness improved after the 6-week intervention
Sweegers et al. [33], 2018, Netherlands	Systematic Review and Meta-analysis	Exercise, characterized by a variety of intervention dimensions (timing, duration and delivery mode) and exercise dimensions (frequency, intensity, type and time). Duration: from $\leq 12$ weeks to $> 24$ weeks	Adult cancer patients	66 RCTs included. Patients in EG had significantly improved QoL and Physical Function. Significant beneficial effects noted for supervised exercise interventions, but not for unsupervised approaches. Concerning to unsupervised exercise, higher weekly energy expenditure was more effective than lower energy expenditure
Schumacher & McNiel [21], 2018, USA	Exploratory mixed-methods study	Exercise rehabilitation — physical and psychosocial outcomes of the Livestrong at the YMCA program (twice a week, 75 min): cardiovascular conditioning, strength training, balance and flexibility. Face-to-face interviews (35–40 min) Duration: 12 weeks	158 cancer survivors (physical outcomes); 68 participants (psychosocial outcomes); and 11 participants (interviewed about their experience)	Physical measures of strength, balance, flexibility and endurance; and psychosocial measures of anxiety, fatigue, sleep disturbance, satisfaction with social role and pain interference were significantly improved post-exercise rehabilitation

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Table 1 cont. Nurse-led exercise interventions

Author and location	Design	Intervention Details	Population	Findings
Mendes & Barichello [22], 2019 Brazil	Integrative Review	Non-pharmacological interventions for oncological fatigue and/or HRQOL	Patients with digestive neoplasia undergoing chemotherapy	6 studies were selected. The practice of PA was considered an effective intervention, but no acupuncture, in the management of CRF and HRQOL
al Maqbali et al. [13], 2019 United Kingdom	Systematic review	Exercise interventions to manage CRF, (similarity in the exercise modality), but the intensity, frequency, duration and the length of the exercises varied between studies. PA: 30 min for 5 days (150 min/week). Intervention starts with a counselling session, but the contact with participants is variable. Duration: from 24 weeks to 12 months	Women with gynaecologic cancer	5 studies met the inclusion criteria: 3 RCT and 2 single-arm trials. Evidence suggest that exercise interventions result in significant reductions in fatigue, but, the current evidence is limited
Mardani et al. [27], 2021 Iran	RCT	Exercise booklet and an Exercise programme: aerobic (walking, reached 150 min/week in the last 4 weeks), resistant (11 exercises for large muscles, gradually reached 12 times in 2 sets in the last 2 weeks), flexible (10 exercises for the elongation of main muscles and tendons) and pelvic floor muscle exercises. One session of group exercise and three sessions of individual exercise per week. Duration: 12 weeks	80 Prostate cancer survivors: CG (n = 40) and EG (n = 40)	In the EG statistically significant improvements in physical, role, emotional, social and sexual function were reported. In addition, this group reported reduced fatigue, insomnia, constipation, diarrhea, and other treatment-related symptoms. in comparison with before the exercise program
Groen et al. [34], 2018 Canada	Systematic Review and Meta-analysis	PA interventions (no more than one face-to-face contact): print material, print and telephone or text and telephone, telephone support, web/online support, mobile app, smartphone, text messaging, telemedicine, Nintendo Wii Fit, DVD. Mean duration 3.5 months (range, 1–24)	5 218 Cancer survivors: breast cancer survivors (45%) and other cancer types survivors	29 RCTs included. Moderate-to-vigorous physical activity data from 24 RCTs were included in the meta-analysis and showed an overall small effect, as for steps, supporting the interventions. Three of these studies used telephone calls and the adherence was very high
Zhou et al. [40], 2020 China	RCT	WeChat-based multimodal nursing program: physical (e.g., tailored information, surgical side upper limb exercise training, coping with fatigue and poor sleep, pain relieving), psychological (e.g., relaxation training, feeling expression, counselling) and social rehabilitation (e.g., adaptation to patient role, social training, role transformation). Duration: 6 months	Postoperative women with breast cancer (stage I-III): EG (n = 56) and CG (n = 55).	Significant improvement in the QoL in the EG during early rehabilitation. Physical well-being only exhibited a time-based effect; social/family well-being and functional well-being had group, time, and group-time interaction effects; emotional well-being had time and group-time interaction effects
Chang et al. [39], 2020 Taiwan	RCT	Informatics-based exercise and health information program: a home-based walking exercise program (3-5 days per week for 30 min), a nursing education program (e-books for diet guidance, rehabilitation exercises, symptom management and psychological adjustments), and instruction in use of the health informatic system Duration: 12 weeks	88 Patients who had undergone an esophagectomy for cancer: EG (n = 44) and CG (n = 44).	EG experienced significant improvements in nutrition, exercise capacity and variables related to QoL

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**Table 1 cont. Nurse-led exercise interventions**

Author and location	Design	Intervention Details	Population	Findings
Frensham et al. [37], 2020 Australia	Quasi-RCT	Walking intervention (online): the STRIDE website and weekly step goals. All participants attended 2 baseline workshops and were provided with a sealed pedometer and with lifestyle information. The EG was instructed on how to use the website, including how to log steps and report ratings of perceived exertion and daily affect. Duration: 12 weeks	91 Cancer survivors: EG (n = 46) and CG (n = 45)	An increase in steps/day at 12 weeks was observed in both groups, with a larger increase in the EG, but changes were not maintained at follow-up. Psychological predictors of maintained changes in steps per day did not differ between metropolitan and rural participants.
Sotirova et al. [35], 2021 United Kingdom	Systematic review and narrative synthesis	Internet-based self-management programmes for post-surgical cancer rehabilitation: an exercise or PA-based self-management intervention and a measure of adherence, acceptability or user satisfaction.	Adult participants after cancer surgery	11 papers included. Interventions had wide variations regarding the adherence levels. Increased acceptability and user satisfaction were linked to interventions which were seen as time and cost-efficient. The majority contained behaviour change components.
Hoffman & Brintnall [36], 2017 USA	Qualitative study	6-week home-based exercise intervention: self-management of CRF (virtual reality using the Nintendo Wii Fit Plus; face-to-face contact followed up with phone contact; use of informational motivators)	37 Non-small cell lung cancer (NSCLC) patients after thoracotomy	Postsurgical NSCLC participants found this rehabilitative exercise intervention acceptable because it removed traditional barriers to exercise
Nemli [38], 2018 Turkey	Quasi-experimental design	Exercise training, supported with follow-up calls at home (1 day a week): moderate intensity PA supported by taking a walk in nature (30 min per day). A physical exercise guide was given to the participants. Duration: 12 weeks	62 Postoperative women undergoing chemotherapy: EG (n = 31) and CG (n = 31).	The number of "very active" individuals and the "total PA level" increased significantly in the EG, but decreased significantly in the CG. This increase in the level of PA its related to good QoL.
Donmez & Kapucu [29], 2017 Turkey	RCT	A clinical and home-based nurse-led physical activity program (PAP) and simple lymphatic drainage (SLD): home visits, twice a week (each session lasted 1 hour). Duration: 6 weeks	52 breast cancer patients: PAP and SLD (n = 25) and CG (n = 27)	Lymphedema-related symptom severity scores (pain, tension, heaviness, numbness sensation, ADL limitation) have decreased significantly in the EG
Temur & Kapucu [30], 2019 Turkey	RCT	Self-Management of Lymphedema Program: training and training booklet "exercise, massage and prevention methods". Follow-up calls for 6 months and through monthly clinical check-ups. Duration: 6 months	61 breast cancer patients: EG (n = 30), CG (n = 31).	Lymphedema development was not observed in the EG, while 61.2% of the CG developed lymphedema. The QoL of the EG was higher than that of the CG
Zhou et al. [32], 2019 China	RCT	Progressive upper limb exercises and muscle relaxation training (PULE-MRT): before surgery in individual or group format, and following surgery via one-to-one supervision in hospital or home visiting. The exercises were performed in a step-by-step modality and the duration per session ranged from 10 to 30 min, with a frequency of 3 to 6 session per day, for PULE. The duration of the MRT was 30 min per session, twice per day.	Duration: 6 months	102 Breast cancer women following surgery: EG (n = 51) and CG (n = 51) All patients in the EG completed the exercises and training, with 100% of compliance and no adverse events. PULE-MRT had positive effects on improving upper limb function and HRQOL

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Table 1 cont. Nurse-led exercise interventions

Author and location	Design	Intervention Details	Population	Findings
Wang et al. [31], 2020 China	RCT	Evidence-based nursing (EBN) intervention on upper limb function: pain relief; psychological intervention and health education; massage and traction of the affected limbs (3 times a day for 10 min each time); upper limb rehabilitation exercise (3–5 times per day, with a minimum break between 2 exercises over 2 h and each exercise with a minimum 15 min duration). Duration: 6 months	126 Postoperative breast cancer patients undergoing radiotherapy: EG (n = 63) and CG (n = 63)	EBN can positively influence the negative emotional state of BC patients, and it is helpful in reducing the degree of lymph node edema, thereby improving the function of the shoulder joint, and the upper limb function
Li et al. [28], 2016 China	RCT	Home-based, nurse-led health program (NHP): physiological rehabilitation; family-care team provision; emotion-release management (Yoga); informal social support system; follow-up monitoring (online communication, a telephone calls every 2 weeks, a home visit every 2–3 months); and nursing education. Duration: 6 months	226 early-stage cervical cancer patients: EG (n = 119) and CG (n = 107)	NHP improves the scores of QoL scales, cohesion and adaptability subscales, and female sexual function index scales (sexual function or sexual well-being)
Knoerl et al. [18], 2020 USA	Review	Management of chemotherapy-induced peripheral neuropathy (CIPN)-associated physical function deficits: pharmacologic interventions, exercise interventions (various exercise types, dosages, durations, and delivery settings)	Cancer patients with CIPN	Exercise and physical therapy may be promising treatments (e.g., improving strength and balance), but the efficacy and optimal dose of such treatments for CIPN are unclear
Metin & Donmez [19], 2016 Turkey	Review	Dyspnea management: pharmacological interventions (opioids, anticholinergics and Beta2-agonists, anxiolytics and diuretics); nonpharmacological approaches (oxygen, fun, exercise, pulmonary rehabilitation, acupuncture, acupressure and Cognitive Behavioural Therapy)	Cancer patients with dyspnea	Morphine is the most common opioid used to relieve dyspnea. Benzodiazepines reduced anxiety-induced dyspnea. Acupuncture, acupressure, neuromuscular electrical stimulation, external nasal dilator strips, pulmonary rehabilitation, regular exercise programs, use of supplemental oxygen and fun have been reported to manage dyspnea. Nurse counselling, effective respiratory-cough exercises, patient education programs, relaxation techniques and coping strategies also have been effective
Liu et al. [24], 2019 China	Meta-analysis	Breathing exercises: abdominal breathing, pursed-lip breathing, diaphragmatic breathing exercises, thoracic breathing training, volume-oriented incentive spirometer (diversities in the characteristics of interventions). Duration: from 1 week to 12 weeks	870 Lung cancer patients	15 RCT were included. Breathing exercises had positive effects on dyspnea and 6MWD, but not on anxiety and depression. In the surgery subgroup, these exercises could significantly improve dyspnea and 6MWD
Wang et al. [42], 2019 China	Meta-analysis	Home-based exercise training (HBET): aerobic training, resistance training, or a combination of both, and breathing exercises at home and including regular follow-up via home visit, telephone or logbook Duration: from 4 weeks to 16 weeks	453 patients with lung cancer	10 articles met the inclusion criteria. HBET was found to increase 6MWD and improve anxiety. No improvements in dyspnea, depression or HRQOL were observed

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**Table 1 cont. Nurse-led exercise interventions**

Author and location	Design	Intervention Details	Population	Findings
Saetan et al. [23], 2020 Thailand	Quasi-experimental study (pre-to-post-test)	Respiratory Rehabilitation Program (RRP): dyspnea education, breathing exercise, using handheld fans, effective coughing, respiratory strengthening training and follow-up by phone (5–10 min) in the third and sixth week. Duration: 8 weeks	28 NSCLC Patients (stage 4): EG (n = 14) and CG (n = 14)	There were significant differences in the mean score of perceived self-efficacy and dyspnea between groups
Liu et al. [43], 2021 China	Non-randomized concurrent-control study	Early ambulation within 2 h after thoracoscopic surgery: patients were encouraged to walk independently for 5–10 min under supervision. On the following days: walk in the corridor for 10 min at least thrice a day. Patients received the standard care as the CG (e.g., back-slapping, effective cough and deep breathing exercises).	227 Patients with lung cancer: OG (n = 100) and CG (n = 127)	83% of patients were able to walk any distance within 2h of extubation, and no adverse events occurred in patients. The length of hospital stay was significantly shorter in the OG than in the CG
Banda et al. [25], 2021 Taiwan	Systematic review and Meta-analysis	Swallowing exercises to improve swallowing function: including jaw, tongue, laryngeal and pharyngeal exercises. The number of sessions ranged from 2–5 per day, with a frequency of 1–15 times per day or weekly. The total duration of exercises ranged from 10 min to 2 hours per day. Duration: from 6 weeks to one year	1100 HNC patients undergoing multimodal treatment	19 RCTs were included for review. Swallowing exercises had a significant small effect on swallowing function, a moderate effect on mouth opening immediately after intervention and a small effect at the 6-month follow-up. Non-significant effects were observed on risk of aspiration, performance status and all domains of QoL
Zeng et al. [26], 2021 China	RCT	Rehabilitation exercises on swallowing function (mouth opening exercises, neck massage, oral organ coordination training, and direct feeding training); oral and pharyngeal nursing (swallowing therapeutic apparatus with frequency of 30–80 Hz, wave width of 700 ms, and current intensity of 0–25mA, for 30 min/time, once/day, and continued for 2 weeks); psychological nursing (relieve anxiety and fear and give psychological comfort) Duration: during radiotherapy	109 esophageal cancer patients undergoing radiotherapy: CG (n = 45) and EG (n = 64)	This intervention can ameliorate dysphagia and improve the QoL. The incidence of complications in the EG was lower than the ones showed in the CG
Ann [41], 2016 Australia	Review	Managing symptom effects of cerebral edema: medication (corticosteroids, antiepileptics), rehabilitation, communication, patient and family education	Patients with high-grade glioma	16 records were selected. While medication is the primary management for symptom clusters, other therapies such as rehabilitation are used to aid in symptom relief and management, improving functionality and QoL, and reducing hospital admissions. Effective communication is needed to the patient and their family to ease coping with symptoms

6MWD — 6-minute walking distance; ADL — activities of daily living; BC — breast cancer; CG — control group; CIPN — chemotherapy induced peripheral neuropathy; CRF — cancer-related fatigue; EG — experimental group; HRQoL — health related quality of life; NHP — nurse-led health program; NSCLC — non-small cell lung cancer; OG — observational group; PA — physical activity; QoL — quality of life; RRP — respiratory rehabilitation program; UC — usual care

mainly among patients with breast cancer or breast cancer survivors. So, specific intervention modes may be more effective for treating CRF at different points in the cancer treatment trajectory [17].

Other studies in this review showed that exercise and physical therapy may be promising treatments for the management of chemotherapy-induced peripheral neuropathy [18] and that they help with dyspnea [19], in addition to fatigue management [20–22].

The respiratory rehabilitation programs provide knowledge on dyspnea and are used to prepare patients with low to moderate dyspnea to manage this symptom [23]. In addition, breathing exercises have positive effects not only on dyspnea but also on the 6-minute walking distance (6MWD) test [24].

Results from 2 studies on swallowing exercises showed that these interventions had effects on swallowing function and on mouth opening in head and neck cancer patients [25], and that can ameliorate dysphagia in esophageal cancer patients, with improvements in QoL [26].

An RCT on using exercise facilities in the community, which included aerobic, resistant, flexible, and pelvic floor muscle interventions, was conducted on prostate cancer survivors, to reduce the complications after treatment, and statistically significant improvements in sexual function were reported [27]. Similarly, home-based physiological rehabilitation along with nursing education, for postoperative patients with early-stage cervical cancer, improved female sexual function or sexual well-being [28].

Concerning lymphedema of the upper extremity in breast cancer patients, Dönmez and Kapucu [29] found benefits for those who were included in a physical activity program and simple lymphatic drainage, reducing lymphedema-related symptom severity scores. In another study conducted by Temur and Kapucu [30] a self-management lymphedema program has been effective preventing lymphedema development in the intervention group. Two RCTs on upper limb exercise following breast cancer surgery were conducted aiming to improve function. Results showed that an evidence-based nursing intervention can reduce the degree of lymph node edema during radiotherapy, thus improving upper limb function [31]. In addition, progressive upper limb exercises and muscle relaxation training had positive effects on HRQoL [32].

Other studies focused on physical function and QoL, showing a significant beneficial effect with supervised exercise interventions. The effects of unsupervised exercise interventions on physical function were better when prescribed at a higher weekly energy expenditure [33]. A systematic review and meta-analysis showed an overall small effect of moderate-to-vigorous physical

activity that employs broad-reach approaches, such as for walking steps, supporting these interventions [34].

Some studies reported a practice of exercise where the patients rely on web/online support and health information programs, with variations in levels of patient adherence. Sotirova et al. [35] developed a systematic review and narrative synthesis, in which they concluded that increased acceptability and user satisfaction were associated with interventions seen as time and cost-efficient. Exercise training, supported with follow-up calls at home was found acceptable because it removed traditional barriers to exercise [36]. In a walking intervention (online) conducted by Frensham et al. [37], there was a large increase in steps per day at 12 weeks, but changes were not maintained at 3-month follow-up. However, exercise interventions supported by internet programs or by phone calls also showed improvements in exercise capacity, which is related to good QoL [38–40].

A review provided evidence of how rehabilitation helps relieve and manage symptoms of cerebral edema in patients with high-grade glioma, in addition to medication, communication strategies, and patient and family education, which resulted in improving functionality and QoL and reducing hospital admissions [41].

Exercise programs were further used for the control of anxiety [42], to reduce the length of hospital stay (by encouraging early ambulation after surgery) [43], or to accept and engage in regular activity [36–38].

The studies included in this review evidenced nurse-led exercise programs with some differences (content, frequency, duration, intensity, and degree of supervision) often coupled with other interventions. Therefore it is difficult to evaluate the benefits of exercise alone. However, positive outcomes were linked to exercise and included better physical performance, symptom management, and, consequently, QoL.

Psychoeducational interventions and/or counseling meetings

Most of the studies included in this category (38.1%) were face-to-face sessions, followed by both in-person and telephone/internet contact (28.6%) with cancer patients as part of the nurse's interventions. Only 2 studies, with breast cancer patients, used a group intervention model.

The content of nurse-led interventions comprised in this category varied across studies and most of them incorporated a multifaceted strategy. Some interventions focused on a specific symptom, others on a cluster of symptoms, or covered other challenges (e.g., QoL, return to work) (Tab. 2).

An RCT performed by Fenlon et al. [44] demonstrated the effectiveness of cognitive-behavioral therapy (CBT) in decreasing hot flushes and night sweats in

breast cancer patients. Another study showed that CBT and cognitive training had promising results on cognitive dysfunction (e.g., memory efficacy) [45]. Results of a behavioral intervention conducted by Hunter et al. [46] showed a reduction of anticipatory nausea and vomiting during chemotherapy in patients receiving mindfulness relaxation or relaxing music.

Nurses' interventions in cancer patients can include psychotherapeutic strategies, such as the hope therapy, which seemed promising in producing both physical and psychological benefits [47], or the positive behavior management model, with a significant impact on self-efficacy, hope levels, and QoL scores [48]. An RCT conducted by Zhou et al. [49], on cyclic adjustment training had positive effects on improving psychological resilience. Another study obtained similar results while using a hospital-family holistic care intervention based on "Timing It Right" [50].

Nurses also need training in spiritual care competencies as evidenced in a study performed by Guo et al. [51], where it was observed that patients having lower preferences for nurse spiritual therapeutics, often report an imbalance of their body, mind and spirit, and may need extra effective measures to promote their psychological capital (self-efficacy, optimism, hope, and resilience) and QoL.

Individual psychoeducational programs, linked to cognitive therapy strategies, showed to be effective in reducing psychological symptoms of distress, anxiety, and depression, 12 months after diagnosis [52]. Nurses can use internet-based learning and self-management programs targeting anxiety and depression to provide helpful information and as a complement to standard care, but only for people with milder problems [53]. Another strategy used by Borji et al. [54] was the eye movement desensitization and reprocessing technique, which had significant results in decreasing patient stress. Byun et al. [55] also showed significant changes in distress and mood using a crying therapy program in breast cancer survivors.

An individually tailored nursing intervention that supports self-management of symptoms using motivational interviewing significantly reduced overall symptom distress and severity in cancer patients undergoing chemotherapy [56]. In an ethnographic study, Cerna et al. [57] identified three categories of nursing strategies that support self-management in pelvic-cancer rehabilitation patients: encouraging self-reflection, tailoring solutions together, and keeping patients motivated.

A nurse-led survivorship model of care may be a supportive intervention for lymphoma patients who had finished treatment because, as concluded by Taylor et al. [58], survivors need individualized and tailored support and resources that can promote self-management.

Other studies utilized some form of educational approach and showed positive effects, for example, the educational technology presented by Perdigão et al. [59] with validity for health education regarding fatigue. An educational respiratory rehabilitation animation showed to be effective for promoting training-related knowledge and exercise compliance, with lower complications due to pulmonary surgery [60]. Similarly, a home-based educational program for breathlessness management resulted in the improvement of patients' breathlessness and anxiety [61]. In addition, educational and counseling nutritional interventions after esophageal cancer surgery empowered patients to develop high levels of bodily consciousness and skills in self-management, re-embodiment eating [62].

Research on fitness to work is needed because a study conducted by Zeng et al. [63] showed that breast cancer survivors reported higher levels of cognitive limitations at work, anxiety, and lower levels of work productivity and QoL. So, a rehabilitation nurse should ponder strategies to help the patient manage anxiety and to best accommodate specific cognitive limitations and work tasks.

Hospital-based rehabilitation counseling programs showed positive effects on women surgically treated for gynecological cancer, achieving their expected or much-higher goals, but some of them needed additional support [64]. Similarly, in a nurse-led sexual rehabilitation program conducted by Bakker et al. [65] on gynecologic cancer patients treated with pelvic radiotherapy (RT), in-person counseling sessions resulted in sexual function improvement.

### Complementary and alternative medicine therapies

Complementary and alternative medicine (CAM) can include a variety of medical products and practices that are not part of standard medical care. Specifically, cancer care CAM comprises the patient's mind, body, and spirit, and includes multidisciplinary approaches (Tab. 3).

The National Cancer Institute [66] believes that evidence-based complementary medicine modalities could be included as part of standard cancer treatment for all patients during the cancer care continuum.

Yangöz and Özer [67] found that music had a moderate effect on the intensity of the pain experienced by patients with cancer-related pain and that this intervention had no adverse effects.

Massage therapy at the end of the chemotherapy treatment, simultaneously with soothing music, showed to be effective in reducing significantly progressive symptoms of pain, fatigue, and sleep disorders' intensity and improving sleep quality over time [68].

A systematic review performed by Baviera et al. [69] assessed the effect of acupuncture on chemotherapy-in-

Table 2. Nurse-led Psychoeducational interventions and/or counselling meetings

Author and location	Design	Intervention Details	Population	Findings
Goldschmidt et al. [52], 2017 Denmark	Randomized pilot study	Individually tailored nurse-navigation intervention (ITNNI): individual, manual-based counselling based on strategies from cognitive therapy and psychoeducation (empathetic listening and dialog, collaborative empiricism, assessment of needs from patient reported outcome measures and dialogue with the patient, goal-setting, intervention plan and debriefing). 1st session conducted face-to-face, while the following sessions were either face-to-face or by telephone. Duration: 12 months	116 Women with newly diagnosed BC (pre-operative): OG (n = 66); EG (n = 25) and CG (n = 25)	This pilot study shows promising feasibility including high participation rate and satisfaction with the ITNNI. No significant effects were observed after 6 months, but results showed statistically significant effects on distress, anxiety and depression, but not on HRQoL, 12 months after diagnosis
Coolbrandt et al. [56], 2018 Belgium	Quasi-experimental study	CHEMO-SUPPORT intervention: one in-person coaching session at the start of treatment, one telephone-based coaching session during the first few days at home, patient information brochure and an online or on-call nursing service for help patients to adequately self-manage their symptoms. Duration: 12 weeks	143 cancer patients starting their first chemotherapy treatment: CG (n = 71) and EG (n = 72)	An individually tailored nursing intervention that supports symptom self-management using motivational interviewing significantly reduces overall symptom distress and symptom severity. Self-efficacy and outcome expectation were significantly higher in the EG. Self-care was statistically similar in both groups
Taylor et al. [58], 2019 Australia	RCT	Care After Lymphoma trial: 3 face-to-face appointments (60 min) in the nurse-led lymphoma survivorship clinic, an individual Survivorship care plan and treatment summary and resource pack. Duration: 6 months	60 Lymphoma participants 3 months post-treatment follow-up: CG (n = 30) and EG (n = 30)	Although not statistically significant, EG reported less unmet needs, less distress and an increase in empowerment, compared with CG. Survivors require individualized and tailored support and resources
Hol et al. [64], 2019 Denmark	Observational cohort study	Hospital-based rehabilitation counselling program: 2 face-to face sessions that lasted up 1 hour (1 and 3 months after discharge) and 2 phone calls (1 month after each rehabilitation session) Duration: 5 months	151 women surgically treated for gynaecological cancer (endometrial, ovarian and cervical cancer)	70% of participants at the first phone call and 72% at the second phone call achieved their goals as expected or more or much more than expected. Endometrial cancer patients more often achieved their goals than others
Zhang et al. [50], 2020 China	RCT	Hospital-family holistic care intervention based on "Timing It Right". The phases of the disease were adjusted to the following: the disease diagnosis phase, the perioperative phase, the discharge preparation phase and the adjustment and adaptation phase. The interventions were implemented in both in-hospital (first two phases) and out-of-hospital sites (last three phases). Duration: 6 months	119 Colorectal cancer patients with permanent colostomy: EG (n = 60) and CG (n = 59)	After intervention, there were significant differences in psychological resilience, self-care ability, complications and QoL between groups, at different observation points
Chan et. [47], 2019 China	Pre-to-post design	Brief Hope Intervention consisted of 4 one-on-one sessions: 2 face-to-face sessions (1 hour) and 2 (30 min) telephone follow-up sessions in between. There were 3 core features in the hope therapy: goal thoughts, pathway thoughts and agency thoughts	40 rehabilitation cancer patients	Participants had significant improvement in all aspects of the memorial symptom assessment scale, but the changes in present hope and depression scores were insignificant.

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**Table 2 cont. Nurse-led Psychoeducational interventions and/or counselling meetings**

Author and location	Design	Intervention Details	Population	Findings
Hao et al. [48], 2020 China	RCT	Positive behaviour management model based on cognitive framework: reshape the cognitive system (20 min), health-related cognitive structure (90 min), physical and mental relaxation cognitive intervention (10 min) and family members' participation in cognitive management (30 min). Conducted every day. Duration: 2 weeks	84 Breast cancer patients following surgery: EG (n = 42) and CG (n = 42)	After the intervention, self-efficacy and hope level of the EG were significantly higher than those of the CG. Similar results were found for the QoL scores in all aspects
Hauffman et al. [53], 2017 Sweden	RCT	Internet-based learning and self-care program, that combines information, self-care aids and psychosocial support. Duration: 24 months	39 patients with breast, colorectal or prostate cancer, reporting symptoms of anxiety and depression	Participants acknowledged that self-management programs targeting anxiety and depression should be used only by people with milder problems and that severe mental health problems should be handled face-to-face. The use of this program was satisfactory
Zhou et al. [49], 2019 China	RCT	Psychological rehabilitation intervention: cyclic adjustment training (CAT) delivered via a mobile device (comprising 4 steps: confront, pre-introspect, adjust and re-introspect) Duration: 12 weeks	132 Post-surgical breast cancer patients: EG (n = 66) and CG (n = 66)	The CAT had positive effects on improving psychological resilience and reducing the symptoms of anxiety and depression
Cerna et al. [57], 2019 Sweden	Ethnographic study	Three categories of nursing strategies that support self-management of radiation-induced bowel and bladder issues: encouraging self-reflection, tailoring solutions together and keeping patients motivated	Pelvic-cancer rehabilitation patients	Nurses and patients jointly make sense of patients' symptoms and they can co-create solutions tailored to each patient's individual needs, as well as develop routines to keep the patient motivated in carrying out the devised solutions
Zeng et al. [63], 2017 China	Cross-sectional study	Assessment of levels of distress (anxiety and depression) and cognitive symptoms at work	412 participants: breast cancer survivors (n = 159) vs women with no cancer (musculoskeletal pain) (n = 253)	Higher anxiety and cognitive limitations at work were associated with work limitations and QoL in the breast cancer group only. Depressive symptoms were significantly associated with work limitations in the non-cancer group
Byun et al. [55], 2020 Korea	Pre-post-test quasi-experimental design	Crying therapy program comprising three-phase: introductory (week 1), execution (week 2), and closing phase (week 3), each of which lasted 2 hours Duration: 3 weeks	27 Breast cancer survivors	Results showed significant changes in distress, mood changes, and immunoglobulin G and smaller changes in blood pressure postintervention. Fatigue and cortisol showed no significant changes
Guo et al. [51], 2021 China	Cross-sectional survey	Spiritual care competencies: preferences for nurse spiritual therapeutics (PNST)	208 cancer patients	Patients with mild-moderate PNST experience lower psychological capital and QoL than patients with high PNST. Psychological capital significantly correlates with QoL of cancer patients

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Table 2 cont. Nurse-led Psychoeducational interventions and/or counselling meetings

Author and location	Design	Intervention Details	Population	Findings
Von Ah & Crouch [45], 2020 USA	Integrative review	Cognitive rehabilitation for cognitive dysfunction: cognitive behavioural therapy (CBT) and cognitive training (CT — structured practice on cognitive tasks)	1543 Cancer survivors (46% breast cancer)	27 manuscripts were identified for review. CBT and CT appear feasible to deliver, satisfactory to participants, and have shown promising results (e.g., perceived cognitive function, memory efficacy)
Fenlon et al. [44], 2020 United Kingdom	RCT	CBT for the alleviation of hot flushes and night sweats (HFNS): stress management, paced breathing, cognitive and behavioural strategies and maintaining changes. Intervention arm participants attended weekly group CBT session (90 min) Duration: 6 weeks (26 weeks after randomization)	130 Breast cancer patients: CBT group (n = 63) and CT (n = 67)	Results showed a 46% reduction in the mean HFNS problem rating score in the CBT arm and a 15% reduction in the usual care arm. Secondary outcomes (frequency of HFNS, sleep, anxiety and depression) improved significantly
Borji et al. [54], 2019 Iran	Semi-experimental study	Home care using Eye movement desensitization and reprocessing technique for decreasing patients' stress, which included 2 sessions (each session lasted for 45 to 60 min)	60 Gastrointestinal cancer patients: EG (n = 30) and CG (n = 30).	No statistically significant difference was observed between the 2 groups before the intervention in terms of patients' perceived stress. The efficacy and perceived distress of the EG was decreased significantly after the intervention
Hunter et al. [46], 2020 USA	RT	Behavioural intervention (20 min): mindfulness relaxation (MR — single exercise, composed of guided mindfulness, imagery, and relaxation practices) or relaxing music (RM — recording consisted of relaxing music with nature sounds or a vocal track), for reduction of anticipatory nausea and vomiting (ANV) Duration: 4 or 6 course chemotherapy protocol	474 Patients undergoing chemotherapy for solid tumours (85% BC): MR (n = 160), RM (n = 159) or standard care (n = 155)	Compared to standard care, there was reduced anticipatory nausea at the midpoint of chemotherapy in those receiving MR and RM. There was no difference between treatment groups in ANV at the end of chemo and post chemotherapy nausea and vomiting at either time point
Bakker et al. [65], 2017 Netherlands	Observational pilot study	Nurse-led sexual rehabilitation after RT: 4 face-to-face counselling sessions at 1, 2, 3 and 6 months following radiotherapy (RT) or brachytherapy (BT). Information booklet and a vaginal dilator set were provided. Couples' mutual coping and support processes were promoted. Duration: 12 months	20 gynaecologic cancer patients treated with combined pelvic RT and BT	Sexual function improved between 1 and 6 months after RT, with additional improvement at 12 months. At 6 months, 88% of participants reported using dilators at least twice a week, and partnered patients gradually replaced or supplemented vaginal dilator use by having sexual intercourse. Most participants reported the nurses had adequate expertise and counselling skills
Missel et al. [62], 2018 Denmark	Qualitative study — phenomenological approach	Education and counselling nutritional intervention: 4 sessions between the patient and a nurse. Duration: Preoperatively to 2 weeks after discharge	10 patients after curative surgery for esophageal cancer	The essence of experiencing the education and counselling intervention can be structured into 3 themes: embodied disorientation; living with increased attention to bodily function and re-embodiment eating. The intervention empowered the patients to regain some control of their own bodies in an effort to regain agency in their own lives

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**Table 2 cont. Nurse-led Psychoeducational interventions and/or counselling meetings**

Author and location	Design	Intervention Details	Population	Findings
Li et al. [60], 2021 China	RCT	The respiratory rehabilitation (RR) animation was downloaded on an iPad, and consisted of 3 sections totalling 31 min: 6-min animation introduction, a 10-min nurse demonstration, and a 15-min patient teach back demonstration. It was performed twice each day at the patient's bedside.	80 postsurgical lung cancer patients: EG (n = 40) and CG (n = 40).	Educational animation is effective for promoting training-related knowledge and exercise compliance with active RR. Mean scores of training-related knowledge and exercise compliance in the EG were higher than those of the CG. Postoperative pulmonary complications were lower, and 6MWD was longer compared with the CG
Choratas et al. [61], 2020 Cyprus	Feasibility RCT	Home-based educational programme for breathlessness management consisted of a PowerPoint presentation (with 2 video recordings and a practical exercise) and implementation of 3 non-pharmacological interventions: diaphragmatic breathing, inspirational muscle training, and use of a handheld fan (lasted about 30-50 min, applied twice to the EG after the 1st and 2nd assessment). Duration: 4 weeks	19 Lung cancer patients and 19 family caregivers (f.c.): EG (n = 11+11) and CG (n = 8+8)	There was a reported improvement in the EG patients' breathlessness and anxiety levels, as well an improvement in the anxiety and burden levels of their f.c.
Perdigão et al. [59], 2019 Brazil	Meth-odological study	Educational technology (ET): "Knowing and coping with fatigue" and non-pharmacological strategies for the management of this symptom (physical exercise practice, sleep hygiene, energy conservation and behavioural intervention)	Cancer patients undergoing outpatient chemotherapy	The ET presented content and appearance validity for health education regarding fatigue

6MWD — 6-minute walking distance; BC — breast cancer; BT — brachytherapy; CAT — cyclic adjustment training; CBT — cognitive behavioural therapy; CG — control group; CT — Cognitive training; EG — experimental group; ET — educational technology; f.c. — family caregivers; HFNS — hot flushes and night sweats; HRQoL — health related quality of life; ITNNI — individually tailored nurse-navigation intervention; NSCLC — non-small cell lung cancer; OG — observational group; PNST — preferences for nurse spiritual therapeutics; QoL — quality of life; RR — respiratory rehabilitation; RT — radiotherapy; RT — randomized trial

duced peripheral neuropathy symptoms. Despite the variety of intervention dimensions, an improvement in peripheral neuropathy was observed without any side effects. Izgu et al. [70], also showed beneficial effects on the prevention of peripheral neuropathic pain in breast cancer patients receiving adjuvant paclitaxel, by using a classical massage intervention.

The symptoms of fatigue experienced by patients during cancer treatment can be managed at home with reflexology or meditative practices [71]. In addition to fatigue improvement, reflexology associated with sleep hygiene education has proven to be effective in increasing sleep quality [72].

## Discussion

Comprehensive rehabilitation care is needed as a standard part of cancer care. According to Alfano and Pergolotti [7], its assessment must include a whole-per-

son view of functioning, disability, and health, aiming toward improving function in activities and improving a patient's capacity to participate completely in life roles, such as work or leisure.

Nurses are recognized as extremely skilled and experienced health professionals who incorporate evidence-based literature into action, improving the quality of care and their patients' outcomes. Three categories of nurse-led interventions were identified within this scoping review, focused on cancer rehabilitation from the diagnosis.

Conceptual models and theories serve as a guide for clinical practice, and this review incorporates elements of Orem's Self-care deficit nursing theory [10]. Considering the theory of nursing systems, the analyzed nurse-led rehabilitation interventions are mainly supportive-educative. In the supportive-educative system, the nurse's role is to encourage and support the person as a self-care agent, as the patient tries to achieve all stages of self-care [10].

Table 3. Nurse-led complementary and alternative medicine therapies

Author and location	Design	Intervention Details	Population	Findings
Miladinia et al. [68], 2016 Iran	RCT	Massage therapy: slow-stroke back massage (SSBM) 3 times a week for 10 min at the end of the chemotherapy treatment. An audio CD containing soothing music was also used during SSBM intervention. Duration: 4 weeks	60 patients with acute leukaemia undergoing chemotherapy: EG (n = 30) and CG (n = 30)	SSBM intervention significantly reduced progressive symptoms of pain, fatigue and sleep disorders intensity, and improved sleep quality over time
Izgu et al. [70], 2019 Turkey	RCT	Classical Massage was applied to the patient before each paclitaxel infusion, once a week, totally 12 sessions (room with a controlled temperature 20-22°C). Massage lasting for 30 min in each session: 20 min for the feet and 10 min for the hands. Duration: 16 weeks	Breast cancer patients receiving adjuvant paclitaxel: EG (n = 19) and CG (n = 21)	The peripheral neuropathic pain was lower in the EG, compared to the CG at week 12. Classical massage improved the QoL and showed beneficial effects on the nerve conduction studies findings
Zengin & Aylaz [72], 2019 Turkey	Pre-to-post design	Reflexology (16 sessions of 30 min) and sleep hygiene education (3 sessions of 20 min). Duration: Reflexology (8 weeks, with 2 sessions per week) and sleep hygiene (3 weeks)	167 adult cancer patients undergoing chemotherapy: EG (n = 84) and CG (n = 83)	Patients in the EG reported increased sleep quality and reduced fatigue
Wyatt et al. [71], 2021 USA	SMART sequential multiple assignment randomized trial	Home-based reflexology and meditative practices: after the first 4 weeks in the two intervention groups, patient's response on fatigue was determined. Dyads with nonresponding patients were randomized for the second time to either continue with the same therapy for more 4 weeks, or add 4 weeks of another therapy. Duration: 12 weeks	Cancer patients and informal caregivers (dyads = 347): reflexology (n = 150), meditative practices (n = 150) or control (n = 47)	Sequences of reflexology and meditative practices were not different in symptom outcomes. Participants who used reflexology for the full 8 weeks had lower summed severity index compared to those who started with reflexology and added meditative practices after the first 4 weeks
Baviera et al. [69], 2019 Brazil	Systematic review	Acupuncture characterized by a variety of intervention dimensions (type of protocol, use of medications, time of treatment, and different outcomes measures) Duration: from only a few weeks to 14 weeks	Adult cancer patients with chemotherapy-induced peripheral neuropathy symptoms	4 cohort studies and 1 quasi-experimental study included. Evidence suggested that acupuncture was associated with an improvement in the peripheral neuropathy, and had no side effects
Yangöz & Özer [67], 2019 Turkey	Systematic review and Meta-analysis	Music intervention: passive listening method, which ranged from 30 to 60 min and 1 to 3 sessions	593 patients with cancer-related pain (CRP)	6 RCTs included. It was found that music interventions had a moderate effect on CRP, and no adverse events were reported

CG — Control group; CRP — cancer-related pain; EG — experimental group; SSBM — slow-stroke back massage

Many of the included studies targeted several outcomes, to manage cancer-related symptoms or improve QoL. The intensity and type of cancer rehabilitation interventions need to be personalized to achieve desired outcomes: restoring function, improving participation, and/or preventing late adverse effects of cancer treatment [7].

As stated previously, CRF was the most targeted symptom, maybe because it is the most common side effect of cancer and its treatments, and it can frequently persist for months or years. Research on fatigue in cancer patients included mainly self-reports of fatigue,

with a lack of data exploring biologic or physiologic correlates [73], and it is also evident in studies included in the review.

Several studies focused on rehabilitation interventions in breast cancer patients and even though they contribute to developing rehabilitation knowledge and clinical practice, additional research is needed for people with other types of cancer, as each diagnosis and treatment may create various burdens for the patient. Not many articles included patients with hematologic malignancies. In addition, studies with advanced

cancer patients in palliative care were scarce in this review. According to Lee et al. [74], advanced cancer patients hospitalized in hospice palliative care units face numerous problems, such as QoL complications and limitations in performing daily activities, which comprehensive rehabilitation interventions can help resolve. So, cancer rehabilitation is crucial at various stages for cancer patients, including in the palliative care phase.

Some other areas could benefit from further attention, such as nutrition or dysphagia, to identify patient-specific needs and interventions and to prevent or control serious disorders, such as cachexia. In addition, it is necessary to gather evidence on the effectiveness of interventions to promote patient employment or return to work and to improve cognitive functioning.

In a study conducted by Smith et al. [75], it was concluded that exercise can be a vital aspect of a patient's treatment and survivorship. Even moderate levels of supervised exercise can provide beneficial physical and psychological outcomes. Thus, incorporating exercise into the routine of a person with cancer provides benefits to their QoL and it is important for muscular and aerobic fitness, both during and after treatment [76]. Studies included in the review also demonstrated that exercise had positive effects, not only on physical function and QoL but also had psychological benefits. Additionally, exercise could be effective in the management of treatment side effects. Thus, according to Segal et al. [77], cancer patients can be allowed to determine the kind of exercise that they would prefer to do for aerobic and resistance training. Finally, the intensity of the exercise must be adjusted for each patient, then increased slowly in the continuum of treatment, and it should be closely monitored by health professionals [78].

In addition to exercise, the other two categories of intervention also showed positive trends. Most of the psychoeducational interventions or counseling meetings had promising results. With regard to many CAM treatments and their hoped-for benefits, reliable scientific evidence is needed in terms of their safety and effectiveness.

### Limitations

Although there are limitations in this scoping review, it does provide a good start for nurses working in cancer rehabilitation. In addition, this article provides a departure point for researchers who need to study the effectiveness of rehabilitation-specific interventions. Several problems seen in the cancer care continuum were identified, including the survivorship period. Even if the results from the studies were variable and showed clinically positive trends, they do not always have a statistical significance and could not be generalized to larger

populations. The discrepancies found between different results can be attributed to the timing when the intervention was delivered to patients, the duration of the intervention or the follow-up, and the focus of each study. So, comparisons between studies may be hard. Another limitation is that some studies had small samples.

Additional research is needed to develop and validate the effects of cancer rehabilitation interventions on patient outcomes, including the efficacy of cancer treatments strategies, prevention of their side effects, and cancer patients' reactivation.

## Conclusions

Cancer rehabilitation is becoming more and more important in different categories (prevention of late effects of treatment, restoring function and enhancing participation) to improve the QoL in cancer patients.

Nurses, as part of the rehabilitation team, play an instrumental role in providing the highest level of patient-centered care with individualized interventions to prevent, manage or alleviate cancer-related symptoms or challenges. These rehabilitation providers deliver evidence-based direct care, psychological support, cancer patient/caregiver education, care coordination, and health promotion, across all stages of the disease.

The main nurse-led interventions in cancer patients included both exercise/physical activity and psychoeducation/counseling sessions. The beneficial effects of these interventions were recognized, but this is still insufficient. More research is needed to help create more rehabilitation programs for specific cancer stages and diagnoses.

## Conflict of interest

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