



Self-management interventions for cancer survivors: a systematic review

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Abstract

Purpose Many cancer survivors experience problems with persisting symptoms such as pain, fatigue, anxiety and depression post-treatment. Self-management interventions are recommended for cancer patients as they can help individuals identify and manage these continuing symptoms. This systematic review examines the type, content and impact of self-management interventions for cancer survivors on health outcomes such as activity participation, self-efficacy, quality of life and symptom management.

Methods This was a systematic review of the English language scientific literature searched for randomised controlled trials (RCT), systematic reviews and meta-analyses of self-management programmes conducted with cancer survivors. Six databases were systematically searched.

Results Initial searches yielded 2633 citations. Following screening and a risk of bias assessment, six studies were included in the final review. Heterogeneity of the interventions precluded meta-analysis. Three studies reported significant differences between groups in a number of areas including fatigue, physical functioning, distress and self-efficacy at their first follow-up assessment. These studies included two psychosocial interventions and one exercise and diet intervention. Not all findings were sustained across studies at follow-up assessment.

Conclusion It is not possible to draw definitive conclusions as to the impact the different types of self-management programme had on cancer survivors. The sustainability of the interventions reviewed was poor, suggesting that cancer survivors require interventions that can be applied into their daily activities.

Keywords Self-management · Cancer survivors · Systematic review

Introduction

The National Cancer Registry of Ireland (NCRI) reported that by the end of 2014, the number of cancer survivors in Ireland was 139,526 [1]. In Ireland, the 5-year survival rate for all invasive cancers in females rose from 52% during the 5-year

period of 1994 to 1999 to 61.5% in 2004 to 2009 [2]. In the male population, greater improvements were seen with survival rates rising from 42% between 1994 and 1999 to 60% from 2004 to 2009. Preventative screening, early diagnosis and widespread treatments have contributed to these increases [2].

As survival rates are increasing, cancer is now regarded as a chronic rather than a fatal condition commonly with persistent symptoms following treatment [3, 4]. Cancer survivors experience symptoms such as fatigue, pain, anxiety and depression post-treatment [5]. Cancer survivors returning to usual roles and routine can experience continuation of these symptoms resulting in social isolation, decreased participation and financial and familial strain [6]. With economic and time constraints affecting the provision of services, it can be difficult for hospital-based services to meet the needs of cancer survivors [7]. Due to these pressures, there is a move towards self-management, although many cancer survivors are unaware of how to manage their continuing symptoms [5].

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Self-management in chronic conditions

Effective self-management provides individuals with the ability to ‘monitor one’s condition and to effect the cognitive, behavioural and emotional responses needed to maintain a satisfactory quality of life’ [8]. It provides knowledge and skills to manage both the physical and psychosocial aspects of chronic illness. Self-management is considered key in bridging the gap between cancer survivors’ needs and the ability of health services to meet those needs [9].

Self-management typically incorporates five core skills of problem-solving, decision-making, resource utilisation, communication with healthcare professionals and action planning or goal setting [10]. It distinguishes itself from traditional health education by its emphasis on the application of these five core self-management skills to one’s own situation [10]. Self-management interventions are considered to be an integral part of cancer treatment as they increase the patient’s knowledge of issues arising post-treatment such as lingering symptoms of fatigue or recurrence anxiety. These interventions enable individuals to implement self-management strategies, thereby reducing levels of distress and encouraging empowerment [11–13]. This shifts the focus on survivors from passive recipient to active participant in managing cancer as a chronic illness [8]. Self-management interventions are often facilitated by health professionals. It is believed that this approach increases adherence due to participants’ confidence in health professionals’ knowledge and the encouragement provided to participants [14].

Despite recommendations to provide cancer survivors with self-management strategies, limited evidence is available regarding self-management interventions with no definitive conclusions of their effectiveness and further research is recommended [15, 16]. The purpose of this research was to systematically review self-management interventions in cancer survivors in relation to the type, content and impact of these interventions compared to usual care on at least one outcome of activity participation, self-efficacy, quality of life and symptom management and on at least one occasion during follow-up.

Methods

The methods are presented according to the PRISMA guidelines [17].

Eligibility criteria

A Population, Interventions, Comparators and Outcomes (PICO) table was created to form inclusion criteria and screen papers based on their title and abstract. Articles were suitable for inclusion if they met the following criteria:

Inclusion criteria

- (i) Randomised controlled trials (RCT) or systematic review/meta-analysis of RCTs
- (ii) Cancer survivors who were aged 18 years or over when diagnosed and completed primary treatments (surgery, chemotherapy and/or radiation therapy)
- (iii) Group, individual and/or online self-management interventions
- (iv) Viable comparison groups including participants randomised to usual care or waiting list control (WLC)
- (v) At least one of the following reported outcomes were measured: activity participation, quality of life, self-efficacy or symptom management

Exclusion criteria

- (i) Non-RCTs or systematic reviews/meta-analysis of non-RCTs
- (ii) Cancer survivors who were diagnosed during childhood or participants who were recently diagnosed or undergoing primary treatments
- (iii) Interventions conducted at the diagnosis or treatment stage or focused on one component e.g. exercise, return to work
- (iv) Studies written in languages other than English

There is no ‘gold standard’ definition for self-management; however, Barlow et al. define it as the ‘individual’s ability to manage the symptoms, treatment, physical and psychosocial consequences and lifestyle changes inherent with living with a chronic condition’ [8]. For this review, studies were included if they contained multi-component interventions aimed at facilitating at least one of five core self-management skills (problem-solving, decision-making, resource utilisation, communication with healthcare professionals and action planning or goal setting).

Search methods:

Search terms were developed in consultation with a medical librarian and applied to the following databases: EMBASE, Scopus, PubMed, CINAHL, PsycINFO and Cochrane. Search terms included ‘self-management’ and ‘self-efficacy’ combined with Boolean terms (and/or) for ‘cancer survivor’. Limitations were employed specific to each database ensuring that only RCTs published in English were included. Appendix A contains examples of two full electronic search strategies for the two databases used.

Study selection

Each study that resulted from the searches was screened for suitability based on their title and abstract by one author (LB). Studies were excluded when it was clear from their title and abstract that the article did not relate to the inclusion criteria. Where there was a lack of clarity from the title and abstract, the full text was obtained to determine its suitability.

Data collection process

A data extraction tool based on the Cochrane Handbook for Systematic Review of Interventions [18] was used by two of the authors (LB, KB) to independently extract data from the included studies with the following information:

- Author, year of publication
- Study design, randomisation, allocation concealment, blinding of participants, outcome assessment, attrition bias, reporting bias and other biases
- Participant numbers, cancer types, country and setting, inclusion and exclusion criteria
- Type of intervention: web-based, group, individual (i.e. face-to-face), content, duration, health professionals as intervention facilitators
- Outcomes—primary and secondary outcomes, follow-up time period

Discrepancies were resolved by discussion between the two reviewers, and a third reviewer was available if they were unresolved.

Risk of bias in individual studies

Two reviewers (LB, KB) assessed risk of bias of each study based on the Cochrane Handbook [18]. This tool assesses bias on random sequence generation, allocation concealment, blinding, incomplete outcome data, selective reporting and other sources of bias. In these studies, the risk of bias for each of these domains was determined to be low, high or unclear. Low indicates the domain was performed adequately, high if inadequately performed and unclear if insufficient information was provided to make a judgement. Disagreements were resolved by discussion between the two reviewers, and a third reviewer was available if they were unresolved.

Results

Study selection

The electronic searches identified 2633 studies (Fig. 1). Upon the removal of duplicates, 2042 citations were screened and

29 citations were retained. Full texts of these articles were obtained. Nine were immediately excluded including seven citations which were conference abstracts, one article was a literature review and one was a systematic review. The remaining 20 articles were assessed for bias. As a result, six articles were eligible for inclusion in the final analysis.

Study characteristics

See Table 1 for an outline of study characteristics of the six studies including location, details of the intervention, participant details (including cancer type), duration and facilitators of the intervention.

Risk of bias in individual studies

A summary of the risk of bias assessment for each study is shown in Fig. 2. Initially, 20 articles were assessed for bias using the RevMan 5.1 Risk of Bias tool. As a result, 14 studies were excluded from the final review for a variety of reasons (Appendix B). The results of the risk of bias of the remaining six articles are displayed as follows in Fig. 2.

Synthesis of results

A meta-analysis of primary and secondary outcomes was planned if sufficient information was available. However, they were differences across the studies in terms of diversity of populations studied, interventions examined, the range of outcomes measures used and follow-up periods. This precluded a statistical synthesis of the included studies' results. Therefore, a narrative summary of the data was carried out. This focused on the nature of the intervention (web-based, group, individual) including content, duration, follow-up, facilitators and the findings from these interventions (Tables 1 and 2).

Content

Table 1 contains detailed information regarding the content of the six interventions. Three out of six studies focused on increasing physical activity [20–22]. Two studies [21, 22] described their exercise interventions which included aerobic and resistance exercise.

Two studies [20, 21] addressed diet. Lee et al. [21] used an online personalised diet programme which involved participants planning their daily caloric requirements in accordance with BMI values, body weight and daily level of activity. Foster et al. [20] did not provide any detailed information regarding the diet content.

Three studies focused on psychosocial adjustment of transition to survivorship [19, 23, 24]. Two studies used workbooks [19, 23] and one used web-based intervention [24].

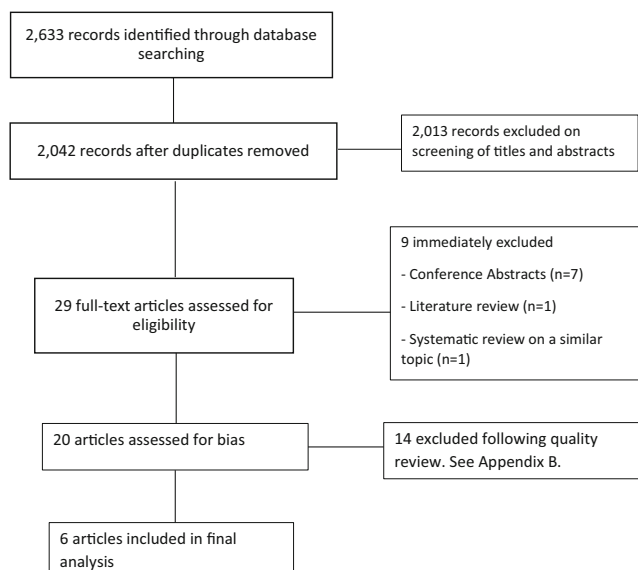


Fig. 1 PRISMA flow chart of the results of the study selection process

Mishel et al. [23] focused on managing recurrence anxiety in long-term breast cancer survivors while Beatty et al. [19] and van den Berg et al. [24] focused on the transition to survivorship for individuals who finished treatment within a year. Both Mishel et al. [23] and Beatty et al. [19] provided participants with relaxation tapes and education on long-term physical and psychosocial issues (see Table 1).

Foster et al. [20] provided self-management skills to long-term cancer survivors to help manage cancer-related fatigue and was the only study that allowed participants to choose the topics to cover over the 6-week intervention.

All six interventions incorporated goal setting i.e. encouraging participants to incorporate the information obtained into achieving personal goals and behavioural changes through the use of assignments or ‘homework’ (see Table 1).

Impact of interventions

Out of the six studies, three [21, 23, 24] demonstrated statistically significant differences between the control and intervention groups at their first follow-up assessment (Table 2). Outcome measures varied between the three interventions as did their results with significant improvements noted in several areas including cognitive reframing, cancer knowledge, social support satisfaction [23] dietary quality, fatigue severity, appetite loss [21] distress, fear of cancer recurrence and self-efficacy [24] (Table 2). Two of these three interventions contained some form of involvement from health professionals [21, 23]. The workbook-based intervention by Mishel et al. [23] involved four weekly phone calls by nurses to guide participants through the intervention. The

involvement of health professionals by Lee et al. [21] was minimal in that a nutritionist contacted participants to ensure food records were being maintained properly, but it is unclear how often this was done. The two web-based interventions lasted 12 weeks [21] and 16 weeks [24] respectively in comparison to the 4-week duration of the workbook-based intervention by Mishel et al. [23].

Of the three studies with significant differences between the control and intervention groups, only one study reported significant differences at longitudinal follow-up. Van den Berg et al. [24] conducted longitudinal follow-up at 6 and 10 months post-intervention. Fear of cancer recurrence was the only significant improvement sustained in the intervention group at the 6-month follow-up. This significant improvement was not sustained at the 10-month follow-up, and no other significant differences between groups were found. Mishel et al. [23] assessed the sustainability of their intervention with a 10-month longitudinal follow-up. This was to allow participants time to identify and experience triggers of cancer recurrence and use the strategies provided. Several significant differences were noted in the intervention group compared to the control group in areas such as cognitive reframing, cancer knowledge and social support satisfaction (Table 2). Lee et al. [21] did not conduct longitudinal follow-up limiting the ability to assess the sustainability of their intervention.

Two studies with no statistically significant between-group differences reported significant within-group differences post-intervention. In their small study, Beatty et al. [19] reported significant improvements from baseline for both the control and intervention groups in venting emotions and cognitive functioning post-intervention. May et al. [22] reported significant improvements in physical activity and quality of life within the physical therapy group and the physical therapy and cognitive behavioural therapy group post-intervention. Both studies lasted 12 weeks. Beatty et al. [19] included only breast cancer survivors while May et al. [22] included mixed cancer diagnoses.

Both studies conducted longitudinal follow-up assessments. Beatty et al. [19] conducted follow-up at 6 months post-intervention. The improvements within both groups in venting emotions and cognitive functioning were no longer significant, and no other significant results were reported. In comparison, May et al. [22] reported sustained significant post-intervention improvements in physical activity and quality of life at 3- and 9-month follow-up within both groups.

The only study to report non-significant differences within or between groups was Foster et al. [20]. This study reported non-significant improvements following the 6-week intervention and at the 12-week follow-up.

Table 1 Characteristics of included studies

Study name and country	Participants	Sample size, gender, intervention vs control	Intervention, length	Intervention facilitators	Format	Programme details
Beatty et al. (2010) [19], Australia	Breast, women who had completed treatment within the past 3 months Mean age 53.05 SD 11.44	<i>n</i> = 40 Female 40 Intervention: <i>n</i> = 20, Control: <i>n</i> = 20	Self-guided workbook, 12 weeks	No health professional involvement	Workbook sent to participants.	Focused on facilitating breast cancer survivors' transition from treatment to survivorship Based on 3 major components: education on common medical and psychosocial issues, suggestions and worksheets to address these issues, survivor stories Relaxation and meditation tape provided to all programme participants
Foster et al. (2016) [20], England	Mixed cancers, survivors 5 years or less post-diagnosis with self-reported moderate to severe levels of fatigue Mean age 57.8 SD 9.95	<i>n</i> = 159 Male 37 Female 122 Intervention: <i>n</i> = 83 Control: <i>n</i> = 76	Self-guided web-based intervention, 6 weeks	No health professional involvement	5 topics in total, each session delivered weekly online	RESTORE, a fatigue management web-based programme; 5 educational topics accessible over a 6-week period First 2 sessions introduce cancer-related fatigue (CRF) and goal setting. Participants could choose to complete all 3 remaining topics or focus on one of those topics for the remaining 3 weeks These topics included (i) diet, exercise, sleep, home and work life; (ii) thoughts and feelings; and (iii) talking to others Topics incorporated CBT and self-management skills. Goal setting implemented throughout
Lee et al. (2014) [21], South Korea	Breast, women who completed primary treatment within 12 months prior to the study Mean age 42.35 SD 5.7	<i>n</i> = 59 Female = 59 Intervention: <i>n</i> = 30 Control: <i>n</i> = 29	Self-guided web-based intervention, 12 weeks	Nutritionist contacted participants in intervention group to ensure food diaries were recorded correctly—unclear how often participants contacted	Group members encouraged to use the programme weekly through automated messaging	Participants encouraged to plan their exercise and dietary behaviours in line with current guidelines Educational sessions included considerations when planning exercise and diet and barriers to sustainability of same Participants kept a web-based diary throughout recording daily exercise and number of units of each food group consumed. This information provided daily feedback to participants on their goal achievements.
May et al. (2009) [22], Netherlands	Mixed cancers, last curative treatment completed 3 months before study entry Mean age 48.8 SD 10.9	<i>n</i> = 147 Male 24 Female 123 PT and CBT: <i>n</i> = 76 PT: <i>n</i> = 71	Face-to-face, individual and group-based; physical training (PT) and cognitive behavioural training (CBT), 12 weeks	PT guided by 2 physiotherapists, CBT facilitated by a psychologist and a social worker	PT group—12 weeks, twice weekly, 2-h group sessions PT and CBT = same PT programme but CBT was weekly, 2-h group sessions	PT group: personalised exercise programme including aerobic bicycle and muscle strength training followed by group sports (badminton, soccer, swimming or balancing games) CBT group: educational sessions on a number of topics including stress, fatigue, exercise and relaxation CBT group assignments provided to facilitate application of self-management skills in

Table 1 (continued)

Study name and country	Participants	Sample size, gender, intervention vs control	Intervention, length	Intervention facilitators	Format	Programme details
Mishel et al. (2005) [23], USA	Breast, women who were 5–9 years post-treatment, stages I–III Mean age 64 SD 8.9	<i>n</i> = 509 Women = 509 Intervention: <i>n</i> = 244 Control: <i>n</i> = 265	Workbook sent to participants, 4 weeks	Nurses	Intervention nurses conducted weekly phone calls for 4 weeks	everyday life using goal setting and problem-solving Workbook addressed recurrence anxiety of cancer survivors. Nurses trained in the intervention guided participants through the workbook for 4 weeks Workbook contained behavioural strategies to develop self-management skills and information on long-term treatment side effects. Audiotape provided to teach coping responses such as relaxation and visual imagery to triggers of cancer recurrence
van den Berg et al. (2015) [24], Netherlands	Breast, survivors who had finished treatment 2 to 4 months pre-baseline Mean age 50.81 SD 8.7	<i>n</i> = 150 Female 150 Intervention: <i>n</i> = 70 Control: <i>n</i> = 80	Self-guided web-based intervention, 16 weeks	No health professional involvement	New material released weekly followed by e-mail reminders	BREATH, web-based programme guided by CBT Aim was to enable breast cancer survivors to take control of and adjust to survivorship Content based on 4 phases of adjustment to breast cancer: looking back, emotional processing, strengthening and looking ahead. Participants required to complete assignments, assessments and videos

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias
Beatty 2010	+	+	+	+	+	+	?
Foster 2015	+	+	+	+	?	+	?
Lee 2014	+	+	+	+	+	+	+
May 2009	+	?	+	+	+	+	+
Mishel 2005	+	?	+	+	+	+	+
Van den Berg 2015	+	?	+	+	+	+	+

Fig. 2 Risk of bias summary: authors' judgements about each risk of bias item for the six included studies

Discussion

The findings highlight the diversity of self-management interventions for cancer survivors, both in format and content, currently available in the published literature. Therefore, it was difficult to provide a conclusive summary of what constitutes a self-management intervention. In addition, the findings of the review highlight the lack of sustainability of self-management interventions.

The content of the six included interventions varied considerably. This may reflect the uncertainty in relation to the most important components and what constitutes a self-management intervention [8]. For example, the impact of exercise on improving fatigue and anxiety in cancer survivors is well documented [25, 26]. However, only three of the six studies [20–22] addressed physical activity. Both Lee et al. [21] and May et al. [22] reported significant improvements in physical activity in their respective studies indicating that this may be one aspect of a self-management programme that participants follow through on.

In relation to content of self-management interventions, diet is considered an important factor to help reduce recurrence [27]. However, only two of the six studies [20, 21] included diet in their intervention. In their study, Lee et al. [21] reported a significant improvement in dietary quality in the intervention group post-intervention. Evidence suggests that interventions targeting specific outcomes generally result

in significant benefits [28]. All six studies targeted specific outcomes including exercise, diet, anxiety, depression, coping and quality of life, and significant results were reported post-intervention in five of these six studies. One study reported non-significant effects in their targeted outcomes [20]. However, in this study, participants in the intervention group were given the choice of whether to cover diet and exercise topics which may have affected their outcomes.

Of the three interventions that produced significant between-group differences at their first follow-up assessment, two addressed psychosocial issues [23, 24] including anxiety and depression. This is reflective of the findings of Howell et al. [28] who in their systematic review reported that self-management education may be beneficial for relieving symptoms of anxiety and depression. A significant amount of literature on the emotional impact of cancer is focused on the diagnosis and treatment stage, while less is known about the survivorship stage [29]. Additionally, in the survivorship stage, physical issues are more widely discussed than psychosocial issues [30]. The findings from our study indicate that there is a clear need to address the emotional impact of cancer post-treatment and self-management may play a key role, thus improving quality of life.

Goal setting was one element of self-management interventions evident across all the six studies. Participants were provided with 'homework' or assignments to facilitate goal setting. This allowed participants to incorporate the information received into their daily routine, thus promoting behavioural changes and encouraged adherence to the interventions [31]. This appears to be a consistent inclusion in self-management interventions.

Two studies that produced significant post-intervention results were both web-based interventions of long duration [21, 24]. This reflects the change of focus in recent years to utilising technology to provide health interventions. The remaining web-based intervention by Foster et al. [20] which lasted 6 weeks was affected by a high attrition rate and did not report any significant differences for any outcomes. This suggests that longer-duration web-based interventions may result in participants embedding self-management knowledge and skills into their daily activities. It is important to note that Lee et al. [21] and van den Berg et al. [24] conducted many statistical tests which may have increased the chance of a type 1 error i.e. identifying a false positive. This may have led to misleading conclusions whereby some of the significant effects of the intervention on outcomes were not true effects but chance findings [32]. Multiple testing increases the chances of detecting effects of interventions just by chance [33].

Although only 4 weeks in duration, a workbook-based intervention delivered by nurses [23] reported statistically significant improvements in the intervention group compared to the control group. In comparison, the other workbook-based intervention by Beatty et al. [19] was 12 weeks in duration,

Table 2 Reported outcomes of included studies, post-intervention and follow-up

Study name	Type of study, length	Outcome measures	Immediate post-intervention results	Longitudinal follow-up	Follow-up results
Beatty et al. (2010) [19]	2-arm RCT: workbook intervention vs usual care, 12 weeks	Coping Operations Preference Enquiry (COPE), EORTC-QLQ-C30	No significant time-by-group interactions; significant improvements within group in venting emotions ($p = 0.034$) and cognitive functioning ($p = 0.042$)	6 months	No significant time-by-group interactions; significant improvements within group in venting emotions and cognitive functioning not maintained
Foster et al. (2016) [20]	2-arm RCT: web-based intervention vs leaflet, 6 weeks	Perceived self-efficacy for fatigue self-management, cancer survivors' self-efficacy scale, Functional Assessment of Cancer Therapy (FACT-G), Personal Wellbeing Index, Patient Health Questionnaire, Brief Fatigue Inventory (BFI)	No significant differences between groups noted; near-significant improvement between groups in fatigue self-efficacy ($p = 0.09$)	12 weeks	No significant differences between groups noted; between-group difference in fatigue self-efficacy decreased becoming negligible
Lee et al. (2014) [21]	2-arm RCT: web-based intervention vs 50-page educational booklet, 12 weeks	Exercise and intake of fruit and veg, Dietary Quality Index, EORTC-QLQ-C30, HADS, Brief Fatigue Inventory (BFI) Stage of Change Perceived Self-Efficacy	Significant increases for the intervention group compared to control in moderate aerobic exercise ($p < 0.0001$), eating five servings of fruit and vegetables per day ($p = 0.0001$), dietary quality ($p = 0.001$), self-efficacy for exercise management ($p = 0.024$) and in self-efficacy to increase fruit and vegetable intake ($p = 0.023$); significant improvements reported for the intervention group compared to control in fatigue severity ($p = 0.032$), physical functioning ($p = 0.023$) and appetite loss ($p = 0.034$)	No longitudinal assessment carried out	N/A
May et al. (2009) [22]	2-arm RCT: physical therapy vs physical therapy and cognitive behavioural therapy (CBT), 12 weeks	EORTC-QLQ-C30, Physical Activity Scale for the Elderly (PASE)	No statistically significant difference between the two groups; statistically significant improvements in quality of life (QOL) ($p < 0.001$) and physical activity ($p < 0.05$) was found within both groups	3, 9 months	No statistically significant differences between groups; statistically significant improvements in QOL ($p < 0.001$) physical activity ($p < 0.05$) within both groups sustained at 3 and 9 months
Mishel et al. (2005) [23]	2-arm RCT: workbook intervention vs usual care, 4 weeks	Cancer Survivor Knowledge Scale, 5-item Patient/Provider Communication Scale Social Support Questionnaire, Cognitive Reframing Subscale of the Self-control Schedule, Cognitive Coping Strategies Questionnaire Total Information Received and Helpfulness of the Information 25-item measure, Profile of Mood States-Short Form	No immediate post-intervention assessment carried out	10 months	Significant increases for the intervention group compared to control in cognitive reframing ($p = 0.01$), cancer knowledge ($p = 0.001$), social support satisfaction ($p = 0.029$), information received ($p = 0.001$) and helpfulness of information ($p = 0.001$)

Table 2 (continued)

Study name	Type of study, length	Outcome measures	Immediate post-intervention results	Longitudinal follow-up	Follow-up results
van den Berg et al. (2015) [24]	2-arm RCT: web-based intervention vs usual care, 16 weeks	Symptoms Checklist-90 (SCL-90), Cancer Empowerment Questionnaire, HADS, EORTC-QLQ-C30, Breast Cancer Module (QOL), Distress Thermometer, Illness Cognitions Questionnaire, Remoralization Scale, Master scale, Positive Adjustment Questionnaire (PAQ), Impact of Event Scale, Self-efficacy Scale, Cancer Worry Scale (CWS), Cancer Acceptance Scale (CAS), Checklist Individual Strength - Fatigue, Openness to Discuss Hereditary Cancer in the Family Scale Big Five Inventory, Trimbos/iMTA questionnaire	Significant differences between groups observed; intervention group reported significantly less distress ($p < 0.05$) than the control group. Intervention group reported significant improvements in 8 of the secondary measures compared to control; general distress ($p < 0.05$), fatigue ($p < 0.05$), fear of recurrence ($p < 0.001$, $p < 0.05$), cancer-specific distress ($p < 0.01$), general self-efficacy ($p < 0.05$), general remoralisation ($p < 0.01$) and cancer-specific new ways of living ($p < 0.05$)	6, 10 months	Only one significant time-by-group interaction at 6 months reported in the intervention group in fear of cancer recurrence ($p = 0.005$) No significant differences between groups reported in any study measures at 10 months

with no health professional involvement. Beatty et al. [19] did not report any significant differences between groups immediately post-intervention or at longer-term follow-up. However, the findings in Beatty et al. [19] were limited by a small sample size ($n = 40$).

On reviewing the impact of health professional involvement in self-management interventions, no clear conclusions can be made based on the studies from this review. Of the six studies, three interventions had some involvement by health professionals [21–23] which varied from full facilitation of the intervention [22] to minimum telephone contact with participants [21, 23]. Two of these studies reported significant differences between the intervention and control groups [21, 23]; however, both studies used different delivery methods. Of the three remaining studies with no health professional involvement [19, 20, 24], one of these studies using a web-based intervention [24] reported significant differences between the intervention and control groups. Based on these six studies, it is therefore not possible to conclude whether the involvement of health professionals contributes to any improvement in adherence to self-management strategies. To establish this, studies are required comparing the outcomes of a self-management intervention with two groups, one of which is facilitated by a health professional.

The lack of consensus on the format and content of self-management interventions made it difficult to review and provide definitive recommendations on preferred self-management interventions for cancer survivors. This has been reported in previous systematic reviews. Coffey et al. [34] conducted a meta-synthesis of qualitative studies exploring cancer survivors' experiences of self-management interventions. The authors reported difficulties in selecting studies for inclusion due to the lack of a 'gold-standard' definition. Similarly, Howell et al. [28] were unable to conduct a meta-analysis to identify the essential components of self-management education due to the variety of interventions and outcome measures used in their included studies.

Conducting longitudinal follow-up is important to determine if interventions can sustain their effectiveness [35]. Mishel et al. [23] and van den Berg et al. [24] conducted longitudinal follow-ups to assess sustainability of their interventions. Mishel et al. [23] conducted their first follow-up assessment 10 months post-intervention, but not at earlier time points when the impact of the intervention may have been more evident. Van den Berg et al. [24] conducted follow-up assessments at 6 months with one significant improvement in fear of cancer recurrence sustained in the intervention group. However, this was not sustained at the 10-month follow-up and no other significant improvements were noted. It appears that the authors were unable to demonstrate sustainability of the self-management interventions over a long period of time. Self-management is considered a lifelong task; therefore, it may be unrealistic to expect a self-management programme

for cancer survivors to sustain these benefits on a long-term basis [10]. Additionally, the mean age of participants ranged from 42 to 64 years [21, 23] which could be a time when other chronic diseases are developing either due to cancer treatments or for other reasons [27]. Therefore, life demands are changing which can result in participants needing different self-management strategies to manage these changes. Reiteration of these interventions may be required to provide participants with the skills to self-manage their chronic diseases in addition to post-cancer issues.

Limitations

Due to the heterogeneity in the study populations and types of interventions included in the six studies, it was not possible to conduct a meta-analysis which may have provided a statistical measure of the impact of self-management interventions with cancer survivors.

Further limitations of this review are the inclusion of RCTs in English only as part of the search strategy which reduces the opportunity to evaluate studies not reported in English. A small number of studies were included in the final review, so these findings should be interpreted with caution. The lack of a ‘gold standard’ definition of self-management and the differing viewpoints on what constitutes a self-management intervention made the initial study screening process difficult [8]. This was overcome, in part, by keeping self-management terms broad in the literature search.

Conclusion

Due to the diversity in the focus of the interventions, their delivery methods, the period of interventions and the presence or absence of facilitators of the interventions, limited recommendations can be made from this systematic review regarding optimal self-management interventions for cancer survivors. Lack of sustainability of the effectiveness of the six included self-management interventions is an issue raising questions on the long-term impact and cost-effectiveness of self-management interventions. A standardised definition of self-management is also needed which may help to ascertain which core components of self-management interventions are effective for improving health outcomes such as activity participation, self-efficacy, quality of life and symptom management in cancer survivors. Finally, further research is needed to determine if self-management interventions facilitated by health professionals result in more significant and sustainable outcomes than interventions with no health professional involvement.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval This article does not contain any studies with human participants performed by any of the authors.

References

1. National Cancer Registry Ireland (NCRI) (2016) Cancer in Ireland 1994–2014. National Council Registry Ireland, Cork
2. National Cancer Registry Ireland (NCRI) (2013) Cancer in Ireland: annual report of the National Cancer Registry Ireland. National Cancer Registry, Cork
3. Centers for Disease Control and Prevention (CDC) & Lance Armstrong Foundation (LAF) (2004) A national action plan for cancer survivorship: advancing public health strategies. CDC, Atlanta, GA
4. Hewitt M, Greenfield S, Stovall E (2005) From cancer patient to cancer survivors: lost in transition. National Academies Press, Washington, DC
5. Shneerson C, Taskila T, Holder R, Greenfield S, Tolosa I, Damery S, Gale N (2015) Patterns of self-management practices undertaken by cancer survivors: variations in demographic factors. *Eur J Cancer Care* 24(5):683–694. <https://doi.org/10.1111/ecc.12252>
6. Foster C, Fenlon D (2011) Recovery and self-management support following primary cancer treatment. *Br J Cancer* 105(S1):S21–S28. <https://doi.org/10.1038/bjc.2011.419>
7. Naidoo J, Hayes E, Teo MY, Horgan A, Calvert P, O’Connor M (2013) An Irish breast cancer survivorship study: are we meeting our patient’s needs? *Ir Med J* 106(9):262,264–262,266
8. Barlow J, Wright C, Sheasby J, Turner A, Hainsworth J (2002) Self-management approaches for people with chronic conditions: a review. *Patient Educ Couns* 48(2):177–187. [https://doi.org/10.1016/S0738-3991\(02\)00032-0](https://doi.org/10.1016/S0738-3991(02)00032-0)
9. McCorkle R, Ercolano E, Lazenby M, Green DS, Schilling LS, Lorig K, Wagner EH (2011) Self-management: enabling and empowering patients living with cancer as a chronic illness. *CA Cancer J Clin* 61(1):50–62
10. Lorig KR, Holman HR (2003) Self-management education: history, definition, outcomes and mechanisms. *Ann Behav Med* 26(1):1–7. https://doi.org/10.1207/S15324796ABM2601_01
11. Purcell A, Fleming J, Burmeister B, Bennett S, Haines T (2011) Is education an effective management strategy for reducing cancer-related fatigue? *Support Care Cancer* 19(9):1429–1439. <https://doi.org/10.1007/s00520-010-0970-2>
12. Schjolberg TKR, Dodd M, Henriksen N, Asplund K, Smastuen MC, Rustoen T (2014) Effects of an educational intervention for managing fatigue in women with early stage breast cancer. *Eur J Oncol Nurs* 18(3):286–294. <https://doi.org/10.1016/j.ejon.2014.01.008>

13. Cheville AL, Shen T, Chang M, Basford JR (2013) Appropriateness of the treatment of fatigued patients with stage IV cancer. *Support Care Cancer* 21(1):229–233. <https://doi.org/10.1007/s00520-012-1515-7>
14. Meneses-Echávez JF, González-Jiménez E, Ramírez-Vélez R (2015) Effects of supervised exercise on cancer-related fatigue in breast cancer survivors: a systematic review and meta-analysis. *BMC Cancer* 15(1):77. <https://doi.org/10.1186/s12885-015-1069-4>
15. Gao WJ, Yuan CR (2011) Self-management programme for cancer patients: a literature review. *Int Nurs Rev* 58(3):288–295. <https://doi.org/10.1111/j.1466-7657.2011.00907.x>
16. Hammer MJ, Ercolano EA, Wright F, Dickson VV, Chyun D, Melkus GD (2015) Self-management for adult patients with cancer an integrative review: an integrative review. *Cancer Nurs* 38(2):E10–E26. <https://doi.org/10.1097/NCC.0000000000000122>
17. Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009) Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Ann Intern Med* 151(4):264–269
18. Higgins JPT, Green S (Eds) (2011) *Cochrane handbook for systematic reviews of interventions version 5.1.0 [updated March 2011]*. The Cochrane Collaboration, 2011. Available from www.handbook.cochrane.org. Accessed March 21st 2017
19. Beatty L, Oxlad M, Koczwara B, Wade TD (2010) A randomised pilot of a self-help workbook intervention for breast cancer survivors. *Support Care Cancer* 18(12):1597–1603. <https://doi.org/10.1007/s00520-010-0962-2>
20. Foster C, Grimmett C, May CM, Ewing S, Myall M, Hulme C, Smith PW, Powers C, Calman L, Armes J, Breckons M, Corner J, Fenlon D, Batehup L, Lennan E, Mary CR, Morris C, Neylon A, Ream E, Turner L, Yardley L, Richardson A (2016) A web-based intervention (RESTORE) to support self-management of cancer-related fatigue following primary cancer treatment: a multi-centre proof of concept randomised trial. *Support Care Cancer* 24(6):2445–2453. <https://doi.org/10.1007/s00520-015-3044-7>
21. Lee MK, Yun YH, Park H-A, Lee ES, Jung KH, Noh D-Y (2014) A web-based self-management exercise and diet intervention for breast cancer survivors: pilot randomised controlled trial. *Int J Nurs Stud* 51(12):1557–1567. <https://doi.org/10.1016/j.ijnurstu.2014.04.012>
22. May AM, Korstjens I, van Weert E, van den Borne B, Hoekstra-Weebers JEHM, van der Schans CP, Mester I, Passchier J, Grobbee DE, Ros WJG (2009) Long-term effects on cancer survivors' quality of life of physical training versus physical training combined with cognitive-behavioural therapy: results from a randomized trial. *Support Care Cancer* 17(6):653–663. <https://doi.org/10.1007/s00520-008-0519-9>
23. Mishel MH, Germino BB, Gil KM, Belyea M, Laney IC, Stewart J, Porter L, Clayton M (2005) Benefits from an uncertainty management intervention for African-American and Caucasian older long-term breast cancer survivors. *Psychooncology* 14(11):962–978. <https://doi.org/10.1002/pon.909>
24. Van den Berg S, Gielissen MFM, Custers JAE, van der Graaf WTA, Ottevanger PB, Prins JB (2015) BREATH: web-based self-management for psychological adjustment after primary breast cancer—results of a multicenter randomized controlled trial. *J Clin Oncol* 33(25):2763–7123. <https://doi.org/10.1200/JCO.2013.54.9386>
25. Blacklock R, Rhodes R, Blanchard C, Gaul C (2010) Effects of exercise intensity and self-efficacy on state anxiety with breast cancer survivors. *Oncol Nurs Forum* 37(2):206–212. <https://doi.org/10.1188/10.ONF.206-212>
26. Buffart LM, Ros WJG, Chinapaw MJM, Brug J, Knol DL, Korstjens I, Van Weert E, Mesters I, Van Den Borne B, Hoekstra-Weebers JEHM, May AM (2014) Mediators of physical exercise for improvement in cancer survivors' quality of life. *Psychooncology* 23(3):330–338. <https://doi.org/10.1002/pon.3428>
27. Anderson AS, Steele R, Coyle J (2013) Lifestyle issues for colorectal cancer survivors—perceived needs, beliefs and opportunities. *Support Care Cancer* 21(1):35–42. <https://doi.org/10.1007/s00520-012-1487-7>
28. Howell D, Harth T, Brown J, Bennett C, Boyko S (2017) Self-management education for patients with cancer: a systematic review. *Support Care Cancer* 25(4):1323–1355. <https://doi.org/10.1007/s00520-016-3500-z>
29. Philip EJ, Merluzzi TV, Zhang Z, Heitzmann CA (2013) Depression and cancer survivorship: importance of coping self-efficacy in post-treatment survivors. *Psychooncology* 22(5):987–994. <https://doi.org/10.1002/pon.3088>
30. Foster C, Wright D, Hill H, Hopkinson J, Roffe L (2009) Psychosocial implications of living 5 years or more following a cancer diagnosis: a systematic review of the research evidence. *Eur J Cancer Care* 18(3):223–247. <https://doi.org/10.1111/j.1365-2354.2008.01001.x>
31. Forrest C (2011) Setting goals with patients to promote behavioural change. *Ind Nurse* 38-39
32. Kim TK (2017) Understanding one-way ANOVA using conceptual figures. *Korean J Anesthesiol* 70(1):22–26. <https://doi.org/10.4097/kjae.2017.70.1.22>
33. Ranganathan P, Pramesh CS, Buyse M (2016) Common pitfalls in statistical analysis: the perils of multiple testing. *Perspect Clin Res* 7(2):106–107. <https://doi.org/10.4103/2229-3485.179436>
34. Coffey L, Mooney O, Dunne S, Sharp L, Timmons A, Desmond D, O'Sullivan E, Timon C, Gooberman-Hill R, Gallagher P (2016) Cancer survivors' perspectives on adjustment-focused self-management interventions: a qualitative meta-synthesis. *J Cancer Surviv* 10(6):1012–1034. <https://doi.org/10.1007/s11764-016-0546-3>
35. Stirman SW, Kimberly J, Cook N, Calloway A, Castro F, Charns M (2012) The sustainability of new programs and innovations: a review of the empirical literature and recommendations for future research. *Implement Sci* 7(1):17. <https://doi.org/10.1186/1748-5908-7-17>