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REVIEW

Recommendations for cancer related fatigue in post-treatment survivorship care: a cross-sectional analysis of guidelines

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Abstract

Background/Objective Existing guidelines for the management of cancer-related fatigue (CRF) differ in scope, evidence strength, and implementation strategies, limiting consistent integration into post-treatment survivorship care. This study systematically evaluates and compares recommendations to identify best practices, highlight evidence gaps, and provide actionable insights for clinicians and policymakers.

Methods A systematic search was conducted across PubMed, the Cochrane Library, and professional society websites. Included were all guidelines from professional oncology societies addressing CRF management in adult cancer survivors and published in English between 2000 and December 2024. From 524 references screened, eleven (11) guidelines from eight (8) professional societies met the inclusion criteria and were analysed. The quality of the guidelines was assessed using the Appraisal of Guidelines for Research and Evaluation II (AGREE II) criteria. Recommendations, their strength of evidence and strength of recommendations were extracted and standardized into the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) framework. The screening, grading, and extraction process was performed by two reviewers independently.

Result The quality of the eleven guidelines was high in three (27%), moderate in seven (64%), and poor in one (9%)**.** Based on a moderate level of evidence, CRF should be screened at every patient encounter by all healthcare providers, with positive screens followed by referral to appropriate professionals for further assessment using one of several validated tools. A strong recommendation based on moderate evidence was for exercise. In particular, aerobic and resistance training of low to moderate intensity, three times per week for 12 weeks was recommended. Guidelines consistently issued a strong recommendation for CBT (moderate evidence), and for psychotherapy (variable evidence). CBT was recommended, especially with structured coping strategies or web-based delivery. Guidelines cautiously recommended mind–body interventions such as Yoga, Tai Chi, and Qigong based on variable strength of evidence and recommendation. Education andcounselling (particularly for depression-related fatigue) are mainly based on expert consensus rather than strong clinical trials. Other options may be considered in individual patients but are not supported by strong evidence.

Conclusion This guideline analysis demonstrates broad support for continued CRF screening during survivorship care, followed by assessment of contributing factors when fatigue is identified. Exercise, especially low- to moderate-intensity aerobic and resistance training, and cognitive behavioral therapy are consistently recommended across guidelines as effective interventions. Psychoeducation and counselling are also beneficial, especially for fatigue linked to mental health conditions. Pharmacological treatments are not recommended due to insufficient evidence and side effects.

Implications for Cancer Survivors Cancer survivors are encouraged to report ongoing fatigue and seek supportive care, given the availability of effective non-drug interventions.

Eva Haegler-Laube and Maria M. Wertli equally contributed to this work.

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Keywords Cancer-related fatigue · Cancer survivorship · Clinical practice guidelines · Non-pharmacological interventions · Quality of life

Introduction

The growing population of cancer survivors driven by advancements in treatments such as immunotherapy, targeted therapies, and chemotherapy, represents a significant achievement in oncology. As of January 1, 2025, an estimated 18.6 million cancer survivors reside in the United States alone, a figure projected to rise in the coming decades [1]. This progress has also brought attention to the long-term and late effects of cancer and its treatment, collectively referred to as survivorship challenges [2]. Survivorship care spans the entire cancer journey, beginning at diagnosis and continuing through treatment and beyond [3]. While the diagnostic and treatment phases focus on planning, therapy delivery, and managing acute toxicities, the post-treatment period is especially critical. This stage, though often marked by relief at completing therapy, is also when survivors face persistent or late-emerging effects such as cancer-related fatigue (CRF), cognitive changes, emotional distress, and physical limitations that can significantly impact daily life. Yet, despite these needs, many survivors do not receive the structured follow-up and supportive care required to manage these challenges effectively [4–6]. CRF stands out as one of the most pervasive and debilitating symptoms faced by survivors [7]. Based on the NCCN guideline, CRF is defined as a distressing, persistent, and subjective sense of tiredness related to cancer or its treatment, which is not proportional to recent activity and interferes with usual functioning [8]. Unlike ordinary fatigue, CRF is not relieved by rest, and often persists for months or years after treatment ends [9]. This condition affects 70% to 100% of cancer survivors, impairing their ability to perform daily activities, maintain employment, and engage in social interactions [10, 11]. The etiology of cancer-related fatigue is multifactorial, arising from both the underlying disease and the toxicities of treatment. Beyond the direct metabolic and inflammatory effects of cancer, therapy-related complications such as cardiovascular dysfunction (e.g., anthracycline-induced heart failure), pulmonary impairment (e.g., radiation-associated loss of lung capacity), neurological damage (e.g., peripheral neuropathy, cognitive impairment), and endocrine disturbances (e.g., hypothyroidism, adrenal suppression) all play a role. Psychological distress, sleep disruption, deconditioning, and comorbid medical conditions further contribute, underscoring the complex and interrelated nature of this symptom [12, 13]. Despite its high prevalence and impact, CRF remains underdiagnosed and undertreated, partly due to variability in guidelines and a lack of standardized recommendations for its management [14]. Existing guidelines propose a range of interventions. However, the strength of evidence varies, and actionable strategies for implementing them in clinical practice are often lacking [6]. Furthermore, integration of CRF management into comprehensive survivorship care plans remains inconsistent, leaving many survivors without adequate support.

Given that different health care providers will care for survivors once they complete their treatment and cancer-related follow-up, we aimed to systematically summarize and assess the level of evidence of recommendations for survivorship care that starts after completion of the cancer-related treatment outside acute oncology settings. Given the wide range of recommendations for follow-up care from somatic diseases to psychosocial conditions, this analysis assessed recommendations for cancer related fatigue (CFR). We systematically summarized, assessed, and compared recommendations across different types of cancer and healthcare professional disciplines. Using this approach, the study aimed to integrate evidence and expert perspectives from multiple fields and to provide a broad overview of current clinical recommendations. Finally, we aimed to identify and summarize gaps in the current evidence for guideline recommendations.

Methods section

Study design

This study is a cross-sectional analysis of guidelines addressing the management of CRF in cancer survivorship care. We conducted a systematic literature search adhering to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [15] to identify all relevant guidelines. Results were reported following the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Checklist for cross-sectional studies [16].

Systematic search of guidelines

To identify all relevant clinical practice guidelines, we conducted a systematic search of PubMed and the Cochrane Library. The search strategy combined MeSH terms and keywords such as “cancer survivors,” “cancer survivorship,” “post-cancer care,” “follow-up,” and “after therapy” with the terms “guideline,” “clinical practice guideline,” and * “recommendation.” The complete search strategy is presented in

Supplemental Table S1. Further, we search on the website of cancer societies and by screening references of reviews and articles on the topic. Given that the clinical focus of this review is CRF, it might ordinarily be expected that the keywords "fatigue" or "cancer-related fatigue" be included in the search. However, our rationale for not doing so was that recommendations on fatigue are frequently embedded within cancer-type-specific survivorship guidelines (e.g., breast, prostate, or head and neck cancer) that do not necessarily mention fatigue in their titles or abstracts. Limiting the search to fatigue-specific terminology would therefore have risked excluding a substantial number of relevant guidelines. To mitigate this, we employed a deliberately broad search strategy designed to capture all survivorship and follow-up guidelines, irrespective of cancer type, and subsequently performed full-text screening to extract recommendations related to fatigue. To maximize comprehensiveness, we additionally searched the webpages of major professional societies, reviewed relevant systematic reviews and key publications, consulted external sources, and sought input from experts in the field. This approach allowed us to capture both general survivorship guidelines and cancer-type-specific guidelines that include recommendations on cancer-related fatigue.

Eligibility criteria

In a first step, we included guidelines developed or endorsed by national or international oncology or survivorship care societies addressing cancer survivorship published between 2000 and 2024. Excluded were other publications on the topic (e.g., reviews, protocols, commentaries, and editorials), guidelines published before the year 2000 because older guidelines may be no longer accurate due to evolving scientific evidence and newer treatments. We excluded guidelines and recommendations for cancer survivors of childhood cancers because their long-term health risks, follow-up care, and late effects differ significantly from those of adult cancer survivors. Childhood cancer survivorship requires specialized guidance addressing developmental, organ-specific, and psychosocial considerations that may not directly be applicable to the broader adult survivor population [17]. Given the wide variety of recommendations for follow-up care that were identified, we included in a second step all guidelines that issued recommendations for CRF. Thus, we excluded all guidelines that did not provide recommendations for CRF. Further, we restricted recommendations that addressed management after the end of the cancer treatment and excluded recommendations during cancer treatment. In the case of various guidelines from the same society and/or several publications, we included the most recent.

Definition of cancer survivorship

Cancer survivorship is a process that begins at the moment of diagnosis and continues through the balance of life [3]. The needs of cancer survivors differ throughout the trajectory and late follow-up care (typically 3 to 5 years after their diagnosis) differs compared to earlier phases. Given that different health care providers will care for survivors once they completed their treatment and cancer related follow-up (e.g., primary care physicians, internal medicine specialists), the primary focused was recommendations CRF for after the completion of the cancer treatment and cancer related follow-up care.

Study procedure

Two independent reviewers (J.A. and N.S) performed each of the following steps: First, all titles and abstracts from the identified references were screened for eligibility. In the next step, all full texts of potentially relevant references were read for in or exclusion. Finally, data on recommendations was extracted using a predefined spreadsheet, covering areas such as authors, society, clinical problem, intervention, and effect of intervention, level of evidence and strength of recommendation. In case a guideline used other methods to grade the evidence and strength of recommendations, the grading was standardized according to the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) framework [18] Table S3 and S4. Disagreements between the assessments of the two reviewers were discussed between the reviewers and resolved by consensus. In case no consensus was achieved, third party arbitration was done by a third reviewer (E.H. or M.W.).

Quality of guidelines

In compliance with the Appraisal of Guidelines for Research and Evaluation II (AGREE II) criteria [19], two reviewers (J.A and N.S) independently assessed the quality of the guidelines (Table S2). Given that the manual recommends up to four assessors, we discussed all discrepancies between and resolved them through consensus discussions by two other authors (E. H–L and M.W). This assessment provided an overall evaluation as well as a detailed analysis across six domains, comprising 23 individual items: scope and purpose (3 items), stakeholder involvement (3 items), rigor of development (8 items), clarity of presentation (3 items), applicability (4 items), and editorial independence (2 items). Each item was scored on a 3 star (***) scale, with 1 star indicating "not adhered to", 2 star "moderately adhered" to and 3 indicating "fully adhered." To summarize overall quality, we applied the following classification criteria: High quality: Guidelines receiving 3 stars in at least 5 of the 6 domains (i.e., > 15 total stars). Moderate quality: Guidelines receiving an average of 2 stars across domains (i.e., ~ 12–15 total stars), including occasional domains rated as 1 star. Low quality: Guidelines with < 12 total stars or multiple domains rated

as 1 star. Given our focus on CRF specific content, providing a general recommendation for the entire guideline would have been potentially misleading and outside our study scope. Instead, we evaluated (1) the overall methodological quality of each guideline using AGREE II, and (2) the strength and evidence base of CRF related recommendations.

Statistical analyses

We summarized continuous and categorical variables with number and percentage.

Result

Systematic literature review

After the exclusion of 105 duplicate references, 419 references were included for screening (Fig. 1). During the title and abstract screening, 271 references were excluded and 148 references read in full text. Of these, 137 guidelines were excluded as they did not give recommendation for the management of CRF. Finally, eleven (11) guidelines from eight (8) professional societies met the predefined inclusion criteria and were included in the final analysis. Guidelines details are summarized in Table 1

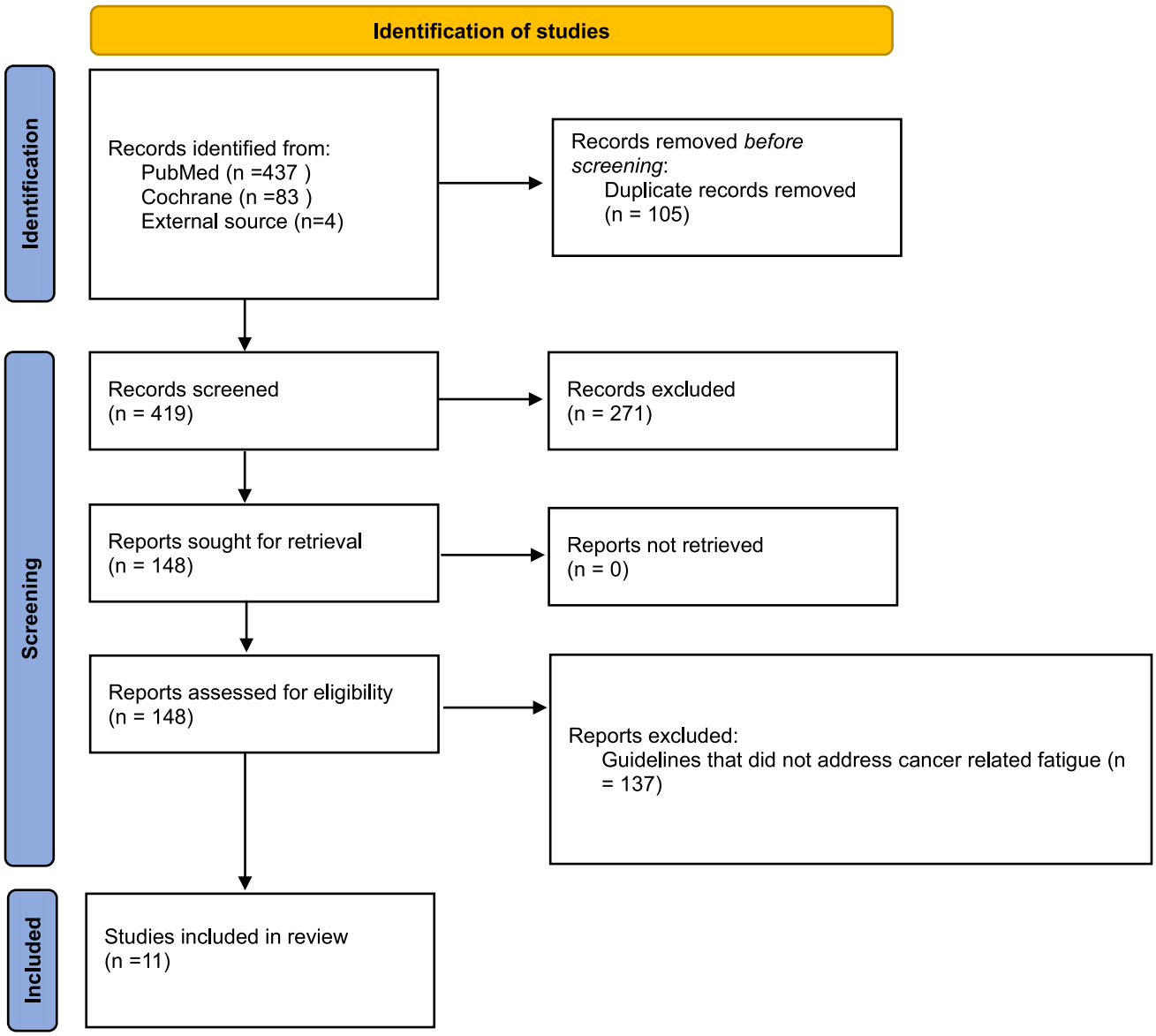

Fig. 1 Preferred reporting items for systematic reviews and meta-analysis statement flow chart

Table 1 Description of guidelines on Cancer-Related Fatigue (CRF) in survivorship care

Guideline	Country/Region	Issuing Organization	Scope	Cancer Type-Specific	Overall quality
ACS 2006 [21]	USA	American Cancer Society (ACS)	Broad	No	Poor
ASCO 2016 [23]	USA	American Society of Clinical Oncology (ASCO)	Cancer type-specific	Breast Cancer	Moderate
ACS HNC 2016 [20]	USA	American Cancer Society (ACS)	Cancer type-specific	Head and Neck Cancer	Moderate
ACSM 2019 [24]	USA	American College of Sports Medicine (ACSM)	Broad	No	Moderate
ESMO 2020 [26]	Europe	European Society of Medical Oncology (ESMO)	Broad	No	Moderate
EHNS 2022 [27]	Europe	European Head and Neck Society (EHNS)	Cancer type-specific	Head and Neck Cancer	Moderate
ASCO/SIO 2024 [25]	USA	American Society of Clinical Oncology & Society for Integrative Oncology	Broad	No	High
NCCN 2024 [8]	USA	National Comprehensive Cancer Network (NCCN)	Broad	No	Moderate
ACS 2015 [22]	USA	American Cancer Society (ACS)	Cancer type-specific	Colorectal Cancer	Moderate
APTA 2022 [28]	USA	American Physical Therapy Association	Broad	No	High
CAPO 2015 [29]	Canada	Canadian Association of Psychosocial Oncology	Broad	No	High

ESMO European Society of Medical Oncology; *ACS/ASCO* American Cancer Society/American Society of Clinical Oncology; *SIO* Society of integrative oncology; *EHNS, ACS HNC* American Cancer Society Head and Neck Cancer. European Head and Neck Society; *NCCN* National Comprehensive Cancer Network; *ACSM* American College of Sports Medicine; *APTA* American Physical Therapy Association; *CAPO* Canadian Association of Psychosocial Oncology

Guidelines

Seven (67%) guidelines were broad in scope, covering all cancer types. Four (33%) focused on specific cancer types (e.g., breast, colorectal, head and neck cancers). Guidelines were issued by organizations from both national and international levels which were developed by the National Comprehensive Cancer Network (NCCN) [8], American Cancer Society (ACS) [20–23], American College of Sports Medicine (ACSM) [24], American Society of Clinical Oncology (ASCO-SIO) [25], European Society of Medical Oncology (ESMO) [26], European Head and Neck Society (EHNS) [27],the American Physical Therapy Association (APTA) [28] and the Canadian Association of Psychosocial Oncology (CAPO) [29].

Quality of guidelines according to the AGREE II criteria

The overall quality of the guidelines varied from high (Table 1, three guidelines (27%), the ASCO-SIO guideline 2024 [25] the Canadian Association of Psychosocial Oncology (CAPO) [29].and the APTA 2022 guideline [28], moderate (seven guidelines (64%)) and low (one guideline (9%, the ACS guideline 2006 [21]). Most guidelines [20–23, 26, 29] fall short in the applicability domain due to limited implementation strategies, lack of cost considerations, and insufficient integration guidance for clinical practice (details of the quality rating are given in Supplemental Table S2). In particular, the lower score of the 2006 ACS guideline reflects evolving standards in guideline development rather than poor quality at the time of publication.

Screening of cancer-related fatigue

Screening recommendations are summarized in Table 2. Across the identified guidelines, routine screening for CRF was consistently recommended in post-treatment follow-up [8, 22, 25, 26, 28, 29]. The APTA 2022 guideline [28] provided the most comprehensive overview of screening and assessment instruments with positive results prompting timely referral for further assessment. Several unidimensional tools were recommended across guidelines. The Edmonton Symptom Assessment System–revised (ESASr) and the Numeric Rating Scale (NRS 0–10) was endorsed by both the CAPO 2015 [29] and ESMO 2020 [26] guidelines respectively, while the Functional Assessment of Chronic Illness Therapy–Fatigue (FACIT-F), and the MD Anderson Symptom Inventory (MDASI) were supported by APTA 2022 and ACS 2015, with the MDASI receiving a moderate level of recommendation for use in post-treatment survivorship [22, 28, 30]. The ACS 2015 guideline

Table 2 Guideline recommendation for the screening for chronic cancer related fatigue and clinical assessment

Recommendation	Guidelines/year (author)	Level of eviendece	Strength of recommendations
Screening approaches			
Screen every patient for fatigue as vital sign at regular intervals using severity scale (0–10). None to mild (0–3), Moderate (4–6), or Severe (7–10)	NCCN 2024, Sanft et al. [8]	Moderate	NS
All cancer patients should be routinely screened for the presence and severity of fatigue from the point of diagnosis onward, at regular intervals during therapy and aftercare and if clinically indicated	ESMO 2020, Fabi et al. [26]	Moderate	Conditional for
Patients who screen positively for fatigue (values of 4 out of 10 or higher indicating moderate to severe fatigue) should undergo a comprehensive and focused diagnostic assessment, with the aim to identify treatable contributing and comorbid conditions	ESMO 2020, Fabi et al. [26]	Moderate	Conditional for
The diagnostic assessment should involve a focused fatigue history, a thorough medical examination, a status of the underlying malignant disease, a review of body systems, a mental status examination and a minimum battery of laboratory tests	ESMO 2020, Fabi et al. [26]	Moderate	Conditional for
As a shared responsibility, the interdisciplinary team in collaboration with the patient should discuss any need for referral to specialists for further evaluation: • Cardiologist; • Endocrinologist; • Rehabilitation/physiotherapy; • Mental health professional	CAPO 2015, Howell et al. [29]	Moderate	NS
Screen for presence of cancer fatigue: • At diagnosis or first intake visit with a health provider; • Start of/throughout treatment at specific interval (e.g. Start, midpoint, and end) or with advanced disease; • Post-treatment follow-up visits; As clinically indicated-changes in disease status or treatment	CAPO 2015, Howell et al. [29]	Moderate	NS
Recommended tools			
Three tools are recommended for assessment of CRF	APTA 2022, Fisher et al. [28]		
• The FACIT-F should be used to assess for CRF in individuals living with or beyond a cancer diagnosis		High	Strong for
• The PFS-R should be used to assess for CRF in individuals living with or beyond a cancer diagnosis		High	Strong for
The PROMIS Fatigue–Short Forms v1.0–Fatigue (4a, 6a, 7a, 7b, 8a, 13a) should be used to assess for CRF in individuals living with or beyond a cancer diagnosis		High	Strong for
Assess with a validated instrument such as the NRS, MDASI, BFI, FACT-G7, or FACT-C	ACS 2015, El-shami et al. [22]	High	NS
Screening should be done using brief and validated tools with established cut-off values for severity (e.g. NRS)	ESMO 2020, Fabi et al. [26]	Moderate	Conditional for
Screen for cancer fatigue severity using a valid quantitative measure24, 26–28: • Use a tool with established cut-offs for severity (i.e. Numerical Rating Scale (NRS) 0–10 for severity such as ESASr*)88; • Use a semi-quantitative tool (fatigue pictogram)	CAPO 2015, Howell et al. [29]	Moderate	NS

Table 2 (continued)

Recommendation	Guidelines/year (author)	Level of eviendece	Strength of recommendations
Complete a focused assessment if screened positive for fatigue (Score > 2 on a 0–10 NRS) to determine: • Onset, pattern and duration (acute, chronic); • Extent of interference with work, activity, mood; • Contributing factors (physical activity, other symptoms-pain, insomnia, depression; • Pre-existing co-morbid conditions; • Explore person's beliefs, values, and knowledge about fatigue	CAPO 2015, Howell et al. [29]	Moderate	NS
Complete a comprehensive assessment include laboratory tests if screened positive for fatigue (Score > 2 on a 0–10 NRS) to determine/treat medical causes: • Anemia; • Adrenal insufficiency; • Hypothyroidism; • Fever and/or Infection; • Nutritional deficiencies; • Testosterone levels; • Co-morbid or late effects, particularly in the elderly, (i.e. cardiovascular or pulmonary, metabolic, endocrine, or liver.)	CAPO 2015, Howell et al. [29]	Moderate	NS

additionally highlighted the Brief Fatigue Inventory (BFI), the FACT-G7, and the FACT-C for assessment [22]. Despite their widespread use, these tools were noted to capture only limited dimensions of CRF. To address this limitation, the APTA 2022 guideline strongly recommended the use of multidimensional instruments such as the Piper Fatigue Scale–Revised (PFS-R), the FACIT-F, and the PROMIS Fatigue–Short Forms. These tools assess the behavioural, affective, sensory, cognitive, and functional components of fatigue, making them particularly suitable for post-treatment survivors with complex or persistent symptoms. In alignment with the CAPO 2015 guideline [29], survivors should be screened for fatigue at post-treatment follow-up visits and whenever clinically indicated (moderate evidence, expert consensus). A score greater than 2/10 should trigger focused assessment of onset, duration, impact, contributing factors, comorbidities, and patient perspectives, while survivors reporting moderate to severe fatigue (≥ 4/10) should undergo comprehensive evaluation including medical history, physical examination, malignancy status, mental health assessment, and laboratory investigations (e.g., anemia, thyroid function, testosterone, nutritional deficiencies) [8, 25, 26, 29]. Survivors with persistent or unexplained fatigue may require referral to specialists such as cardiology, endocrinology, rehabilitation, or mental health services (expert consensus). Finally, the ESMO 2020 guideline further emphasized caregiver education to support recognition, prevention, and management of CRF, underscoring the importance of shared understanding and self-management strategies [26].

Management of underlying conditions

Several guidelines [20, 23, 25, 27, 29] addressed the need to identify and treat underlying or contributing medical and psychological conditions (Table 3). The ASCO-SIO 2024 guideline [25] (and the previous version ASCO 2014 [31]) outlined diagnostic strategies to identify and manage somatic conditions. Underlying or contributing factors include cardiac (i.e., arrhythmias, hypertension, coronary artery disease, or heart failure), endocrine (i.e., diabetes, hypothyroidism, hypogonadism, and adrenal insufficiency), pulmonary and renal dysfunction. Additionally, electrolyte disbalance, anemia, and neuromuscular conditions (e.g., neuropathy, sleep disturbances, restless leg syndrome). Additionally, pain and emotional distress (e.g., anxiety and depression) should be assessed using validated tools or structured diagnostic interviews.

Specific recommendations

Guidelines issued a strong recommendation for exercise, CBT, and psychotherapy based on variable level of evidence (Table 4).

Exercise recommendations

Recommendations for exercise changed over time due to the evolving evidence. Whereas, early guidelines (i.e., the ACS 2006 [21]) initially recommended daily 10 min stretching,

Table 3 Guideline recommendation for the management of underlying conditions

Offer treatment for factors that may impact fatigue (e.g., mood disorders, sleep disturbance, pain, etc	ASCO 2016, Runowicz et al. [23]	High	NS
Offer treatment or referral for factors that may impact fatigue (e.g., mood disorders, sleep disturbance, pain, etc	ACS 2016, Cohen et al. [20]	High	NS
Offer treatment or referral for factors that may impact fatigue (e.g., mood disorders, sleep disturbance, pain, etc	EHNS 2022, Verdonck-de Leeuw et al. [27]	High	NS
Assess for fatigue and treat any causative factors for fatigue, including anemia, thyroid dysfunction, and cardiac dysfunction	EHNS 2022, Verdonck-de Leeuw et al. [27]	Very low	NS
Treat any causative factors for fatigue, including anemia, thyroid dysfunction, and cardiac dysfunction	ASCO 2016, Runowicz et al. [23]	Very low	NS
Assess for fatigue and treat any causative factors for fatigue, including ane-mia, thyroid dysfunction, and cardiac dysfunction	ACS 2016, Cohen et al. [20]	Very low	NS
Assess for fatigue and treat any causative factors for fatigue: • Cardiac dysfunction: Consider echocardiogram, exercise test for cardiopulmonary reserve • Endocrine dysfunction (eg, diabetes, hypothyroidism, hypogonadism, adrenal insufficiency): Consider measuring HgbA1C, TSH, glucose, and testosterone, conduct dexamethasone suppression test • Pulmonary dysfunction: Consider chest x-ray, 6-min walk test, pulmonary function tests, oxygen saturation • Renal dysfunction: Consider kidney and electrolyte chemistries • Arthritis: Consider CBC • Neuromuscular complications (neuromuscular, neuropathy): Consider grip strength test, neuropathy sensory testing, electromyography • Sleep disturbances: Consider assessing sleep with standardized questionnaire, possible sleep study • Pain: Evaluate with standardized assessment tool • Emotional distress: Evaluate with standardized assessment tool or diagnostic interview	ASCO-SIO 2024, Bower et al. [25]	NS	NS

more specific recommendations included a structured exercise programs with 150 min of aerobic activity and strength training per week (ACS guideline 2015 [22]) based on a recommendation for the general population [32]. The CAPO 2015 guideline [29] strongly recommends physical activity as a core non-pharmacological strategy for the management of CRF. All patients, as clinically safe, should be counselled to engage in moderate-intensity aerobic activity (e.g., brisk walking, cycling, and swimming) for at least 30 min on five or more days per week, or vigorous-intensity activity for at least 20 min on three or more days per week. Progressive resistance training at least three times per week is also beneficial when combined with aerobic activity. Evidence was judged sufficient, with benefits consistently outweighing harms, particularly in breast, colorectal, and prostate cancer during the post-treatment phase. Finally, the CAPO guideline advises that referral to rehabilitation specialists should be considered for patients with obesity, physical inactivity, or treatment sequelae such as peripheral neuropathy or lymphedema. This recommendation, based on consensus-level evidence, emphasizes the need for individualized and supervised exercise prescriptions in vulnerable populations. Further, ASCO 2015 guideline for breast cancer survivors [23] and the ACS 2016 guideline for Head and Neck cancer survivors [20] recommended that physician should counsel for exercise but lacked specific details on duration, intensity and type. In 2019, moderate-intensity aerobic exercise three times per week for 12 weeks was recommended (ACSM guideline 2019 [24]). Further, the guideline highlighted that a combination of aerobic and resistance training was effective in reducing fatigue, particularly for prostate cancer survivors. The ESMO 2020 guideline [26] recommended structured programs, including moderate-intensity aerobic exercise, resistance training, physical activities like walking and home-based aerobic and resistance exercises but did not specify intensity, supervision, or timing. The ASCO/SIO 2024 guideline [25] published the most comprehensive recommendation. Based on nine RCTs, aerobic and resistance training resulted in a significant fatigue reduction within 12 weeks. Early rehabilitation and aquatic exercise (60 min, 3 times per week for 8 weeks) showed promising results in breast cancer survivors. The guideline addressed the difficulty to determine the type and dose of exercise that is most effective for managing CRF. Nonetheless, the guideline recommended exercise in the form of aerobic and resistance training, and low to moderate intensity (Level of evidence: moderate, strength of recommendation: strong).

Table 4 Non-pharmacological and pharmacological interventions for cancer-related fatigue in cancer survivorship care

Intervention details	Guidelines/year (Author)	Level of evidence	Strength of recommendation
Exercise			
Recommend 150 min of physical activity per week plus strength training per ACS Nutrition & Physical Activity Guidelines for Cancer Survivors [67]	ACS 2015, El-shami et al. [22]	High	NS
Head and neck cancer survivors should be counselled to engage in regular physical activity	ACS 2016, Cohen et al. [20]	High	NS
Survivors should engage in moderate-intensity aerobic training three times per week for at least 12 weeks. Moderate-intensity combined aerobic plus resistance training sessions performed two to three times per week or twice weekly moderate-intensity resistance training may also be effective	ACSM 2019, Campbell et al. [24]	High	NS
Counsel head and neck cancer survivors to engage in regular physical activity	EHNS 2022, Verdonck-de Leeuw et al. [27]	High	NS
Engage in regular physical activity	ASCO 2016, Runowicz et al. [23]	High	NS
All types of physical activity at lower levels of intensity (i.e. walking, yoga) likely will contribute to decreasing fatigue for most patients during active treatment and post treatment survivorship	CAPO 2015, Howell et al. [29]	High	Strong for
Physical exercise of moderate intensity and aerobic and functional resistance exercise are recommended in patients with CRF	ESMO 2020, Fabi et al. [26]	High	Strong for
Physical activities like walking and home-based aerobic and resistance exercises are recommended to improve CRF	ESMO 2020, Fabi et al. [26]	High	Strong for
Survivors may be encouraged to do 10 min of stretching exercises daily	ACS 2006, Doyle et al. [21]	NS	NS
12 weeks of aerobic, resistance or a combination training. Exercise may be either supervised or unsupervised, and tailored to the ability of the survivors. Early rehabilitation and aquatic exercise (60 min, 3 times per week for 8 weeks) showed promising results specific for breast cancer survivors	ASCO-SIO 2024, Bower et al. [25]	Moderate	Strong for
Survivors should maintain adequate levels of physical activity Make use of local resources to help patients increase exercise (e.g., aerobics, strength training, yoga) Community exercise programs or classes, preferably those focused on cancer survivors Exercise professional certified by the ACSM. For patients with fatigue interfering with function, consider referral to a physical therapist or physiatrist	NCCN 2024, Sanft et al. [8]	Moderate	NS

Table 4 (continued)

Intervention details	Guidelines/year (Author)	Level of evidence	Strength of recommendation
Counsel all patients as is safe to engage in moderate-intensity physical activity 55 75% for at least 30 min on five or more days of the week, or vigorous-intensity physical activity for at least 20 min on three or more days of the week (e.g. fast walking, cycling or swimming) • Progressive resistance training a minimum of three days per week is also beneficial for most patients in combination with other physical activity • Lack of consensus on optimal exercise dose patients to guage intensity based on appropriate heart rate for age, level of previous activity • Efficacy and safety mostly established for breast, colorectal, prostate cancer in post-treatment phases • Likely a role for physical activity in advanced disease but optimal dose not clear and should be supervised and based on tolerance	CAPO 2015, Howell et al. [29]	Moderate	Strong for
Patients should be advised that there is preliminary evidence that yoga is likely to improve cancer fatigue	CAPO 2015, Howell et al. [29]	Moderate	Strong for
Cognitive behaviour therapy (CBT)			
Refer survivors for CBT as appropriate	ACS 2016, Cohen et al. [20]	High	NS
Refer survivors for CBT as appropriate	ASCO 2016, Runowicz et al. [23]	High	NS
CBT should be recommended. CRF severity is reduced after 6 months of CBT sessions andand may be delivered in person or via a web-based program	ASCO-SIO 2024, Bower et al. [25]	Moderate	Strong for
A 4–5 weekly CBT sessions reduces CRF	NCCN 2024, Sanft et al. [8]	Moderate	NS
CBT is recommended to manage CRF	ESMO 2020, Fabi et al. [26]	Moderate	Conditional for
Mindfulness-based programme			
Mindfulness-based program should be recommended	NCCN 2024, Sanft et al. [8]	High	NS
Mindfullness based programs should be recommended: MAPs (6 weeks), MBSR (6–12 weeks), and MBCT significantly improved fatigue, with sustained benefits at 3 and 6-month follow-ups	ASCO-SIO 2024, Bower et al. [25]	Moderate	Strong for
MBSR can be recommended as an option against CRF	ESMO 2020, Fabi et al. [26]	Moderate	Conditional for
Yoga could be an option to improve CRF in cancer survivors and QoL	ESMO 2020, Fabi et al. [26]	Moderate	Conditional for
Patients should be advised that there is preliminary evidence that mindfulness based interventions are likely to improve fatigue	CAPO 2015, Howell et al. [29]	Consensus based	Conditional for
Clinicians may recommend yoga to reduce the severity of cancer-related fatigue in adults who have completed cancer treatment, especially in women with breast cancer	ASCO-SIO 2024, Bower et al. [25]	Low	Conditional for

Table 4 (continued)

Intervention details	Guidelines/year (Author)	Level of evidence	Strength of recommendation
A referral to a specialist in rehabilitation should be considered for cancer patients obese individuals, physically inactive patients and, those who require tailored regimes (i.e. peripheral neuropathy and pain, lymphedema)	CAPO 2015, Howell et al. [29]	Consensus based	Strong for
Psychotherapy			
Cancer services should promote access to multi-component, group psycho-education programs targeted to self-management of fatigue for patients and survivors. Components likely to be beneficial include: • Coping with emotions; • Understanding of fatigue; • Healthy sleep; • Positive peer reinforcement; • Overcoming barriers; Opportunity to share experiences	CAPO 2015, Howell et al. [29]	High	Strong for
Psychoeducation therapy should be recommended and have also been shown to reduce fatigue in cancer survivors	NCCN 2024, Sanft et al. [8]	High	NS
Psychosocial support interventions alone or with mind–body interventions should be recommended	ACS 2015, El-shami et al. [22]	High	NS
All patients are likely to benefit from routine patient education about fatigue that emphasizes self-care, coping techniques, energy, and activity management	CAPO 2015, Howell et al. [29]	Moderate	Conditional for
Referral to experts or fatigue clinics that are trained in cognitive behavioural therapy specifically targeted to fatigue should be offered to patients and those with chronic cancer fatigue as survivors	CAPO 2015, Howell et al. [29]	Moderate	Strong for
Information and counselling are recommended in cancer patients and their caregivers to help them in understanding CRF and to educate them about ways to either prevent fatigue, avoid it becoming a chronic condition or to manage it. Psychoeducation should be recommended to manage CRF	ESMO 2020, Fabi et al. [26]	Moderate	Conditional for
Acupuncture			
Acupuncture should be recommended. Acupuncture resulted in a significant reduction in fatigue after 2 weeks	NCCN 2024, Sanft et al. [8]	Moderate	NS
Concerning the use of acupuncture, the panel has not reached a consensus: for three panel members were for a conditional recommendation for the use of acupuncture. Six panel members were for a conditional recommendation against acupuncture for CRF	ESMO 2020, Fabi et al. [26]	Moderate	No consensus
Acupuncture. No recommendation. There is insufficient or inconclusive evidence to make recommendations for or against acceptance	ASCO-SIO 2024, Bower et al. [25]	Very low	No recommendation for or against
Lifestyle modification			

Table 4 (continued)

Intervention details	Guidelines/year (Author)	Level of evidence	Strength of recommendation
Ginseng and vitamin D: There is recommendation against the use	NCCN 2024, Sanft et al. [8]	Moderate	NS
Wisconsin ginseng: No consensus For three panel members, extracts of Wisconsin ginseng could be considered for patients with fatigue and no other treatable reasons and where the fatigue lasts > 4 weeks during active cancer treatment. Six panel members conclude that Wisconsin ginseng cannot be recommended	ESMO 2020, Fabi et al. [26]	Moderate	No consensus
The use of L-carnitine, coenzyme Q10, astragalus and guarana is not recommended for the control of CRF	ESMO 2020, Fabi et al. [26]	Moderate	Conditional against
Omega fatty acids: No recommendation. There is insufficient or inconclusive evidence to make recommendations for or against acceptance of	ASCO-SIO 2024, Bower et al. [25]	Very low	No recommendation for or against
Ginseng: No recommendation. There is insufficient or inconclusive evidence to make recommendations for or against the use	ASCO-SIO 2024, Bower et al. [25]	Very low	No recommendation for or against
Complementary medicine			
Acupressure			
Clinicians may recommend acupressure to manage symptoms of cancer-related fatigue in adults who have completed cancer treatment	ASCO-SIO 2024, Bower et al. [25]	Low	Conditional for
Moxibustion			
Moxibustion. Clinicians may recommend moxibustion to manage symptoms of cancer-related fatigue in adults who have completed cancer	ASCO-SIO 2024, Bower et al. [25]	Low	Conditional for
Bright white light therapy			
Bright white light exposure of 1,250–10,000 lx, administered in the early morning for 30–40 min is recommended with timing adkjusted for survivors who sleep during the day	NCCN 2024, Sanft et al. [8]	Moderate	NS
Bright white light therapy. No recommendation. There is insufficient or inconclusive evidence to make recommendations for or against acceptance	ASCO-SIO 2024, Bower et al. [25]	Very low	No recommendation for or against
Massage therapy			
Massage therapy is recommended without specific details	NCCN 2024, Sanft et al. [8]	High	NS
Massage therapy. No recommendation. There is insufficient or inconclusive evidence to make recommendations for or against acceptance	ASCO-SIO 2024, Bower et al. [25]	Very low	No recommendation for or against
Acupressure. Clinicians may recommend acupressure to manage symptoms of cancer-related fatigue in adults who have completed cancer treatment	ASCO-SIO 2024, Bower et al. [25]	Low	Conditional for
Moxibustion			

Table 4 (continued)

Intervention details	Guidelines/year (Author)	Level of evidence	Strength of recommendation
Patients seeking complementary therapies in the form of herbal medicine should be advised that there is insufficient evidence demonstrating their effectiveness in reducing fatigue	CAPO 2015, Howell et al. [29]	High	Strong for
Patients should be advised that all herbal products should be used with caution as their safety may not be established and discuss their use with their oncology team as adverse effects could occur in combination with cancer treatment drugs or other drugs	CAPO 2015, Howell et al. [29]	High	Strong for
Patients should be advised that insufficient evidence is available to advise seeking acupuncture for the treatment of fatigue	CAPO 2015, Howell et al. [29]	Moderate	Conditional for
Clinicians may recommend moxibustion to manage symptoms of cancer-related fatigue in adults who have completed cancer treatment	ASCO-SIO 2024, Bower et al. [25]	Low	Conditional for
Pharmacological intervention			
Misletoe			
Mistletoe: No consensus was reached between panel members for or against the Concerning the use of mistletoe extracts, the panel has not reached a consensus: For three panel members, mistletoe extracts could be considered for the control of fatigue in advanced pancreatic cancer (conditional for) While for 6 panel members, mistletoe cannot be recommended (conditional against)	ESMO 2020, Fabi et al. [26]	Moderate	No consensus
Wakefulness agents (e.g., modafinil or armodafinil): Clinicians should not recommend wakefulness agents, such medicationsas modafinil or armodafinil, to manage symptoms of cancer-related fatigue in adults who have completed cancer treatment. Wakefulness agents such as modafinil and armodafinil should not be recommended for the control of CRF	ESMO 2020, Fabi et al. [26]	Moderate	Conditional against
Psychostimulants (e.g., methylphenidate): Clinicians should not routinely recommend psychostimulants, such as methylphenidate, to manage symptoms of cancer-related fatigue in adults who have completed cancer treatment Psychostimulants (methylphenidate): Consider use psychostimulants (methylphenidate) after ruling out other causes of fatigue and if other interventions are unsuccessful	ASCO-SIO 2024, Bower et al. [25] NCCN 2024, Sanft et al. [8]	Moderate	Condition against

Table 4 (continued)

Intervention details	Guidelines/year (Author)	Level of evidence	Strength of recommendation
Psychostimulants (e.g., Concerning the use of methylphenidate, dexmethylphenidate, long-acting methylphenidate and dexamphetamine): No consensus was reached, Three panel members suggested that the psychostimulants could be considered in thoroughly selected patients and their usefulness and safety should be evaluated after a very short time period (conditional recommendation for) Six panel members recommended that psychostimulants should not be used because most trials failed to show the intended effects on the primary outcome measures (conditional against). The use of modafinil and armodafinil is not recommended for the control of CRF	ESMO 2020, Fabi et al. [26], ASCO-SIO 2024, Bower et al. [25]	Moderate	No consensus
Antidepressants: The use of antidepressants, and in particular paroxetine, is not recommended for the control of CRF	ESMO 2020, Fabi et al. [26]	Moderate	Conditional against
The use of Eszopiclone, megestrol acetate and melatonin is not recommended for the control of CRF. The use of donepezil for the control of CRF is not recommended	ESMO 2020, Fabi et al. [26]	Moderate	Conditional against
Evidence is insufficient to recommend pharmacological agents for fatigue at any stage of disease • Tentative trend in benefit for methylphenidate in advanced disease but safety was not confirmed to recommend use • Modafinal evaluated in brain, prostate, breast, lung cancer not superior to placebo • Minimal benefit of short-term use of dexamethasone in advanced cancer • CoQ10 supplementation was not superior to placebo	CAPO 2015, Howell et al. [29]	Very low	Strong against
Patients should be advised that there is insufficient evidence for Paullinia cupana and certain types of ginseng products for reducing fatigue	CAPO 2015, Howell et al. [29]	Very low	Strong against
Patients should be advised that there is no evidence for supplementation with CoQ10 for reducing fatigue	CAPO 2015, Howell et al. [29]	low	Conditional against

LOE Level of Evidence; *SOR* Strength of Recommendation; *GRADE* Grading of Recommendations Assessment, Development, and Evaluation; *NRS* Nutrition Risk Screening; *NS* Not stated; *NRFoA* No Recommendation For or Against; *MDASI, MD* Anderson Symptom Inventory; *BFI* Brief Fatigue Inventory; *FACT-G7* Functional Assessment of Cancer Therapy – General 7-Item Scale; Or *FACT-C* Functional Assessment of Cancer Therapy – Colorectal Cancer

Cognitive Behavioural Therapy (CBT)

The CAPO 2015 guideline [29] was the first to provide detailed implementation advice, recommending that CBT targeting fatigue be delivered in dedicated fatigue clinics with trained staff, through at least three structured sessions incorporating education, coping strategies, and activity management. Later guidelines reinforced CBT's value but with less practical detail. ASCO 2016 [23] and ACS HNC 2016 [20] highlighted CBT based on meta-analyses, while ESMO 2020 [26] endorsed it on the basis of three studies, including one RCT. The NCCN 2024 guideline [8] broadened its scope, grouping CBT with mindfulness-based stress reduction, psychoeducation, counselling, and support

groups, and specifically recommending CBT for insomnia-related fatigue. Most recently, ASCO/SIO 2024 [25] issued a strong recommendation for CBT with moderate-quality evidence and suggested web-based delivery as an alternative where access to trained personnel is limited.

Psychotherapy

The CAPO 2015 guideline [29] strongly emphasized structured education for all patients, including information on the etiology and management of fatigue, energy and time management, healthy sleep, coping with emotions, and opportunities for peer exchange. It further recommended ongoing screening, patient and family counselling, and general fatigue management strategies such as energy conservation, priority setting, and maintaining dignity and meaning in life. Subsequent guidelines also endorsed psycho-educational approaches. The EHNS 2022 [27] and ACS 2016 [23] highlighted education and counselling, particularly for depression-related fatigue. The NCCN 2024 guideline [8] issued strong support, citing meta-analyses that found moderate though variable reductions in fatigue [33, 34]. By contrast, the ASCO/SIO 2024 guideline [25] refrained to issue a recommendation due to insufficient or inconclusive evidence.

Mindfulness-based interventions

Mindfulness-Based Cognitive Therapy (MBCT), Mindfulness-Based Stress Reduction (MBSR) and Mindfulness awareness practices (MAPs) are manualized, group-based skills training programs that teach mindfulness both in and between sessions [35].The CAPO 2015 guideline [29] recommended that Patients should be advised that there is preliminary evidence that mindfulness-based interventions are likely to improve fatigue. Further, the ESMO 2020 [26] guideline recommended MBSR as an option to reduce fatigue based on studies that did not specifically use CRF reduction as an outcome criterion. According to the NCCN 2024 [8] guideline, MBSR over 6-weeks in a large RCT (322 breast cancer survivors) reduced fatigue. The ASCO/SIO 2024 [25] guidelines strongly recommended MBSR, MBCT and MAPs (moderate evidence). According to different studies, MAPs (6 weeks), MBSR (6–12 weeks), and MBCT significantly improved fatigue with sustained benefits at 3 and 6-month follow-ups. Although, web-based MBCT also showed effectiveness, patient engagement remains uncertain. Further, yoga has been recommended for reducing CRF based on clinical evidence reported by three guidelines. The ESMO 2020 guideline [26] conditionally recommend yoga based on a phase 3 RCT demonstrating yoga's benefits in fatigue reduction. The NCCN 2024 guideline [8], recommended a 4-week yoga therapy program (low evidence, one trial involving 410 cancer survivors). According to the ASCO/SIO 2024 guideline [25], two studies showed CRF improvement in breast cancer survivors: one with 90-min Hatha yoga sessions twice weekly for 12 weeks, and another with 75-min sessions twice weekly for four weeks (conditional recommendation, moderate level of evidence since neither trial screened specifically for fatigue nor had it as a primary outcome).

For other mind–body intervention such as Tai Chi or Qigong, insufficient evidence for or against the use was available according to the ASCO/SIO 2024 [25].

Acupuncture

There was inconclusive evidence for or against a recommendation to use acupuncture in CRF. Although a meta-analysis of 10 RCTs found an effect in breast cancer survivors, also adverse events were reported in 6 studies. For the ESMO 2020 guideline [26], no consensus could be reached. Three panel members recommended the use and six panel members recommended against the use of acupuncture due to inconsistent results and safety concerns. Given that a pilot study of breast cancer survivors (effect after two weeks) and one RCT from breast cancer survivors (effect after six weeks) showed improvement in CRF, the NCCN 2024 guideline [8] acknowledged that acupuncture may be an option. However, given methodological limitations further studies are needed. Further, the CAPO 2015 guideline [29] advises that insufficient evidence exists to recommend acupuncture for the treatment of cancer-related fatigue. The ASCO/SIO 2024 [25] also concluded that there is still insufficient evidence to recommend acupuncture unless further large-scale trials show a benefit in CRF management.

Complementary medicine

The CAPO 2015 guideline [29] advised that herbal medicines should not be recommended for the management of cancer-related fatigue, citing sufficient evidence demonstrating no benefit. It further cautioned that all herbal products should be used with care given the potential for unestablished safety profiles and interactions with cancer therapies or other drugs. Both statements carried strong recommendations. More recent guidelines have revisited complementary approaches with conditional support for selected modalities. The ASCO/SIO 2024 [25] issued a conditional recommendation for acupressure and moxibustion (both low level of evidence). For acupressure, one RCT in 288 breast cancer survivors showed a 34% fatigue reduction and thus, acupressure was considered a low-risk, cost-effective intervention that can be self-administered via a mobile app or learned in a single session with a licensed acupuncturist. Moxibustion

trials showed significant benefits. Further research is needed with standardized treatment protocols that show effectiveness across different cancer types. Although there are studies, that showed CRF improvement in cancer survivors using bright light therapy, no guideline recommended the use at this point. According to the ASCO/SIO 2024 [25], one RCT of 81 cancer survivors showed a 17% greater fatigue reduction following 30 min of daily bright light exposure for four weeks. However, a Phase III trial in 166 lymphoma patients found no effect. According to the NCCN 2024 [8] guideline, bright white light exposure of 1,250–10,000 lx, administered in the early morning for 30–40 min may be used. However, additional research is needed before making a recommendation. Massage therapy may be effective in CRF. However, two guidelines (ASCO/SIO 2024 [25], NCCN 2024 [8]) suggested that larger trials are needed that confirm efficacy to reduce fatigue. According to a study in breast cancer survivors, 6 weeks of once-weekly Swedish massage therapy for 45 min by a licensed massage therapists resulted in a reduction of CRF [36].

Pharmacological intervention

The CAPO 2015 guideline [29] found no pharmacological agent supported for managing CRF. Psychostimulants (methylphenidate, modafinil) showed no benefit over placebo, dexamethasone had only minimal short-term effects, and CoQ10 was ineffective. Accordingly, the CAPO guideline issued a strong recommendation against pharmacologic agents. It further advised against ginseng/guarana and CoQ10 supplementation. Recent evidence has reinforced these conclusions [25].. The ASCO/SIO 2024 guideline [25] considers the impact of mistletoe therapy inconclusive for the management of CRF.According to one study, mistletoe 0.01–10 mg three times a week for 12 months improved CRF in a pancreatic cancer patient [37]. However, larger trials are required to confirm these findings. For most other medications that were reviewed either no consensus or a conditional recommendation against the use was issued. No effect was observed for antidepressants like paroxetine as they failed to show efficacy, while acetylcholinesterase inhibitors (e.g., donepezil) lacked significant improvement. Findings for psychostimulants like methylphenidate and modafinil were inconsistent. According to a phase III RCT in 328 glioma patients, modafinil was no more effective than placebo [38], which resulted in a recommendation against the use (ASCO/SIO 2024 [25]).

Lifestyle modifications

Unless high quality studies show efficacy of dietary supplements such as omega fatty acids, vitamin d supplements, or ginseng, guidelines either issue no recommendation or a conditional recommendation against the use (ASCO/SIO 2024 [25]). Although ginseng showed promising results in four RCTs (2,000–3,000 mg/day) [39], Korean red ginseng's effectiveness varied by extraction method and there were raising safety concerns for hormone-sensitive cancers.

Discussion

The management of CRF in cancer survivors who completed their cancer related treatment is multifaceted, requiring a coordinated approach that spans screening, assessment, and management through non-pharmacological interventions. The quality of the guidelines varied: three (27%) were high, seven (64%) were moderate, and one (9%) was low. In particular, the lower score of the 2006 ACS guideline reflects evolving standards in guideline development rather than poor quality at the time of publication. We identified a total of 59 recommendations, for the screening and clinical assessment for CRF (13), management of underlying conditions (17), pharmacological and non-pharmacological interventions (29). The recommendations varied in scope and strength of evidence. Cancer survivors should be screened using validated screening tools (e.g., MDASI [30]) also after they completed their cancer related treatment and/or follow-up care. A positive screen should prompt a comprehensive assessment to identify contributing factors and inform individualized management strategies. In addition, a thorough clinical evaluation should identify medical, psychosocial, and lifestyle-related conditions that may exacerbate fatigue. For intervention, our synthesis shows high consistency across guidelines in prioritizing non-pharmacological approaches. Exercise, specifically aerobic and resistance training at low to moderate intensity, three times per week was recommended as the most strongly supported first-line treatment. CBT was also consistently recommended, particularly for survivors with psychological or behavioral contributors to fatigue. Additional options such as yoga, tai chi, psychoeducation, and counselling were endorsed more variably and typically supported by expert consensus rather than high-quality evidence.

Findings in light of the literature

Advancing care for CRF in cancer survivors requires addressing barriers to implementing guidelines and ensuring adherence. Despite strong recommendations for CRF screening, assessment, and interventions like exercise and CBT, significant obstacles remain in translating these recommendations into practice [40, 41]. One major barrier is the lack of healthcare provider training in CRF management. Studies show that many oncology professionals report insufficient training in managing fatigue,

which affects screening and intervention adoption [42, 43]. Educational initiatives are crucial to improving provider knowledge and ensuring that CRF is systematically addressed during follow-up care [44]. Another challenge is the limited resources available to support CRF interventions. While CBT and exercise are evidence-based recommendations, access to trained providers and necessary infrastructure is often inadequate. In resource-limited settings, telemedicine and digital solutions, such as mobile apps and wearable devices, can offer accessible alternatives for delivering CBT and monitoring exercise adherence remotely. These digital tools have shown promise in overcoming logistical constraints and improving patient engagement [45, 46]. Fragmentation in healthcare systems further complicates CRF management [47]. Different providers often manage aspects of a survivor's care, leading to inconsistent CRF screening and follow-up. Multidisciplinary care teams that integrate oncologists, rehabilitation specialists, and mental health professionals are key to implementing these guidelines effectively. Monitoring adherence to CRF management is critical. Regular screening for cancer-related fatigue may help identify symptoms earlier, potentially allowing care teams to offer supportive interventions sooner. Although direct evidence linking screening itself to improved outcomes is limited, clinical guidelines recommend routine assessment as a way to ensure timely recognition and management of CRF. Adherence to these practices can be inconsistent. Implementing reminder systems and incorporating patient-reported outcomes into electronic health records can support ongoing adherence [48]. Additionally, ensuring the sustainability of CRF management strategies requires regular follow-ups and reassessments, as fatigue levels can fluctuate over time [49]. Further, to effectively implement CRF interventions, Some frameworks has prooven effective, such as the RE-AIM [50] or PARIHS [51] models. These frameworks help translate research into practice by providing structured strategies for implementation and evaluation. Furthermore, engaging healthcare providers through ongoing training sessions, role-play, and educational materials can enhance their self-efficacy and commitment to CRF management. Local opinion leaders and stakeholder engagement also play a crucial role in overcoming resistance and ensuring that CRF guidelines are consistently applied across clinical settings. Incorporating audit and feedback mechanisms may further monitor adherence and identify areas for improvement [52].

In conclusion, advancing CRF care in cancer survivors depends on addressing barriers to guideline implementation and ensuring consistent adherence through training, resource allocation, and monitoring systems. By overcoming these challenges, the quality of care for cancer survivors can be significantly improved.

Limitations

There are several limitations that need to be discussed. Although we used an extended search strategy, and consulted all websites of professional societies, we may have missed guidelines with recommendations for CRF in cancer survivors. Further, more evidence on specific interventions may have been published since the publication of the guidelines and thus, not be included in this study. Given that newer evidence is also not included in the guidelines, clinicians are also not likely to use them for their patients. In addition, the included guidelines span more than two decades, during which both the strength of the evidence base and the methodological standards for guideline development have evolved. As a result, some variability in recommendations may be attributed to publication date. Older guidelines may not reflect current best evidence and should therefore be interpreted with caution. Importantly, our analysis was restricted to recommendations for post-treatment survivorship care. We did not evaluate interventions specific to patients undergoing active cancer treatment, nor those living with advanced disease or receiving end-of-life care. Thus, this study provides the most comprehensive overview of current recommendations and their evidence for the management of CRF in the survivorship phase.

Implications for research

We identified several key implications for future research from existing evidence gaps. Despite the high prevalence of CRF, few studies have rigorously evaluated the impact of screening or interventions in cancer survivors. Heterogeneity in study design highlights the need for standardized intervention protocols, uniform outcome measures, and long-term follow-up to assess sustainability of effects. An important overarching research priority concerns the utility and real-world adoption of clinical guidelines. Evidence-based recommendations can only improve survivor outcomes if they are consistently implemented. Future work should therefore examine strategies to promote guideline uptake, including clinician-facing tools (decision aids, electronic prompts), implementation frameworks, and audit-and-feedback systems to monitor adherence and identify areas for improvement. Evaluating barriers and facilitators to guideline adoption across diverse care settings such as oncology, primary care, and community survivorship programs will help ensure that guidelines translate into meaningful practice change. It would also benefit from expanded health services research focused on survivorship-care delivery for CRF. This includes examining models of care that optimize coordination between oncology and primary care, assessing workforce needs (e.g., availability of rehabilitation, behavioural health, and integrative providers), and

testing strategies to close gaps in access. Such research is essential for determining how evidence-based CRF interventions can be delivered equitably, efficiently, and at scale. Future research should also focus on scalable, low-cost approaches such as community-based exercise, telehealth, and culturally tailored nutrition programs to enhance accessibility. Digital innovations including mobile apps, wearable devices, and AI-driven coaching could further personalize and improve adherence to fatigue management strategies [53, 54]. Precision medicine approaches may clarify inter-individual variability in response to exercise, diet, or pharmacologic therapies, given the influence of metabolic, inflammatory, and genetic factors on fatigue [55–58]. The gut microbiome also represents a promising target; large-scale trials examining probiotics, prebiotics, and fiber-rich diets could elucidate their effects on inflammation and energy metabolism [59, 60]. Other emerging avenues include chronotherapy to restore circadian rhythms through adjustments in sleep, light exposure, and activity [61], as well as melatonin supplementation for survivors with severe sleep–wake disturbances [62, 63]. Inflammation-related neurocognitive fatigue warrants further study, with metformin and similar anti-inflammatory agents showing potential for repurposing [64, 65]. Neuroimaging, including functional MRI, may help delineate brain correlates of CRF and inform targeted therapies [66]. Finally, socioeconomic disparities in access to CRF care remain underexplored; equitable implementation of effective interventions should be prioritized [67]. Advancing these research directions will support more personalized, sustainable, and accessible CRF management to improve survivor quality of life.

Implications for clinical practice

In addition to evidence-based recommendations such as exercise and cognitive behavioural therapy, several emerging interventions show potential for managing CRF but are not yet endorsed in current guidelines due to limited or inconsistent evidence. These include mind–body approaches such as Tai Chi and Qigong, targeted sleep–wake regulation strategies (e.g., bright light therapy, melatonin), integrative therapies (e.g., acupuncture, acupressure, moxibustion, massage therapy), and selected nutritional interventions such as ginseng or omega-3 fatty acids.

While these options should not replace established first-line treatments, clinicians may consider them for selected patients within the context of shared decision-making, careful monitoring, and preferably research protocols. Staying informed about ongoing trials will help clinicians identify which of these approaches may become viable additions to CRF care in the future.

Further, it is important to also critically consider the utility of clinical guidelines themselves. While guidelines provide evidence-based frameworks, their conservative nature—driven by the rigor and breadth of evidence required for inclusion—can sometimes limit the integration of newer treatments. As a result, guidelines may restrict patient care to only those therapies that have been extensively studied, potentially overlooking emerging options that could benefit individual patients. Given the evolving nature of medical research, guidelines should be seen as dynamic tools, not rigid directives. Clinicians must balance adherence to established guidelines with an openness to promising treatments that are still under investigation. This flexibility ensures that emerging therapies, alongside established options, can be considered to enhance patient outcomes.

Conclusion

Routine screening and multidimensional assessment using validated and recommended tools are essential to identify and guide multidimensional aspects of CRF. For intervention, exercise (aerobic and resistance training) and CBT are the most consistently recommended, evidence-based interventions for CRF. Psychoeducation and counselling are also beneficial, especially for fatigue linked to mental health conditions. Pharmacological treatments are not recommended due to insufficient evidence and side effects.

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Author contribution J.A., K.G.F., E.H–L., and M.M.W. conceived the study and designed the methodology. J.A. and N.S. conducted the literature search, data extraction, analysis, and quality assessments. S.I.R. provided oncological expertise and a critical review of clinical relevance. J.A wrote the main manuscript text. E.H–L. and M.M.W. reviewed the manuscript. All authors contributed to the final manuscript revisions and approved the final version for submission.

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Data availability No datasets were generated or analysed during the current study.

Declarations

Conflict of interest J.A declare no competing interest. N.S declare no competing interest. S.R declare competing interest; Research support from other organizations: Roche, AstraZeneca, Swiss National Foundation and Amgen. K.G-F declare competing interest; Grant from the Kanton Aargau, Switzerland. Funding a pilot project for consultation of cancer survivors. E.H–L declare competing interest; Grant from the Kanton Aargau, Switzerland. Funding a pilot project for consultation of cancer survivors. M.M.W declare competing interest; Grant from the Kanton Aargau, Switzerland. Funding a pilot project for consultation of cancer survivors and a Grant from the Stiftung Cardio.

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