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Living well with advanced cancer: a scoping review of non-pharmacological supportive care interventions

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Abstract

Purpose The increasing number of people living longer with advanced cancer presents unique physical, psychosocial, financial, legal, practical and complex care needs. Supportive care interventions aim to address these needs by improving symptom management, promoting wellbeing, enhancing quality of life and potentially improving prognosis. To integrate supportive care interventions into clinical practice, a comprehensive review of existing studies is needed. This scoping review maps the evidence on non-pharmacological supportive care interventions for people with advanced cancer and identifies gaps to inform future research.

Methods We systematically searched four electronic databases—CINAHL, Medline, Cochrane and PsycINFO—for peer-reviewed original research on non-pharmacological supportive care interventions for adults with advanced cancer, published from January 1, 2013, to July 1, 2024.

Results Out of 3716 studies, 84 publications met the inclusion criteria. These studies were categorised into key supportive care domains: physical activity, psychosocial support, patient care and autonomy, multimodal approaches and others. Most publications focused on interventions addressing physical and psychosocial needs, showing benefits such as reduced fatigue, pain and improved mood. However, significant gaps were found in research on interventions addressing practical needs essential to autonomy, including health system and information needs, patient care and support and financial needs.

Conclusion Mapping the studies to the needs of the advanced cancer population showed that domains with greatest unmet needs have the fewest interventions available. Our scoping review suggests that non-pharmacological supportive care interventions can improve the wellbeing and quality of life of people living with advanced cancer. However, addressing methodological limitations requires further large-scale, multi-centre studies focusing on the identified gaps to inform the implementation of suitable supportive care programs.

Implications for Cancer Survivors Non-pharmacological interventions can boost wellbeing and quality of life for advanced cancer survivors, but addressing gaps in practical and systemic support is crucial.

Keywords Supportive care · Advanced cancer · Metastatic cancer · Cancer survivorship

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Introduction

For the most commonly diagnosed cancers—breast, prostate, lung, colorectal, bladder and melanoma—between 30 and 72% of patients will present with, or progress to, metastatic disease [1]. Advances in cancer therapies have contributed to longer survival in individuals with metastatic disease, and as access to treatment options like immunotherapy continues to expand, the population of people living with advanced cancer is expected to grow [2, 3]. "Advanced cancer" in this context typically refers to individuals with metastatic disease or those with "treatable but not curable" cancer, where the disease is unlikely to be eradicated but managed through therapies that slow progression, extend survival and aim to control symptoms and side effects associated with the cancer and its treatments [4]. The advanced cancer population experiences a high symptom burden, with common physical symptoms such as pain, fatigue, dyspnoea and gastrointestinal disturbances, alongside psychological challenges like anxiety and depression. These symptoms often follow unpredictable trajectories, significantly affecting daily functioning, quality of life and adherence to treatments [5–7]. Economically, advanced cancer imposes substantial direct and indirect costs: patients frequently face out-of-pocket expenses for supportive care, while the cumulative social and healthcare system costs [8, 9]. Although this population demonstrates a strong motivation to engage in supportive care, there is a paucity of evidence regarding safe and effective care provision and further research is needed [10, 11]. A comprehensive review of non-pharmacological supportive care interventions is needed to identify approaches that enhance quality of life, symptom management and overall wellbeing, with the goal of facilitating translation into clinical practice.

Historically, healthcare models for individuals with advanced cancer have been misaligned with the needs of this patient population, focusing predominantly on end-of-life care or on those with a prognosis of no more than 6 to 12 months [12]. Typical palliative care and survivorship care approaches may not address the unique combination of psychological distress, financial burden and the combination of acute and chronic symptoms that is experienced over a longer period of time [10, 13]. However, there is an increasing recognition of the importance of interventions that provide on-going, personalised care tailored to the unique and evolving needs of this group [11, 13, 14].

Non-pharmacological supportive care interventions can address symptoms that fluctuate due to varying treatments and disease progression to meet unique needs of this patient group. Definitions of what therapies are included under the umbrella of supportive care in people with cancer vary but there is some consensus, that supportive care aims to address physical, emotional, social and spiritual needs, the management of treatment side effects and practical concerns such as finance or information on managing future symptoms [10, 15–17]. Supportive care is delivered by multiple disciplines including allied health, social workers, psychologists, exercise physiologists and physiotherapists and increasingly integrates evidence-based mind–body practices and lifestyle modifications [16, 18].

Despite the benefits of supportive care, it is unclear what supportive care interventions are being investigated specifically for individuals living with advanced cancer. This scoping review aimed to map the characteristics of available evidence regarding non-pharmacological supportive care interventions in people living with advanced cancer and identify gaps to inform future research.

The following research questions were formulated:

1. What does the published evidence tell us about non-pharmacological supportive care interventions for people living with advanced cancer?
2. What are the gaps in the literature?

Methods

This scoping review followed the Arksey and O'Malley framework [19] which has been used in similar studies. A protocol was developed prior and registered with the Joanna Briggs Institute (JBI) on 2023–08-21. We have reported the review according to the PRISMA Extension for Scoping Reviews (PRISMA-ScR) (Supplemental Materials 1) [20].

Search strategy

A literature search was conducted across four databases, CINAHL, Medline, Cochrane and PsycINFO, to identify relevant papers published between January 1, 2013, and July 1, 2024. This study period was selected to coincide with newer targeted therapies that have become available allowing people with advanced cancer to live longer [21]. A comprehensive search strategy was developed in consultation with an experienced academic librarian and by adapting the search strategy of a scoping review of unmet needs describing a similar population [22]. The final search strategy for Medline is provided in Supplemental Materials 2.

Inclusion criteria

Population Studies that include adults (aged eighteen years or older) with advanced cancer of any cancer type and receiving active supportive cancer care. "Advanced cancer" refers to those diagnosed and living with metastatic

disease or with "treatable but not curable cancer" which refers to the expectation that the cancer is highly unlikely to be eradicated with a high chance this cancer will lead to death [23].

Studies with a focus on patients receiving end of life care were not included. Papers that included a mixed sample of patients (i.e., patients at any cancer stage) were excluded except for papers separating results for advanced cancer patients, which permitted subgroup analysis.

Intervention Any non-pharmacological supportive care intervention aimed at addressing physical, emotional, spiritual, social, quality of life, wellbeing, financial and informational needs of people with advanced cancer were included. No delivery or geographical limitations were applied, and interventions could include technology-based interventions (e.g., apps), in-person interventions, or a combination. We excluded support groups as this model of care was recently reviewed elsewhere [24]. Pharmacological and palliative care service interventions were excluded.

Comparison All comparisons were included, including comparisons to no intervention or another intervention form.

Outcomes All outcome measures were included, such as quality of life scales, pain measures and self-efficacy measures.

Study design

We included original research articles that were quantitative or mixed-method studies to explore the full extent of original research. Non-original studies, such as editorials, abstracts without full papers and opinion pieces were excluded. Qualitative studies were also excluded due to the extensive nature of the quantitative literature and to maintain the clarity of the analysis. Reviews, including systematic reviews and meta-analyses, were excluded as they are not reporting primary data. However, their reference lists were cross-checked, in addition to snowballing, to identify other potential studies for inclusion.

Data management and study selection

Articles meeting the inclusion criteria were downloaded into Endnote 20 citation management software and exported into Covidence. Titles and abstracts of all articles were independently screened against inclusion criteria by a pair of authors (SG, BK, KKA, MTH). This process was repeated for the full-text review, and the two authors required a consensus at all stages. If disagreements occurred, a third author was consulted to ensure consistency. At the beginning of each screening level, a calibration exercise for 20% of the sample was used to ensure a minimum interrater agreement of 80% [25].

Data extraction

A data extraction template was jointly developed by two authors (BK, SG) using Covidence. Before extracting data, these authors piloted the template on five studies. Following piloting, reviewers discussed if modifications were required to ensure the template captured all relevant data.

Data extraction relevant to our aims include (1) article details including author and publication year; (2) participant criteria including cancer type, stage (e.g. advanced), age, gender, number of participants, location (where the patient receiving care was physically located when receiving the intervention, e.g., outpatient clinic, home); (3) study information including study design, aim and duration; (4) nature of intervention including intervention type (e.g., physical activity), intervention group and control group; (5) the supportive care need(s) addressed by the intervention (6) outcomes (primary and secondary study outcomes, study limitations and adverse events). Data were grouped by the type of supportive care intervention, with results presented in a table (Supplemental Material 3).

No quality or bias assessments were conducted. We mapped our intervention types according to Edney, Roseleur [22] which recognised three broad groups of needs for the advanced cancer population, namely, physical, psychosocial and practical needs, which includes financial and informational needs such as patient autonomy. This method of classification has allowed us to draw comparisons between the types of interventions available and the areas of unmet need identified in recently conducted studies [14].

Results

The search yielded 3716 studies. After title and abstract screening and removal of duplicates, 113 abstracts were retrieved for full-text evaluation. After examining full text, 84 publications were retained. Figure 1 shows the PRISMA flowchart of the study selection process. Sample and intervention characteristics are summarised in Fig. 2. Study characteristics are detailed in Supplemental Materials 3.

Sample characteristics

Sample size

The sample size of the studies ranged from 6 to 349 participants, with a mean of 76 participants. The mean age of participants was 61.3 years. Eleven studies (13.1%, $n=11$) had all female participants, 6 studies (7.1%, $n=6$) had all male participants, and 67 studies (79.8%) included men and women. One study did not identify whether participants were male or female [26].

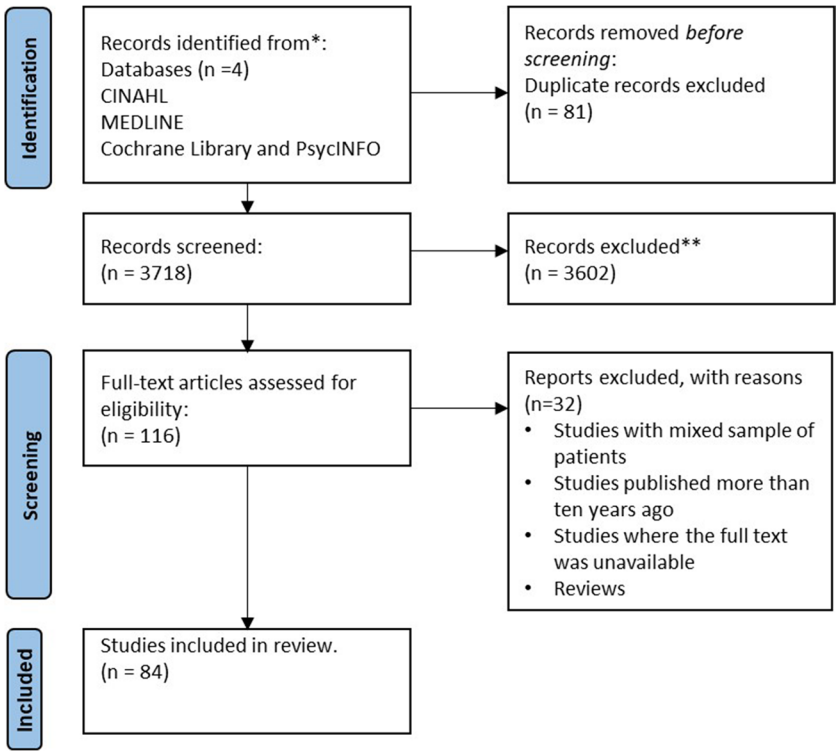


Fig. 1 PRISMA flow diagram including screening and reasons for exclusion during second round of title and abstract screening

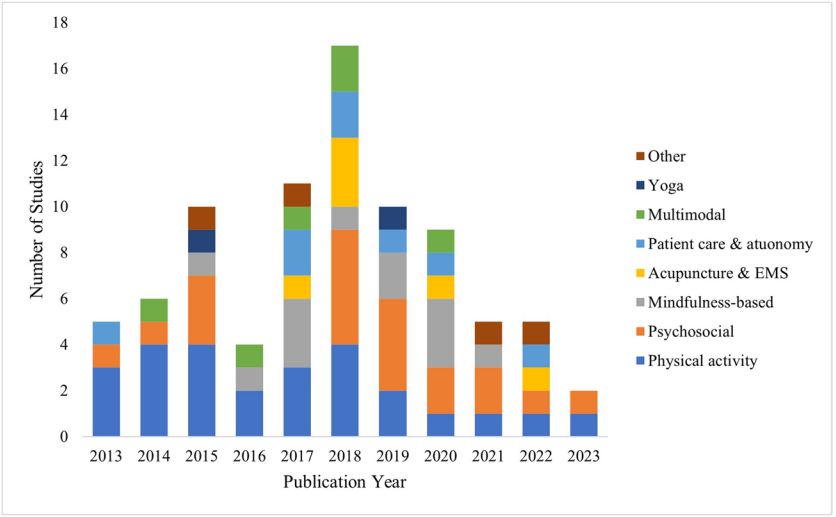


Fig. 2 Distribution of peer-reviewed studies reporting non-pharmacological supportive care interventions of people with advanced cancer: 2013 to 2023

Cancer type

Forty-five studies focused on a single cancer type, including lung cancer (16.7%, $n=14$), breast cancer (14.3%, $n=12$), prostate cancer (7.1%, $n=6$), melanoma (4.8%, $n=4$), gastrointestinal tract cancer (3.6%, $n=3$), colorectal cancer (3.6%, $n=3$), ovarian cancer (2.4%, $n=2$) and nasopharyngeal cancer (1.2%, $n=1$). A population of mixed cancer types was the most common overall (46.4%, $n=39$).

Study design

Study type

Study designs included randomised controlled trials (RCTs) (73.8%, $n=62$), single-arm interventional studies (15.5%, $n=13$), mixed methods studies (3.6%, $n=3$), two-arm interventional studies (2.4%, $n=2$), retrospective clinical control trials (CCT) (2.4%, $n=2$) and pilot studies (2.4%, $n=2$).

Study settings

Intervention settings were varied and, in some instances, included multiple locations (6%, $n=5$). Single-intervention locations include hospitals (45.2%, $n=38$), outpatient clinics (16.7%, $n=14$), participant homes (15.5%, $n=13$), academic settings (9.5%, $n=8$), gym or exercise area (4.8%, $n=4$) and hospice (2.4%, $n=2$).

Study length

The average intervention duration was 10 weeks, with a range of 3 days to 56 weeks.

Study mode of delivery

Studies were conducted in person (83.3%, $n=70$), online (14.3%, $n=12$), or a combination of both (2.4%, $n=2$). Interventions were conducted individually (89.3%, $n=75$), through group interventions (95.2%, $n=8$), or a mix of both (11.9%, $n=1$).

Intervention types and outcomes

Most studies investigated a single intervention (92.9%, $n=78$) and six studies (7.1%, $n=6$) investigated multi-modal interventions. Only 34 studies (40.5%, $n=34$) reported adverse events. Of these, most recorded no adverse events (33.3%, $n=28$) or fatigue or distress directly related to the intervention (7.1%, $n=6$). Thirty-two studies (38.1%, $n=32$) showed statistically significant improvements in investigated interventions addressing psychosocial and physical supportive care needs through improvements in symptom burden and quality of life. Only one study reported adverse events as a primary outcome [27].

Physical activity–based interventions

Twenty-six studies (31%, $n=26$) focused on physical activity–based interventions alone, with twenty-one RCTs, three single-armed interventional studies and two two-armed interventional studies [28, 29]. Interventions included endurance [30, 31], strength [32] and resistance training [29, 33] with thirteen studies using more than one type of physical training (15.5%, $n=13$) [26, 28–30, 32, 34–41]. Two studies explored isometric training of vertebral muscles [42, 43]. Other modalities included aerobic exercise [44, 45], very low interval training [46], walking interventions [47] and multifaceted programs prompting patients to exercise via text messages [48].

Two studies (2.4%, $n=2$) investigated the feasibility of yoga interventions to improve quality of life. A couples-based Vivekananda Yoga (VKC) was tested in a single-armed feasibility trial on patients and their caregivers, assessing pre- and post-intervention levels of fatigue, sleep disturbances, psychological distress and relational closeness [49]. The other was an RCT focusing on mindful yoga techniques [50].

Of the twenty-six studies investigating physical activity–based interventions, certain studies demonstrated improvements in activity levels [29, 41, 48, 51], strength [30, 38], mobility [32], endurance [30] and reductions in pain and fatigue [38, 39]. High adherence rates were observed in programs suggesting feasibility and acceptability [34, 39]. Some interventions [35, 50] showed no significant change in fatigue, suggesting limited efficacy in addressing this symptom ($p>0.05$). Multidimensional interventions [36, 41] provided further insight into exercise capacity improvements, highlighting the potential benefits of these interventions ($p<0.05$). Further studies [26, 43] highlight the importance of high completion rates in attaining positive outcomes. Mixed findings and negative outcomes were also evident including challenges in recruitment and participation [46, 52].

Primary outcomes for the twenty-six studies investigating physical activity–based interventions, included activity levels [29, 41, 48, 51], strength [30, 38], mobility [32], endurance [30], lung capacity [36, 40], quality of life [26, 28, 42, 44] as well as reductions in pain and fatigue [26, 38]. Of the eight studies reporting feasibility, feasibility primary outcome criteria were completion rates [39, 43], adherence and attendance [34, 45, 46], adverse events [33] and satisfaction [47, 53].

Psychosocial-based interventions

Psychosocial-based interventions include targeted interventions that address fear of cancer recurrence, mindfulness and distress through approaches such as cognitive behaviour therapy (CBT). Twenty studies (29.8%, $n=25$) investigated psychosocial-based interventions, including fourteen RCTs, four single-armed interventional studies, one single-arm mixed methods study and one retrospective study. These programs reported significant reductions in depression [54–56], spiritual well-being [57, 58], death-related distress [55, 59, 60], sleep [61] and physical symptom distress [62–64]. Feasibility studies reported on satisfaction [52], acceptability[65] and adherence [66].

CBT protocols were used in six studies for patients with insomnia, anxiety, depression and fatigue [52, 54, 61, 66–68] including CBT via a mobile app to improve anxiety, depression and quality of life [67]. Acceptance and Commitment Therapy (ACT) was investigated for functional well-being and fatigue in sessions conducted in-person or via telephone [61, 69]. One study focused on the combined effect of CBT and ACT on the impact on insomnia [61]. Other modalities

applied Meaning-centred Psychotherapy (MCP) to address existential distress and spiritual well-being [58]. Several interventions aimed to reduce cancer-specific distress and improve quality of life including Cognitive Behavioural Stress Management (CBSM), ACT [61–63, 70] and Managing Cancer and Living Meaningfully (CALM) [56, 71, 72]. One study investigated logotherapy to help individuals acquire meaning in their lives [60] while Dignity Therapy (DT) [59, 73] was used to encourage self-reflection as a means to achieve spirituality and identify a purpose in life.

CBT-based interventions were associated with improved mood and quality of life, particularly for those with insomnia and fatigue (7.1%, $n = 6$). Significant improvements in fatigue were noted with at-home delivered CBT intervention [52]. A study that delivered CBT via a mobile app also found significant improvements in anxiety, depression and quality of life when compared to baseline [67]. A CBT feasibility study reported high adherence to lessons (70%) accompanied with high treatment satisfaction [66]. CBT sessions delivered concurrently with chemoradiotherapy also demonstrate lower depression and anxiety scores twenty-four months after completion [74]. CBT focusing on ACT reported significant improvements in sleep efficiency, sleep latency, worry and depression from baseline to 6 weeks [61]. CBT focusing on stress reduction and management reported fewer depressive symptoms, intrusive thoughts and improvements in emotional wellbeing [72].

Two feasibility studies (2.4%, $n = 2$) investigated interventions for fear of cancer recurrence. One acceptability and feasibility RCT (Fear-Less: A Stepped-Care Program) stratified participants according to need to individual sessions delivered by a clinical psychologist or to a self-management group, compared to usual care [65]. In the self-management group, 13/21 participants had a reduction of Fear of Cancer Recurrence (FCR) and 5/7 participants in the individual psychologist session group. The stepped-care intervention was found to be acceptable and feasible. The other study was a nurse-led single-armed mixed methods study exploring the feasibility of a fear-conquering videoconferencing sessions. The intervention met feasibility and acceptability criteria with a reduction score of 8 points and 19.1 points for fear of progression and cancer-related distress respectively [75].

Twelve studies (14.3%, $n = 12$) investigated mindfulness interventions; seven RCTs, two single-arm interventional studies and three mixed methods studies. Interventions included art therapy [76], mindfulness-based cognitive therapy (MBCT) [71], mindfulness-based stress reduction (MBSR) [77–80], Lessons in Linking Affect and Coping (LILAC) [81], Naikan and Morita therapy [59, 73] and meditation interventions [70, 82, 83]. Seven studies reported increased positive changes in acceptance, mood and anxiety (8.3%, $n = 7$) [70, 73, 77–79, 81, 82]. Mindfulness and acceptance were measured by the Mindful Coping Scale (MCS), the Acceptance and Action Questionnaire-II (AAQ-II) and the Meaning in Life Questionnaire (MLQ) [82]. Spiritual-wellbeing was assessed with the Functional Assessment of Chronic Illness Therapy-Spiritual well-being scale (FACIT-Sp) [49, 70, 76, 84], Patient Health Questionnaire (PHQ-9) [55] and the Spiritual Well-being Scale (SWB) [58, 83].

Symptom management and autonomy

Eight studies (9.5%, $n = 8$) addressed the practical needs of patient autonomy in symptom management and education. Six of these studies were RCTs and two were mixed methods. Three studies involved accessing an app or a website via a personal device or laptop. One study [85] used an app to allow patients to report their symptoms daily, and another app educated women on improving quality of life (QoL) during chemotherapy through a game [86]. Additionally, websites such as "Together" [87] and "Loop" [88] support clinical collaboration. Programs such as the life review program [64] and Be Resilient to Breast Cancer (BRBC) [89] facilitate resilience and empowerment. Furthermore, a nurse practitioner–led trial focused on telemonitoring pain [90]. In addressing anxiety, depression and stress among individuals coping with cancer, a comprehensive guided self-help program known as Targeted Selection, Enhanced Care, Stepped Care (TES) was investigated in a cluster RCT [91].

The TES Program, patients reported that screening survivor experiences were easy to complete (98%), acceptable (100%) and were all likely to recommend the therapy to others. All participants who completed the intervention reported subjective improvements in fear of cancer recurrence levels, and all attributed these changes to therapy [91]. Web-based programs such as Loop, a tool for clinical collaboration, enabled patients to communicate asynchronously with members of their healthcare team [88]. Other feasible web-based tools include an intervention targeting cognitive behavioural stress management [72] and nurse-led tele-health delivered survivorship care [92].

Multimodal interventions

A multimodal intervention combines multiple therapeutic approaches or techniques to address various aspects of a health condition simultaneously. Six studies (7.1%, $n = 6$) investigated multimodal interventions. Of the six studies, five were RCTs and one was a single-arm interventional study. Studies included aerobic exercises alongside dietary advice [84]; Wheel Balance Cancer Therapy (WBCT) consisting of dietary advice, acupuncture and daily meditation [93] and the effects of Whole-body Electro-myo-stimulation

(WB-EMS) alongside controlled nutritional intake [94]. Another study explored the effects of balance, endurance and exercise training for advanced colorectal cancer patients [95]. CBT concomitantly with graded exercise therapy investigated effects of fatigue [68]. Finally, another program combined exercise with dietary advice to investigate effects for patients with metastatic melanoma [96].

Implementing aerobic and resistance exercise [84] alongside dietary advice resulted in significant improvements in Functional Assessment of Cancer Therapy-Prostate (FACT-P) scores post-supervised intervention ($p < 0.05$), though this was not sustained. The Wheel Balance Cancer Therapy (WBCT) regimen [97] reported notable overall survival rates of 63.6% and 24.2% at the ends of years 1 and 2, respectively. The intervention offering CBT ($p = 0.012$) alongside Graded Exercise Therapy (GET) [68] demonstrated significant fatigue reduction. WB-EMS training (utilising light dynamic physical exercises and electrical muscle stimulation) resulted in higher skeletal muscle mass ($p = 0.022$) [94]. The comprehensive exercise program, including endurance and balance training [95], led to significant improvements in the Trial Outcome Index (TOI) ($p < 0.05$). Finally, the combining multimodal therapy with immunotherapy reduced symptom burden [96].

Other interventions

Two RCTs (2.4%, $n = 2$) examined the effects of Yarrow liver compress for those with cancer-related fatigue undertaking palliative radiotherapy [98, 99] while nutritional interventions employing individualised diets targeted weight loss due to cachexia [100]. A live music–based intervention explored self-rated relaxation in comparison to an MBSR [101]. We found no studies addressing other key areas identified as practical needs of the advanced cancer population, including financial and sexual needs [102].

Three studies (3.6%, $n = 3$) explored the effects of acupuncture on cancer-related fatigue, quality of life and pain relief. One study investigated the efficacy of self-applied acupressure in alleviating fatigue levels [103] while another explored moxibustion acupuncture's potential in enhancing quality of life metrics [104]. Additionally, a third study examined the role of intradermal acupuncture in managing cancer-related pain [105].

Three studies (3.6%, $n = 3$) investigated the effects of transcutaneous electrical stimulation on pain and symptomatic relief of chemotherapy such as fatigue, nausea and vomiting [106–108]. Electrical stimulation interventions using Transcutaneous Electrical Nerve Stimulation (TENS) significantly reduced pain when compared to baseline ($p < 0.01$); however, it did not sustain lasting effects after 60 and 120 min [107]. Nerve Electrical Stimulation (NES) therapy had a significant reduction in nausea ($p = 0.02$), vomiting ($p = 0.04$) and appetite improvement ($p = 0.02$) [106] while Neuromuscular Electrical Stimulation (NEMS) treatment groups did not achieve better outcomes in cancer-related fatigue as measured by the MFI scale ($p = 0.21$) [108].

Discussion

This scoping review maps the breadth of research on non-pharmacological supportive care interventions in the population of people living with advanced cancer. Our review identified diverse interventions focusing on a range of supportive care needs, particularly physical and psychosocial needs. There were clear gaps in study design, with only three studies using a mixed methods approach, few studies set in the community or evaluating group-based interventions. The increasing number of included studies published from 2013 until 2018 reflects this field's emerging nature, while the decline following this period may reflect the impact of COVID-19 on clinical trials [109].

Most included studies addressed physical needs, such as fatigue, with clear benefits of structured exercise programs in improving physical activity levels and lean mass. However, there has been a rise in interventions addressing psychosocial needs, such as depression, over time. This follows an increased awareness of this population's unique psychological challenges, including the long-term uncertainty of a life-limiting illness [110]. Feasible psychosocial approaches include coping skills and programs to reduce psychological distress and promote positive changes in acceptance. While physical and psychosocial needs remain well-addressed by interventions, an understudied domain is interventions addressing practical supportive care needs such as informational needs, financial needs and returning to work. Our findings align with existing studies that demonstrate these domains with greatest unmet need are the domains with fewest available interventions (see Fig. 1) & Fig. 3 [102]. Given its role in person-centred care, this warrants further research and the future development of programs addressing these unmet domains.

Few multimodal interventions were studied. In the context of advanced cancer, multimodal interventions might integrate physical therapies, psychological counselling and nutritional support to manage pain, reduce anxiety and improve overall quality of life. These interventions tailored to the individual's unique needs may prove to be more effective than single-modality approaches, as they address the multidimensional nature of many health conditions.

Our review showed that most studies were conducted in hospital settings. While these hospital-based interventions are vital, the heterogeneity of the advanced cancer

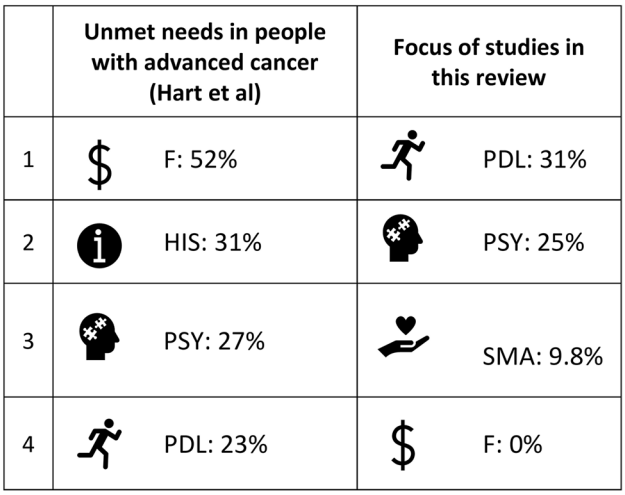


Fig. 3 Areas of need versus focus of interventions. F, Financial; HIS, Health System and Information Needs; Psy, Psychological; PDL, Physical and Daily Living: SMA, Symptom management and autonomy

population and living with an incurable illness means that community interventions are vital. It follows that further research into optimising care pathways involving primary care providers in survivorship interventions is vital.

A growing area of service delivery is supportive care. Methods of incorporating technology in selected studies include web-based interventions and apps. Our findings are consistent with the advantages identified in existing literature including broader dissemination and cost efficiency while barriers include reduced medical record integration and healthcare provider participation [111]. As collaboration is vital to caring for patients with complex needs, addressing these limitations in future research is essential. The two identified app-based interventions [67, 85] demonstrated positive outcomes including high patient engagement, symptom control and continuity of care. While a self-management tool such as an app can increase patient empowerment [85], on-going research is required to optimise adherence.

While most studies utilised individual therapy, limited studies have used group therapy. One group intervention [60] effectively reduced existential concerns of loneliness. For this psychosocial need, group therapy uniquely positions patients to heal in a setting of shared empathy and hardship. Given these benefits, group therapy has suitability in other supportive care domains such as physical needs, particularly for motivation and should be an avenue for future research.

A significant gap identified by this scoping review is the methodological limitations of the evaluated supportive care interventions. Small sample sizes, short study duration and recruitment from only one site in most studies render most results preliminary and lacking statistical power. Finding appropriate control groups can be difficult, as patients may be receiving various concurrent therapies that impact outcomes. These methodological gaps and challenges restrict the ability to draw definitive conclusions about the efficacy of interventions, which hampers the development of comprehensive guidelines and impedes the implementation of supportive care for this population. To address this, large-scale, population-based research and novel research approaches are needed to build robust evidence and facilitate effective supportive care strategies for individuals living with advanced cancer [112].

Strengths and limitations

This is the first scoping review to comprehensively synthesise evidence and identify gaps regarding non-pharmacological supportive care interventions for individuals living with advanced cancer. It excludes the typical pharmacological and palliative care service provision that has become current standard of care during acute treatment and in the patients with complex progressive disease. It was guided by a protocol based on expert scoping review methodology, utilised a search strategy developed with an academic librarian with inclusive and specific search terms and rigorous screening procedures to ensure all key studies were identified. This is a unique trait to this review, as existing studies neglected a full-text review due to the quantity of identified studies [22]. Another strength of this scoping review is its ability to capture a heterogeneous study population with different cancer types in different settings.

A barrier to the implementation of supportive care interventions in clinical practice is lack of access to synthesised evidence. Existing reviews of interventions for this population have targeted specific domains such as exercise and nutrition [113]. Such disaggregated reporting manifests as a limitation for clinicians in selecting interventions for their patients, as they cannot compare interventions addressing different care needs. Therefore, the breadth of this scoping review, accessibility of the results in a tabulated format and transparency to intervention outcomes and adverse events will improve quality of care by allowing clinicians to make informed clinical decisions and feel more confident in combining these interventions with standard care.

As an emerging field, there are inconsistencies surrounding the term advanced cancer which may have reduced identification of studies. Additionally, further relevant studies may have become available since conducting the search on July 1, 2024. While these are unlikely to significantly impact the conclusions drawn from this review, it remains a limitation as important interventions may not have been included. Despite using a comprehensive search strategy, all potential

databases were not used, and therefore, all available literature may not be identified, Our review only included English terms and articles published in English, presenting a language bias and while in keeping with standard protocol for scoping reviews, the methodological quality of the studies was not assessed. Finally, excluding the paediatric population and an overall under-representation of the haematological cancers where there is no clear advanced stage limits the generalisability of these results.

Future direction/recommendations

Our scoping review has highlighted the benefits of supportive care interventions for people with advanced cancer. Future research to assess the efficacy of supportive care interventions should be large multi-centre studies including community or primary care–based interventions and multi-modal interventions. These interventions should address the identified gaps including practical needs such as financial and informational needs and integrate methods to optimise and measure adherence to these interventions. Subsequent phases will involve optimising implementation by identifying barriers and facilitators to programs. Combining these findings with our review can support the development of intervention options.

The recently released MASCC-ASCO standards for supportive care for people with advanced or metastatic cancer provide seven standards and 45 practice recommendations to support optimisation of care experiences and health outcomes [114]. These standards highlight the importance not just of evidence-based and comprehensive supportive care, but of care that is person-centred, coordinated, integrated, accessible, equitable, sustainable and well-resourced. The standards reinforce the need not just to add to the evidence-base around effectiveness of supportive care interventions but to ensure that system-level factors such as patient navigation support, timely referrals to interprofessional supportive care services and models of care (e.g. specialist- vs nurse-led) meet the patient's needs. Going forward, improvements in the experiences of people with advanced cancer and their health outcomes will require a coordinated response across multiple domains.

Conclusion

The advanced cancer population is understudied and growing, experiencing a range of unmet care needs, which supportive care interventions can address. This scoping review has synthesised the published evidence and identified specific gaps where future research is required, with implications to improve outcomes for this population.

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Author contribution SG and KKA conceived the study. SG, KKA, BK and MTH designed the study. SG, KKA, BK and MTH reviewed papers. BK and MTH extracted data, SG and KKA checked a sample and provided guidance on consensus. BK made the original draft of the manuscript. MTH made the original draft of the figures and tables. Supervision provided by SG. SG, BK, MH, KKA, AS, SBB and JL contributed to revisions and approved the final paper.

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

Declarations

Ethical considerations Ethics was not required as data from previously published studies was used, where those investigators already obtained consent.

Consent for publication Not applicable,

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References

1. Gallicchio L, et al. Estimation of the number of individuals living with metastatic cancer in the United States. JNCI: J Natl Cancer Inst. 2022;114(11):1476–83.
2. Conforti F, et al. Cancer immunotherapy efficacy and patients' sex: a systematic review and meta-analysis. Lancet Oncol. 2018;19(6):737–46.
3. Aggarwal C, et al. Assessment of tumor mutational burden and outcomes in patients with diverse advanced cancers treated with immunotherapy. JAMA Netw Open. 2023;6(5):e2311181–e2311181.
4. Maher J, Velikova G, Betteley A. Incurable, but treatable: how to address challenges for an emerging group. BMJ Support Palliat Care. 2015;5(4):322–4.
5. Henson LA, et al. Palliative care and the management of common distressing symptoms in advanced cancer: pain, breathlessness, nausea and vomiting, and fatigue. J Clin Oncol. 2020;38(9):905–14.
6. Madsen R, Birkelund R, Uhrenfeldt L. Patients experience major changes in life and significant others struggle with caregiving during the course of incurable cancer: a systematic review and meta-synthesis. Eur J Pers Cent Healthc. 2018;6(1):88.

7. Grassi L, Spiegel D, Riba M. Advancing psychosocial care in cancer patients. F1000 Res. 2017;6:2083–2083.
8. Chan RJ, et al. Relationships between financial toxicity and symptom burden in cancer survivors: a systematic review. J Pain Symptom Manage. 2019;57(3):646-660.e1.
9. Park J, Look KA. Health care expenditure burden of cancer care in the United States. INQUIRY: J Health Care Org Provision Financing. 2019;56:0046958019880696.
10 Stegmann ME, et al. Improving care for patients living with prolonged incurable cancer. Cancers (Basel). 2021;13(11):2555.
11. Frikkel J, et al. Fatigue, barriers to physical activity and predictors for motivation to exercise in advanced cancer patients. BMC Palliat Care. 2020;19(1):43.
12. Zimmermann C, et al. Perceptions of palliative care among patients with advanced cancer and their caregivers. Can Med Assoc J (CMAJ). 2016;188(10):E217–27.
13 Tometich DB, et al. Living with metastatic cancer: a roadmap for future research. Cancers. 2020;12:3684. https://doi.org/10.3390/cancers12123684.
14. Hart NH, et al. Unmet supportive care needs of people with advanced cancer and their caregivers: a systematic scoping review. Crit Rev Oncol Hematol. 2022;176:103728.
15. Olver I, et al. Supportive care in cancer—a MASCC perspective. Support Care Cancer. 2020;28:3467–75.
16. Hui D, Hoge G, Bruera E. Models of supportive care in oncology. Curr Opin Oncol. 2021;33(4):259–66.
17 Berman R, et al. Supportive care: an indispensable component of modern oncology. Clin Oncol (Royal College of Radiologists (Great Britain)). 2020;32(11):781–8.
18. Kaasa S, et al. Supportive care in cancer: new directions to achieve universal access to psychosocial, palliative, and end-of-life care. Lancet Glob Health. 2018;6:S11–2.
19. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. Int J Soc Res Methodol. 2005;8(1):19–32.
20. Tricco AC, et al. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. Ann Intern Med. 2018;169(7):467–73.
21. Lee RT, et al. Implementation of supportive care and best supportive care interventions in clinical trials enrolling patients with cancer. Ann Oncol. 2015;26(9):1838–45.
22. Edney LC, et al. Mapping a decade of interventions to address the supportive care needs of individuals living with or beyond cancer: a scoping review of reviews. Support Care Cancer. 2022;30(5):3793–804.
23. White R, et al. Treatable but not curable cancer in England: a retrospective cohort study using cancer registry data and linked data sets. BMJ Open. 2021;11(1):e040808.
24. Li Z, et al. Professionally led support groups for people living with advanced or metastatic cancer: a systematic scoping review of effectiveness and factors critical to implementation success within real-world healthcare and community settings. J Cancer Survivorship, 2024. https://doi.org/10.1007/s11764-023-01515-w
25. Belur J, et al. Interrater reliability in systematic review methodology: exploring variation in coder decision-making. Sociol Methods Res. 2021;50(2):837–65.
26. Henke C, et al. Strength and endurance training in the treatment of lung cancer patients in stages IIIA/IIIB/IV. Support Care Cancer. 2014;22:95–101.
27. Cormie P, et al. Functional benefits are sustained after a program of supervised resistance exercise in cancer patients with bone metastases: longitudinal results of a pilot study. Support Care Cancer. 2014;22(6):1537–48.
28. Jensen W, et al. Exercise training in patients with advanced gastrointestinal cancer undergoing palliative chemotherapy: a pilot study. Support Care Cancer. 2014;22:1797–806.
29. Litterini AJ, et al. Differential effects of cardiovascular and resistance exercise on functional mobility in individuals with advanced cancer: a randomized trial. Arch Phys Med Rehabil. 2013;94(12):2329–35.
30. Schmidt T, et al. Comparing endurance and resistance training with standard care during chemotherapy for patients with primary breast cancer. Anticancer Res. 2015;35(10):5623–9.
31. Boileau M, et al. Description of supportive care and feasibility of physical exercise program to improve quality of life in advanced melanoma patients. Melanoma Res. 2023;33(3):230–8.
32. Cheville AL, et al. A home-based exercise program to improve function, fatigue, and sleep quality in patients with stage IV lung and colorectal cancer: a randomized controlled trial. J Pain Symptom Manage. 2013;45(5):811–21.
33. Cormie P, et al. Safety and efficacy of resistance exercise in prostate cancer patients with bone metastases. Prostate Cancer Prostatic Dis. 2013;16(4):328–35.
34. Kuehr L, et al. Exercise in patients with non-small cell lung cancer. Med Sci Sports Exerc. 2014;46(4):656–63.
35. Schuler MK, et al. Impact of different exercise programs on severe fatigue in patients undergoing anticancer treatment—a randomized controlled trial. J Pain Symptom Manage. 2017;53(1):57–66.
36. Quist M, et al. The impact of a multidimensional exercise intervention on physical and functional capacity, anxiety, and depression in patients with advanced-stage lung cancer undergoing chemotherapy. Integr Cancer Ther. 2015;14(4):341–9.
37. Pyszora A, et al. Physiotherapy programme reduces fatigue in patients with advanced cancer receiving palliative care: randomized controlled trial. Support Care Cancer. 2017;25:2899–908.
38. Galvao DA, et al. Exercise preserves physical function in prostate cancer patients with bone metastases. Med Sci Sports Exerc. 2018;50(3):393.
39. Cheung DST, et al. Feasibility of aerobic exercise and Tai-Chi interventions in advanced lung cancer patients: a randomized controlled trial. Integr Cancer Ther. 2021;20:15347354211033352.
40. Jastrzębski D, et al. Pulmonary rehabilitation in advanced lung cancer patients during chemotherapy. Respiratory Health, 2015, p. 57–64. https://doi.org/10.1007/5584_2015_134
41. Rutkowska A, et al. Exercise training in patients with non-small cell lung cancer during in-hospital chemotherapy treatment: a randomized controlled trial. J Cardiopulm Rehabil Prev. 2019;39(2):127–33.
42. Rief H, et al. Quality of life and fatigue of patients with spinal bone metastases under combined treatment with resistance training and radiation therapy-a randomized pilot trial. Radiat Oncol. 2014;9:1–8.
43. Rief H, et al. Feasibility of isometric spinal muscle training in patients with bone metastases under radiation therapy-first results of a randomized pilot trial. BMC Cancer. 2014;14:1–10.
44. Ligibel JA, et al. Randomized trial of a physical activity intervention in women with metastatic breast cancer. Cancer. 2016;122(8):1169–77.
45. Scott JM, et al. Feasibility, safety, and efficacy of aerobic training in pretreated patients with metastatic breast cancer: a randomized controlled trial. Cancer. 2018;124(12):2552–60.
46. Reljic D, et al. Feasibility, safety, and preliminary efficacy of very low-volume interval training in advanced cancer patients. Med Sci Sports Exerc. 2022;54(11):1817–30.
47. Tsianakas V, et al. CanWalk: a feasibility study with embedded randomised controlled trial pilot of a walking intervention for people with recurrent or metastatic cancer. BMJ Open. 2017;7(2):e013719.
48. Bade BC, et al. A patient-centered activity regimen improves participation in physical activity interventions in advanced-stage lung cancer. Integr Cancer Ther. 2018;17(3):921–7.

49. Milbury K, et al. Vivekananda Yoga program for patients with advanced lung cancer and their family caregivers. Integr Cancer Ther. 2015;14(5):446–51.
50. Porter LS, et al. Feasibility of a mindful yoga program for women with metastatic breast cancer: results of a randomized pilot study. Support Care Cancer. 2019;27:4307–16.
51. Stuecher K, et al. Exercise improves functional capacity and lean body mass in patients with gastrointestinal cancer during chemotherapy: a single-blind RCT. Support Care Cancer. 2019;27:2159–69.
52. Bernatchez MS, et al. Feasibility of a cognitive-behavioral and environmental intervention for sleep-wake difficulties in community-dwelling cancer patients receiving palliative care. Cancer Nurs. 2019;42(5):396–409.
53. Uth J, et al. Football training in men with prostate cancer undergoing androgen deprivation therapy: activity profile and short-term skeletal and postural balance adaptations. Eur J Appl Physiol. 2016;116:471–80.
54. Liu YW, et al. Therapeutic efficacy of traditional chinese medicine syndrome-based formulae to neuropathic pain caused by chemotherapy. Integr Cancer Ther. 2022;21:15347354221121096.
55. Lo C, et al. Managing Cancer And Living Meaningfully (CALM): phase 2 trial of a brief individual psychotherapy for patients with advanced cancer. Palliat Med. 2014;28(3):234–42.
56. Rodin G, et al. Managing Cancer and Living Meaningfully (CALM): a randomized controlled trial of a psychological intervention for patients with advanced cancer. J Clin Oncol. 2018;36(23):2422–32.
57. Breitbart W, et al. Individual meaning-centered psychotherapy for the treatment of psychological and existential distress: a randomized controlled trial in patients with advanced cancer. Cancer. 2018;124(15):3231–9.
58. Breitbart W, et al. Meaning-centered group psychotherapy: an effective intervention for improving psychological well-being in patients with advanced cancer. J Clin Oncol. 2015;33(7):749.
59. Dose AM, et al. Outcomes of a dignity therapy/life plan intervention for patients with advanced cancer undergoing chemotherapy. J Hosp Palliat Nurs. 2018;20(4):400–6.
60. Heidary M, Heshmati R, Hayes J. Effect of group logotherapy on anxiety about death and existential loneliness in patients with advanced cancer: a randomized controlled trial. Cancer Nurs. 2023;46(1):E21–30.
61. Wells-Di Gregorio SM, et al. Pilot randomized controlled trial of a symptom cluster intervention in advanced cancer. Psychooncology. 2019;28(1):76–84.
62. Li H, et al. Effects of Acceptance and Commitment Therapy on fatigue interference and health-related quality of life among patients with advanced lung cancer: a pilot randomized controlled trial. Asia Pac J Oncol Nurs. 2022;9(8):100102.
63. Serfaty M, et al. Manualised cognitive-behavioural therapy in treating depression in advanced cancer: the CanTalk RCT. Health Technol Assess (Winchester, England). 2019;23(19):1.
64. Xiao H, et al. Effect of a life review program for Chinese patients with advanced cancer: a randomized controlled trial. Cancer Nurs. 2013;36(4):274–83.
65. Lynch FA, et al. Feasibility and acceptability of fear-less: a stepped-care program to manage fear of cancer recurrence in people with metastatic melanoma. J Clin Med. 2020;9(9):2969.
66. Murphy MJ, et al. A mixed methods pilot and feasibility open trial of internet-delivered cognitive behaviour therapy (iCanADAPT Advanced) for people with advanced cancer with depression and/or anxiety. Internet Interv. 2021;26:100449.
67. Greer JA, et al. Randomized trial of a tailored cognitive-behavioral therapy mobile application for anxiety in patients with incurable cancer. Oncologist. 2019;24(8):1111–20.
68. Poort H, et al. Cognitive behavioral therapy or graded exercise therapy compared with usual care for severe fatigue in patients with advanced cancer during treatment: a randomized controlled trial. Ann Oncol. 2020;31(1):115–22.
69. Mosher CE, et al. Acceptance and commitment therapy for symptom interference in advanced lung cancer and caregiver distress: a pilot randomized trial. J Pain Symptom Manag. 2019;58(4):632–44.
70. Mosher CE, et al. Examining the effect of peer helping in a coping skills intervention: a randomized controlled trial for advanced gastrointestinal cancer patients and their family caregivers. Qual Life Res. 2018;27(2):515–28.
71. Chambers SK, et al. Mindfulness-based cognitive therapy in advanced prostate cancer: a randomized controlled trial. J Clin Oncol. 2017;35(3):291–7.
72. Yanez B, et al. Feasibility, acceptability, and preliminary efficacy of a technology-assisted psychosocial intervention for racially diverse men with advanced prostate cancer. Cancer. 2015;121(24):4407–15.
73. Han XB, et al. Efficacy of combined naikan and morita therapies on psychological distress and posttraumatic growth in Chinese patients with advanced cancer: A randomized controlled trial. Medicine. 2021;100(30):e26701.
74. Liu F, et al. Effects of cognitive behavioral therapy for depression and anxiety, response rates and adverse events in patients with locoregional advanced nasopharyngeal carcinoma. Integr Cancer Ther. 2021;20:15347354211006180.
75. Reb AM, et al. A nurse-led intervention for fear of cancer progression in advanced cancer: a pilot feasibility study. Eur J Oncol Nurs. 2020;49:101855.
76. Ando M, et al. Effectiveness of the mindfulness art therapy short version for Japanese patients with advanced cancer. Art Ther. 2016;33(1):35–40.
77. Arden-Close E, et al. Mindfulness-based interventions in recurrent ovarian cancer: a mixed-methods feasibility study. Integr Cancer Ther. 2020;19:1534735420908341.
78. Eyles C, et al. Mindfulness for the self-management of fatigue, anxiety, and depression in women with metastatic breast cancer: a mixed methods feasibility study. Integr Cancer Ther. 2015;14(1):42–56.
79. Lee CE, et al. Effects of a mindfulness-based stress reduction program on the physical and psychological status and quality of life in patients with metastatic breast cancer. Holist Nurs Pract. 2017;31(4):260–9.
80. Poletti S, et al. Mindfulness-Based stress reduction in early palliative care for people with metastatic cancer: a mixed-method study. Complement Ther Med. 2019;47:102218.
81. Cheung EO, et al. A randomized pilot trial of a positive affect skill intervention (lessons in linking affect and coping) for women with metastatic breast cancer. Psychooncology. 2017;26(12):2101–8.
82. Zimmermann FF, Jordan J, Burrell B. Coping with cancer mindfully: a feasibility study of a mindfulness intervention focused on acceptance and meaning in life for adults with advanced cancer. Eur J Oncol Nurs. 2020;44:101715.
83. Milbury K, et al. A mindfulness-based intervention as a supportive care strategy for patients with metastatic non-small cell lung cancer and their spouses: results of a three-arm pilot randomized controlled trial. Oncologist. 2020;25(11):e1794–802.
84. Bourke L, et al. Lifestyle changes for improving disease-specific quality of life in sedentary men on long-term androgen-deprivation therapy for advanced prostate cancer: a randomised controlled trial. Eur Urol. 2014;65(5):865–72.
85. Crafoord MT, et al. Engagement in an interactive app for symptom self-management during treatment in patients with breast

or prostate cancer: mixed methods study. J Med Internet Res. 2020;22(8):e17058.
86. Kim HJ, et al. A mobile game for patients with breast cancer for chemotherapy self-management and quality-of-life improvement: randomized controlled trial. J Med Internet Res. 2018;20(10):e273.
87. Petzel SV, et al. Effects of web-based instruction and patient preferences on patient-reported outcomes and learning for women with advanced ovarian cancer: A randomized controlled trial. J Psychosoc Oncol. 2018;36(4):503–19.
88. Voruganti T, et al. My team of care study: a pilot randomized controlled trial of a web-based communication tool for collaborative care in patients with advanced cancer. J Med Internet Res. 2017;19(7):e219.
89. Ye ZJ, et al. Effect of a mentor-based, supportive-expressive program, Be Resilient to Breast Cancer, on survival in metastatic breast cancer: a randomised, controlled intervention trial. Brit J Cancer. 2017;117(10):1486–94.
90. Kim HS, et al. Randomized controlled trial of standardized education and telemonitoring for pain in outpatients with advanced solid tumors. Support Care Cancer. 2013;21:1751–9.
91. Schuurhuizen CS, et al. Screening and stepped care targeting psychological distress in patients with metastatic colorectal cancer: the TES cluster randomized trial. J Natl Compr Canc Netw. 2019;17(8):911–20.
92. Lai-Kwon J, et al. Feasibility, acceptability, and utility of a nurse-led survivorship program for people with metastatic melanoma (MELCARE). Support Care Cancer. 2022;30(11):9587–96.
93. Kim J, Cho CK, Yoo HS. Survival analysis of advanced non-small cell lung cancer patients treated by using wheel balance cancer therapy. Integr Cancer Ther. 2016;15(4):467–77.
94. Schink K, et al. Effects of whole-body electromyostimulation combined with individualized nutritional support on body composition in patients with advanced cancer: a controlled pilot trial. BMC Cancer. 2018;18(1):1–17.
95. Zimmer P, et al. Eight-week, multimodal exercise counteracts a progress of chemotherapy-induced peripheral neuropathy and improves balance and strength in metastasized colorectal cancer patients: a randomized controlled trial. Support Care Cancer. 2018;26:615–24.
96. Lacey J, et al. A supportive care intervention for people with metastatic melanoma being treated with immunotherapy: a pilot study assessing feasibility, perceived benefit, and acceptability. Support Care Cancer. 2019;27:1497–507.
97. Kim J, Cho C-K, Yoo H-S. Survival analysis of advanced non–small cell lung cancer patients treated by using wheel balance cancer therapy. Integr Cancer Ther. 2016;15(4):467–77.
98. Foucre C, et al. Randomized pilot trial using external yarrow liver compress applications with metastatic cancer patients suffering from fatigue: evaluation of sympathetic modulation by heart rate variability analysis. Integr Cancer Ther. 2022;21:15347354221081252.
99. Ghadjar P, et al. External application of liver compresses to reduce fatigue in patients with metastatic cancer undergoing radiation therapy, a randomized clinical trial. Radiat Oncol. 2021;16(1):76.
100. Lin JX, et al. A multidisciplinary team approach for nutritional interventions conducted by specialist nurses in patients with advanced colorectal cancer undergoing chemotherapy: a clinical trial. Medicine. 2017;96(26):e7373.
101. Warth M, et al. Music therapy in palliative care: a randomized controlled trial to evaluate effects on relaxation. Dtsch Arztebl Int. 2015;112(46):788.
102. Hart NH, et al. Unmet supportive care needs of people with advanced cancer and their caregivers: a systematic scoping review. Crit Rev Oncol Hematol. 2022;176:103728–103728.
103. Cheung DST, et al. Patient-centred, self-administered acupressure for Chinese advanced cancer patients experiencing fatigue and co-occurring symptoms: a pilot randomised controlled trial. Eur J Cancer Care (Engl). 2022;31(5):e13314.
104. Jeon JH, et al. A feasibility study of moxibustion for treating anorexia and improving quality of life in patients with metastatic cancer: a randomized sham-controlled trial. Integr Cancer Ther. 2017;16(1):118–25.
105. Kim K, Lee S. Intradermal acupuncture along with analgesics for pain control in advanced cancer cases: a pilot, randomized, patient-assessor-blinded, controlled trial. Integr Cancer Ther. 2018;17(4):1137–43.
106. Guo WC, Wang F. Effect of nerve electrical stimulation for treating chemotherapy-induced nausea and vomiting in patients with advanced gastric cancer: a randomized controlled trial. Medicine. 2018;97(51):e13620.
107. Nakano J, et al. Effects of transcutaneous electrical nerve stimulation on physical symptoms in advanced cancer patients receiving palliative care. Int J Rehabil Res. 2020;43(1):62–8.
108. Zhang MJ, et al. Effect of neuromuscular electrical stimulation for fatigue management in patients with advanced laryngeal cancer receiving chemoradiotherapy. Medicine. 2018;97(28):e11370.
109. Sathian B, et al. Impact of COVID-19 on clinical trials and clinical research: a systematic review. Nepal journal of epidemiology. 2020;10(3):878.
110 SéguinLeclair C, Lebel S, Westmaas JL. The relationship between fear of cancer recurrence and health behaviors: a nationwide longitudinal study of cancer survivors. Health Psychol. 2019;38(7):596.
111. Aapro M, et al. Digital health for optimal supportive care in oncology: benefits, limits, and future perspectives. Support Care Cancer. 2020;28:4589–612.
112. Mollica MA, et al. Survivorship for individuals living with advanced and metastatic cancers: National Cancer Institute meeting report. J Natl Cancer Inst. 2022;114(4):489–95.
113. Hall CC, et al. Combined exercise and nutritional rehabilitation in outpatients with incurable cancer: a systematic review. Support Care Cancer. 2019;27:2371–84.
114. Hart NH, et al. Survivorship care for people affected by advanced or metastatic cancer: MASCC-ASCO standards and practice recommendations. Support Care Cancer. 2024;32(5):313.

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