

REVIEW ARTICLE (META-ANALYSIS)

Community-Based Exercise Programs for Cancer Survivors: A Scoping Review of Program Characteristics Using the Consolidated Framework for Implementation Research



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Abstract

Objective: To describe the characteristics of exercise programs for survivors of cancer conducted outside of a research laboratory (ie, home-based or community-based settings).

Data Sources: A systematic search of published literature was conducted using Medline, Pubmed, Cumulative Index of Nursing and Allied Health Literature, PsycINFO, SPORTdiscus, and Embase from 1980 to January 2021. Where conference abstracts were identified, authors were contacted for other articles.

Study Selection: Two independent reviewers screened titles and abstracts and full texts of potentially relevant studies to determine eligibility, with discrepancies resolved by discussion. Included studies were reports of exercise programs or interventions in which participants exercise at home or in a community-based setting and including individuals diagnosed with cancer either undergoing treatment or who had completed treatment.

Data Extraction: Data were extracted using the Oxford Implementation Index and coded under the 5 domains of the Consolidated Framework for Implementation Research (CFIR). Extraction and coding were completed by 2 independent reviewers, with discrepancies resolved through discussion. Data were synthesized narratively according to CFIR.

Data Synthesis: A total of 58 publications describing 34 individual programs from around the world were included. Of these, only 14 publications had the specific goal of reporting on program implementation and development. A variety of intervention characteristics and characteristics of individuals involved in the intervention were described. Reporting of factors related to the CFIR domains of inner setting, outer setting, and implementation process were minimal.

Conclusions: This review summarizes the characteristics of existing programs that have been reported in the literature and finds that partnerships and collaboration occur in the inner and outer settings and as part of the process of implementation. This review highlights key knowledge gaps to be answered to support the development of future community-based interventions.

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Exercise is recommended as an intervention to help manage side effects of cancer and its treatment both during the active treatment

phase (ie, chemotherapy, radiation) and into the posttreatment phase.¹ Evidence from randomized controlled trials conducted within research settings has shown the efficacy of exercise in reducing fatigue, improving cardiovascular fitness and muscular strength, and improving quality of life in individuals diagnosed with cancer.^{2–4} Building on evidence from randomized controlled

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trials, a number of guidelines have been published from both exercise-focused organizations^{5,6} and clinical oncology associations^{7,8} to support the role of exercise for survivors of cancer (defined from the point of diagnosis until the end of life⁹). In light of these calls to action, there is a need to translate exercise programming beyond controlled settings and into the community to truly improve cancer survivors' health and well-being.^{10,11}

Many barriers exist to exercise program implementation in community settings.¹¹ The purpose of an efficacy study is to determine whether the specified intervention (ie, exercise) has a statistically significant effect on a specified outcome; however, these studies often provide little information on optimal design features of such interventions when applied in real-world settings. Implementing a new program is resource intensive, and it may be useful to learn from programs that have been previously implemented. To date, several examples of community-based programs for cancer survivors have been reported in the literature; however, a synthesis of factors influencing implementation has yet to be conducted. As the field aims to move research into practice, there is an opportunity to learn from practice-based evidence from real-world programs.^{12,13}

Within the field of implementation science (or knowledge translation science) a number of theories, models, and frameworks exist to inform determinants of implementation and the process of implementation and to evaluate the effectiveness of implementation.¹⁴ The Consolidated Framework for Implementation Research (CFIR) is an example of a widely used determinants framework by which implementation can be understood.¹⁵ The CFIR is a comprehensive, multilevel taxonomy of evidence-based constructs that influence implementation. The CFIR organizes 39 constructs into 5 major domains: (1) intervention characteristics; (2) characteristics of individuals involved; (3) outer setting (ie, external factors that may influence intervention implementation); (4) inner setting (ie, characteristics of the organization implementing the intervention); and (5) the process of implementation. The CFIR has been used across a wide range of settings and with various populations (eg, to understand implementation characteristics in a balance training program for people with Parkinson disease,¹⁶ in school-based physical activity programs,¹⁷ and in a community-based cancer prevention intervention¹⁸); however, a summary of these characteristics related to community-based exercise programs for survivors of cancer has not been conducted. As such, the purpose of this scoping review is to describe the characteristics of exercise interventions conducted outside of a research laboratory or hospital setting (ie, home-based or community-based settings) that have been reported in the literature using the CFIR. These findings may be useful to help both researchers and practitioners identify potential strategies for future implementation of community-based exercise programs for survivors of cancer.

Methods

The scoping review is reported according to the Preferred Reporting Items for Systematic Reviews and Meta Analyses statement extension for scoping reviews.¹⁹ An original protocol for a systematic review was registered in the PROSPERO database on

September 2017 (CRD42017074002). Owing to the limited and heterogeneous literature found in our search, after registration, a decision was made to follow a protocol for a scoping review,²⁰ because this was better suited to report on implementation characteristics across a wide range of study designs. As a result, a risk of bias assessment of included studies was not performed. Although systematic reviews are a widely used and accepted methodology to answer clinically relevant questions related to feasibility, efficacy, or effectiveness, the scoping review is a relatively new methodology.²¹ A scoping review is indicated when there is a need to identify and map the available evidence, examine how research has been conducted, and identify important knowledge gaps in a field.²² Although scoping reviews are often precursors to future systematic reviews, they usually do not answer questions related to what the best practice is. A secondary objective of our registered review was to explore whether specific implementation characteristics were associated with program effectiveness. Because of the specific study design used and nature of the data reported within the included studies, we were unable to identify programs that we could confidently deem effective. Thus, we were unable to address this secondary objective in the current review. All other specifications from our registration were followed.

Search strategy and selection

Per our published protocol, 6 electronic databases (Medline, Pubmed, Cumulative Index of Nursing and Allied Health Literature, PsycINFO, SPORTdiscus, Embase) were systematically searched using a search strategy developed with input from the coauthors and in consultation with a librarian with expertise in knowledge syntheses. The search combined terms relevant to exercise or physical activity, cancer, and home- or community-based programs (appendix 1). Search results were limited to studies written in the English language in peer-reviewed journals, published between January 1980 and January 2021. Reference lists of key systematic reviews and/or meta-analyses identified through the search were hand-searched to identify additional publications.

To be eligible for inclusion, studies had to target male or female survivors of cancer over the age of 18 years and report on a community-based exercise program that aimed to help cancer survivors meet published physical activity guidelines (eg, aerobic or resistance training, walking in an individual or group-based setting).^{5,8} Studies that focused on alternative or low-intensity activity such as yoga or Tai Chi, as well as therapeutic (eg, shoulder rehabilitation for lymphedema) interventions were excluded. We defined a community-based program as one that (1) was conducted outside of an exclusively research setting (ie, not conducted solely for research purposes) and (2) included supervised or unsupervised exercise that could be completed by participants on their own or in a group, in any setting outside of an inpatient or outpatient hospital setting, including at home. No restrictions were applied based on study design or program duration.

Bibliographic records from each database were uploaded into the Covidence systematic review management software^a and duplicates were removed. Two reviewers (S.N.S., J.S.T., A.F., and K.K.) independently screened the title and abstract of each reference to determine potential eligibility. The full text of studies passing the initial screening level were examined by 2 independent reviewers to verify eligibility (S.N.S., J.S.T., A.F., and K.K.). Discrepancies were resolved through discussion and consensus. Where conference abstracts were identified without full text

List of abbreviations:

CFIR Consolidated Framework for Implementation Research

articles, authors were contacted for additional publications. Conference abstracts alone were excluded because the lack of information that could be extracted.

Data extraction

Data were extracted using Covidence. The data extraction form was piloted independently by 2 reviewers (S.N.S., J.S.T., and A.F.) and revised prior to full extraction of included studies. All data were extracted independently by 2 reviewers (S.N.S., J.S.T., and A.F.). Any notable discrepancies were resolved through discussion and consensus.

The following data were extracted from each eligible study using the Oxford Implementation Index, a previously developed tool designed to guide the extraction of implementation data from primary studies.²³ Specifically, data related to (1) study identification (ie, country, setting, author names, institution); (2) study design; (3) intervention characteristics (ie, exercise type, frequency, program duration, delivery format, equipment/space requirements, fee structure, cost for participants); (4) characteristics of the participant population (ie, sociodemographic information, cancer type, cancer stage, treatment status), program staff characteristics (ie, training), and program delivery; and (5) contextual factors (ie, geographic location, organizational characteristics, contact with health care professionals).

Data coding and analysis

After data extraction, the identified data were coded in duplicate for analysis using the CFIR to examine program implementation characteristics at multiple levels. Some extracted data from the Oxford Implementation Index were relevant under multiple CFIR domains. Discrepancies were resolved through group discussion. Given the limited data on implementation characteristics presented in included studies, we were unable to sufficiently code data across the 39 CFIR constructs; thus, a narrative synthesis of the findings is presented across the 5 broad CFIR domains.

Results

The database search retrieved 5721 unique citations, of which 813 underwent full-text review (fig 1). A total of 4908 records were excluded because of clear ineligibility based on the title and/or abstract. Hand searching and contacting authors yielded 1 additional publication (published after the date of our last search) from an already included program. In total, 58 full-text publications describing 34 unique programs were included.²⁴⁻⁸¹

Description of included publications

The final 58 included publications primarily reported various aspects of community-based exercise programs for survivors of cancer. Over half of publications (53%) reported on changes in physiological or psychosocial outcomes as a result of taking part in the program through single-group pre-post or randomized controlled trial design.^{25,35-38,41,43-46,48,53,54,56,58-61,65-71,73-78} Others (21%) primarily focused on describing program development and implementation.^{24,32,33,38,40,47,50,52,57,63,72,80} Thirteen publications (22%) reported participants' experiences in community-based

exercise programs using a qualitative^{27,30,31,49,51,55,62,64,69,81} or cross-sectional survey design^{29,34,75}; 2 were study protocol papers (3%)^{39,79} and 2 described hybrid implementation-effectiveness trials (3%).^{26,28}

Consolidated Framework for Implementation Research domains

Here we provide a narrative summary of findings according to each of the 5 CFIR domains, with additional details provided in tables 1-5 and supplemental tables S1 and S2 (available online only at <http://www.archives-pmr.org/>).

Intervention characteristics

Programs ranged from 4 weeks³⁸ to 1 year²⁶ in duration. Five programs did not describe specific program lengths.^{34,40,53,54,64,71} Most programs included a combination of aerobic and resistance exercise (62%),^{24,25,27,31,34-36,39,40,43-48,50,52-63,67-71,73,74,76,78} whereas others described only resistance training^{26,41,65,77} or aerobic exercise.^{30,37,72} Several programs included specific sports, such as football,^{28,32,79} triathlon,⁶⁷ and a run/walk program³⁰ (see table 1).

Programs most commonly operated within public exercise facilities (62%), such as YMCAs, community centers, or private fitness studies/centres.^{25,27,28,30-32,34-36,39,41,43-48,50-54,57-59,64,66,68-74,76-79} A variety of other locations were used, such as space within private clinics such as physical therapy and breast clinics and rehabilitation centers (15%)^{26,55,56,60-63,80} and community sites (12%) including churches, support groups, or wellness centers.^{38,40,65,81} Two programs (6%) did not report specific details about settings^{37,67} and 2 programs were delivered entirely remotely (ie, by phone or web).^{24,62,63} Most programs were delivered in a group-based format for at least part of the program (76%), 7 programs explicitly stated home exercise components,^{24,26,40,57-63,77} and 1 program was exclusively one-on-one.^{27,73}

A wide range of supports for participation were described in the included studies, such as inclusion of family members or friends,^{25,38,46-48,52} initial assessment or reassessment,^{34,40,46} physical activity tracking,^{24,25,28,32,47,48,52,57-59,77,79} and a team or group-based format to encourage social support.^{30,38,43-45,50,55-61,64,67,74} Many programs reported cointerventions, the most common of which were education,^{26,30,35,36,40,43-45,50,55-63,74} psychosocial support,^{34,43-45,50,55,56,65,74} and nutrition or dietary counseling.^{38,46} Programs were often reported as free to participants (44%)^{25,27,31,38,39,41,43-45,47,48,50,52,57-59,62-64,69,70,73,74,76,78,80,81}; however, whether or not there was a cost to participate was not reported in 38% of programs.^{24,32,34,37,40,55,56,60,61,65,67,68,71,72,77} Reported costs ranged from CA\$15 for a single group-based session^{53,54} to US \$229 for a single assessment.²⁶

Characteristics of individuals

Half of the programs (50%) were open to all adults with a cancer diagnosis regardless of cancer type or treatment status.^{25,27,34,40,43-45,47,48,50,52-54,62-64,71-74,76,78,80} Other programs were limited to either adults who had completed cancer treatment (9%)^{41,55,56,65} or were currently undergoing treatment (6%).^{24,68} One-third of programs (32%) were designed only for women diagnosed with breast cancer^{26,30,31,46,51,57-61,67,69,70,77,81} and 1 program was exclusively open to men with prostate cancer.^{28,32,79} Additional eligibility criteria included medical clearance or referral (32%)^{27,39-41,57-63,67,73,76-78} or some restriction around contraindications or preparticipation

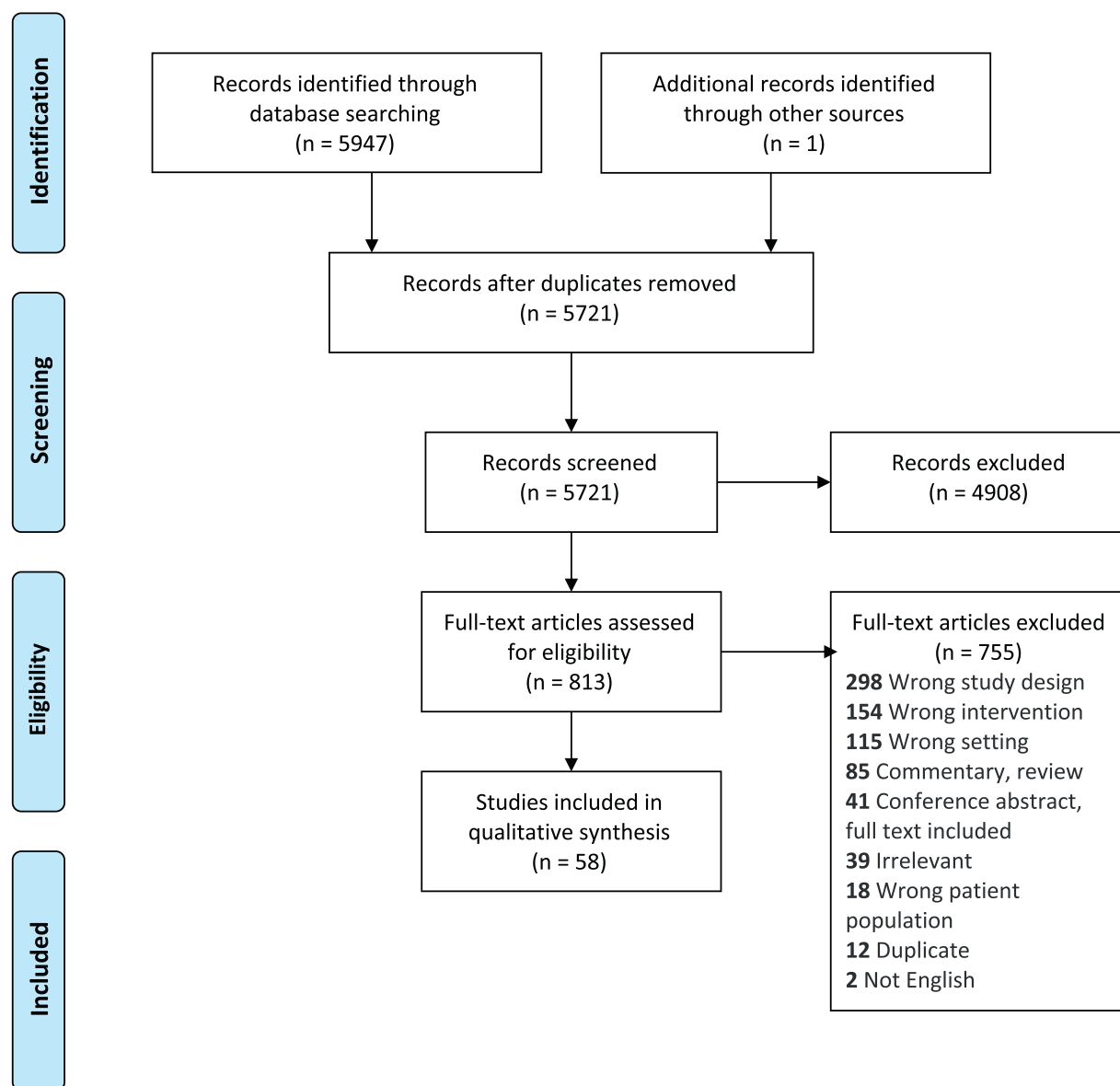


Fig 1 Preferred Reporting Items for Systematic Reviews and Meta Analyses flow diagram of study selection.

screening (12%).^{26,28,32,35,36,69,70,79} Three programs were restricted to those with comorbidities or risk factors^{38,46,55,56} and others (41%) reported no additional criteria^{24,25,30,31,34,37,43-45,47,48,50-54,64,65,68,71,72,74,80,81} (see table 2).

The mean age of program participants included in the published evaluations ranged from 32-68 years. Across all programs, most participants were female (82%), and within programs that included all cancer types, all but 3 programs reported that most participants were survivors of breast cancer.^{40,64,78} A wide range of stages, treatment types, and time since diagnosis and/or treatment were reported. Information on the socioeconomic status of participants was largely missing from published reports.

The primary staff responsible for delivering the programs included exercise specialists (eg, fitness instructor, personal trainer, or coach; 47%),^{28,30-32,34-36,38,43-46,50,53,54,60,61,65,67,69,70,74,79,81} qualified exercise professionals (eg, kinesiologist, exercise physiologist with a noted degree or qualification; 32%),^{25,38-40,43-45,47,48,50,52,57-59,62-64,68,74,76,80} and physical therapists (26%).^{26,40,55,56,64,65,71,76,78,80} Others included a nurse,⁶⁴ social worker,^{60,61} registered

dietician,^{60,61} and medical resident.³⁸ Five programs did not describe the staff delivering the programs.^{24,25,37,47,48,52,72,77} Combined percentages exceed 100% because some programs were delivered by multiple staff. Most programs reported that staff were required to have or were provided with additional training specific to working with people with cancer (56%).^{25,27-29,34-36,39,40,42-45,47-50,53,54,65,66,69,70,73,74,76,78,80} Others reported general exercise-related training not specific to cancer (9%).^{46,57-59} The remaining 35% of programs did not specify staff training.^{24,37,41,55,56,60-64,67,68,72,77,81} Additional staff to support program delivery included clinical support (eg, physicians, nurses, physical therapists, social workers; 24%),^{35,36,40,43-46,50,60,61,65,67,69,70,74} content experts to support education (9%),^{30,55,56,80} administrative support staff (9%),^{28,32,38,43-45,50,74,79} dietitians or nutritionists (6%),^{38,71} additional exercise staff (6%),^{25,35,36,47,48,52} and a health coach (3%).^{62,63}

Inner setting

Community-based exercise programs were most often delivered by existing community sport or fitness organizations, such as

Table 1 Intervention characteristics

Program Name	Exercise Rx	Program Location	Delivery Format	Attendance/Adherence	Participation Supports	Cointerventions	Participant Cost	Equipment, Space Requirements
ActivOnco ⁴⁰	3 mo+ AER, RES (ACSM guidelines)	Wellness center affiliated with hospital or home	Group-based+home exercise	71% compliance (subset of participants)	Ongoing reassessment	Psychosocial support Education Service referral	NR	NR
Beauty ⁵⁷⁻⁵⁹	12+12 wk 2 × /wk 20- to 60-min AER (40-60% HRM), 1 × /wk RES 1-3 sets, 8-12 reps, 5-14 exercises	Thrive Centre, free exercise facility for cancer survivors	Group-based or home exercise	7.5±6.5 sessions (out of 24) 24.4% attended ≥12 sessions	Exercise tracking Choice of delivery format	Education	Free	Resource package for home exercise
Bronx Oncology Daily Living Healthy Living Program ³⁸	4 or 12 wk (12 sessions total) 1-3 × /wk, 60 min	Medical centers, churches, American Cancer Society office	Group-based (5-12)	62.5% (IQR, 40.0-80%) Greater attendance to 12- vs 4-wk program	Translator, culturally tailored Self-management Family/caregivers Transportation Walking groups/local resources	Diet/nutrition counseling	Free	Toolkit handouts (available online)
Cancer rehabilitation strengthening and conditioning program ⁷⁸	8 wk+6 mo 1- to 1.5-h AER+RES (light-mod)	Fitness center adjacent to hospital	First 2 sessions 1:1 with PT then individual or group-based	NR	Maintenance phase Independent exercise in facility free of charge	NR	Free	Treadmills; elliptical, upright, and recumbent bikes; functional cable machine; track
CanWell ^{35,36}	12 wk AER (50%-80% HRm) RES (2-3 s, 8-12 reps)	YMCA	Individualized Supervised	74% completed 12 wk 85.4% continued	NR	Education	YMCA membership	
CaRE @ Home ^{62,63}	8 wk AER 150 min/week moderate, RES 2-3 × /wk RES	Home	Individualized, online	NR	Health coaching, Physitrack access, Fitbit	Self-management e-learning modules	Free	Physitrack subscription, Fitbits
Chemo Club ⁶⁴	2 × /wk, 1-h walking, exercises using gym equipment	Local fitness center	Individualized, group-based	NR	Team leader actively engages with members (local champion)	NR	Free	Indoor oval for walking, gym equipment
CU Fitter ³⁴	Low-impact AER, RES	Exercise facility Pop-up gym Support groups	1:1 or group-based Specific classes by diagnosis/treatment	1-2 × /wk: 82% 72% reported other PA	Initial assessment tailoring Regular review	Support group	NR	NR
Curves ^{46,75}	6 mo 3 × /wk AER+RES circuit 12 wk 3-5 × /wk AER+RES circuit	Curves gyms	Group-based	0.6-1.1±0.8 × /wk 67% 2-3 × /wk	1:1 initial consult 1-y membership	Dietary counseling NR	US\$50/mo (free during study) CA\$420/y (free for study)	Pneumatic machines NR
Drake et al ⁴¹	8 wk 3 × /wk, 60-min RES	Private fitness studio	Individual (center)	29% completed All completed >20/24	NR	1:1 consult with EP	Free	NR
Energy Through Motion ²⁴	3 mo 2-3 × /wk 150-min MVPA +RES	Comprehensive cancer center is implementation point	Home exercise Text-messaging reminders	NR	Educational materials Fitness trackers Text messages	None	NR	Secure SMS platform Fitness trackers RES bands
ExpINKT ⁵¹	6- to 12-mo individualized program, group circuit training	University of Otago	1:1 individual followed by group	NR	NR	NR	NZ\$50	NR
FC Prostate ^{28,32,79}	6 mo 2 × /wk 60-min football	Local football clubs	Team-based	59% continued	Web-based portal to track testing results	NR	Free during study, regular fees after	Football club Football equipment Coach manual
FitSTEPS for Life ^{25,47,48,52}	12 mo 3 × /wk AER+RES	Community center	Individually tailored and supervised (center)	50% dropout	Pedometer Family/support inclusion	NR	Free	Bands, stability ball, dumbbells, elliptical

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Table 1 (Continued)

Program Name	Exercise Rx	Program Location	Delivery Format	Attendance/Adherence	Participation Supports	Cointerventions	Participant Cost	Equipment, Space Requirements
Get Fit-Stay Fit ³⁷	12 wk 2 × /wk low-impact AER, toning	NR	Group-based	10.5 wk (5-12) 12.5/24 sessions (5-24)	NR	Relaxation techniques	NR	NR
Kirkham et al ^{53,54}	3-6 mo+ 2 × /wk 20- to 30-min AER (50%-80% HRR), 15- to 20-min RES, 5- to 10-min flex/core	Community-based fitness studio	Individual (center) and group-based	0.9±0.7 × /wk (0-2.4) 75% follow-up	NR	NR	CA\$85-100 assessment, CA \$70-75/1:1 session; CA\$15-25/group session (some insurance)	Clinic space
Korstjens et al ^{55,56}	12 wk 2 × /wk 1-h AER+RES, group sports/game, 30-min aquatic	Rehabilitation center, Netherlands	Group-based	NR	Social support (refreshment period)	Psychoeducation with partners and family members	NR	Cycle ergometer, resistance machines, pool
Lee et al ^{60,61}	6 wk Group: 1 × /wk, 2.5-h class AER+RES; home: 150-min/wk walking; 2-3 × /wk 1-3 s RES	Breast clinic	Group-based+home exercise	5.1±0.9 of 6 sessions	Group sessions provide instruction for home exercise	Self-management education	NR	Weights or Thera bands
LifeSpring ⁸⁰	12 wk 2 × /wk 20- to 30-min AER intervals, 20- to 30-min group (RPE 11-13)	Community medical center	Group-based	80% completed program	NR	Education	Free	Stationary bike, treadmill, track, recumbent stepper, upper-body ergometer, warm water pool
Life Now Exercise Program ^{39,49}	3 mo 2 × /wk 60-min AER (60%-85% HRm), RES (60%-85% 1-RM)	Community exercise clinics	Group-based	68% completed program 19±4 of 24 sessions	Caregivers included User-pay model begins after 3-mo program	Initial and follow-up 1:1 consult with EP	Free	NR
LiveStrong YMCA ^{42-45,50,66,74}	12 wk 2 × /wk 30-min AER (70-85% HRm/3-5 RPE), 30-min RES (1-2 s, 8-12 reps, 60%-70% 1-RM)	YMCA	Group-based	81%-84% attendance 71%-78% retention	NR	Deep diaphragmatic breathing	Free	YMCA gym equipment
		YMCA		NR	Peer-to-peer support	NR		
		YMCA		88% attended >50%	Family members receive membership	Social support		
		YMCA, New York, Philadelphia		NR	NR	Education		
Moving Forward ⁶⁵	12 wk 2 × /wk, 1 h RES	Breast cancer support center	NR	20 (14-24) of 24 sessions 82% completed	NR	Group psychosocial support session	NR	NR
Ng et al ⁶⁷	14 wk 2 × /wk 45- to 60-min triathlon training, AER, core+RES 3 × /wk home exercise	NR	Group training, individualized	92% completed race	Team-based social support; Past participants join Equipment loan/donations	NR	NR	Bicycles Postmastectomy swimwear
Ottawa Regional Cancer Foundation ⁷¹	8 wk 2 × /wk 60-min AER+RES	Community site	Group-based	83.1%	Individual tailoring	NR	\$0	NR
Packel et al ⁷¹	3-5 × /wk mod AER 2-3 × /wk mod RES	Outpatient fitness centers	Supervised	NR	NR	Nutritional counseling	NR	NR
RENEW ^{27,73}	4 60-min meetings to develop individualized program, AER+RES	YMCA	One-on-one	77% attended 1 session, 61% completed the 12-wk program	Gym membership, online supports	NR	Free	YMCA gym equipment

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Table 1 (Continued)

Program Name	Exercise Rx	Program Location	Delivery Format	Attendance/Adherence	Participation Supports	Cointerventions	Participant Cost	Equipment, Space Requirements
Running Room ³⁰	12 wk 3 × /wk 20 min to 5K run/ walk	Urban for-profit running store	Group-based	NR	Group comradery	Education	NR	NR
Step It Up! Survivors ⁷²	3 mo 1-2 × /wk walking group	8 community organizations	Group-based (except 1)	Median 12 attendees/group (range, 6-114) Mean weekly attendance 13.7	NR	NR	NR	Walking routes
Strength After Breast Cancer ^{26,33}	12 mo 2 × /wk RES	PT clinic (group) +home exercise	4 supervised group- based sessions+home exercise	50.7±36.1 sessions 48.8%±34.7%	PT follow-up calls	Lymphedema education	US\$229/ assessment+ \$US37.50/ session (US\$0-80 copays)	Adjustable dumbbells Compression sleeve
The Gathering Place ^{69,70}	20 wk 5 × /wk 30-min walk 2 × /wk 2 s, 8-12 reps (50- 80% 1-RM) RES	Community location	Group-based		Transportation provided	Lymphatic decongestion = Compression sleeve Support group	Free	NR
UW WellFit ⁶⁸	12 wk 2 × /wk 60-min mod AER, RES, stretching	University of Waterloo community gym	Individualized, group- based	30.7% withdrew	Wide hours of operation	NR	NR	Gym equipment, heart rate monitors
Wellspring ^{29,76}	10+20 wk Phase 1: 2 × /wk Phase 2: 1 × /wk 60 min, AER interval (50- 80% HRR, 3-5 min 4-6 ×) +RES	Wellspring community- based centers	Group-based	Phase 1: 71%, Phase 2: 49%	Phased approach. Discharge package at end of 30 wk	Manual therapy Lymphatic massage Kinesio taping Rehabilitation Education	Free	NR
Wurz et al ⁸¹	8 wk 2 × /wk classes	Maplesoft Centre for Cancer Survivorship Care	Group-based	60%-100%	NR	NR	Free	NR
YWCA Encore ⁷⁷	8 wk 1 × /wk 20-min low- intensity mobility+30-min RES	YWCA community center	Group-based+home exercise encouraged	NR	Home exercise tracking Coordinator check-in	Education Hydrotherapy	NR	Heated swimming pool, separate rooms for exercise and education

Abbreviations: ACSM, American College of Sports Medicine; AER, aerobic; EP, exercise physiologist; HRM, heart rate max; HRR, heart rate reserve; IQR, interquartile range; MVPA, moderate-vigorous physical activity; NR, not reported; PA, physical activity; PT, physical therapist; RES, resistance; 1-RM, 1-repetition maximum; RPE, rating of perceived exertion; Rx, prescription; SMS, short message service.

Table 2 Characteristics of individuals

Program Name	Participants	Design Other Eligibility	Age	% F	Cancer Type	Delivery Stage	Tx Status	SES	Staff	Staff Training	Additional Staff
ActivOnco ⁴⁰	Any	Referral for deteriorating status	52±16	65	27% hematological, 24% breast, 19% H&N, 11% GI	Advanced/metastatic: 35.5%; bone metastatic: 16%	NR	NR	Clinical director (PT), 4 staff PTs, 3 kin	PT training in oncology	Hospital PT; complex patients referred
Beauty ⁵⁷⁻⁵⁹	>18 y F Breast <3 mo post Tx	Medically stable	50.3±9.0	100	Breast	I: 21%, II: 54%, III: 19%, IV: 6%	NR	NR	CSEP certified EP	CSEP-CEP	NR
Bronx Oncology Daily Living Healthy Living Program ³⁸	>18 y	≥1 diabetes risk factor	60.5±10.2	95	76% breast	NR	5.1 (1.5, 9.1) y post Dx	Ethnic minority, underserved geographic area	EP, fitness instructor or medical resident	Fitness instructors trained by EP	Program coordinator, RD, dietetic intern, translator
Cancer rehabilitation strengthening and conditioning program ⁷⁸	Adult	Medical clearance Oncologist referral	63±12 (complete) 61±13 (dropouts)	61	26% breast, 15% lung	37% metastatic	30% during 47% <6 mo post Tx 7% 6-12 mo post Tx 17% >12 mo post Tx	NR	PTs	1-wk Rocky Mountain Cancer Rehab	NR
CanWell ^{35,36}	Any adult	Living at home, able to ambulate, no acute conditions, pre-exercise screen	54.9±9.97 (32-78)	73	52% breast	NR	23.2±25.6 (0-141) mo post Dx	NR	YMCA staff deliver program	12-h cancer pathophysiology, Tx, exercise Rx, data collection	PT or NP onsite 2 h/wk; assessment by PT, NP, or kin
CaRE @ Home ^{62,63}	>18 y	English, comfortable using technology, medical clearance from physiatrist	55±15.9	63	34% breast, 14% GI, 14% lymphoma	NR	24±25.4	40% >75,000 annual income, 34% NR	Registered kinesiologist	NR	Health coach trained in motivational interviewing
Chemo Club ⁶⁴	>18 y	None	57-74	67	33% lymphoma, 33% colorectal, 11% breast, 22% ovarian	NR	22% during	NR	PT, EP, nurses (volunteers)	NR	NR
CU Fitter ³⁴	Any adult	None	30% 41-60 y 40% 61-70 y 28% >70 y	62	43% breast, 23% prostate, 15% hematological	NR	68% during	NR	Qualified personal trainers	Cancer-specific exercise education	NR
Curves ^{46,75}	21-70 y F Hispanic or African American 0-IIIa >6 mo post Tx	BMI>25, sedentary, no smoking, diabetes, hypertension, high cholesterol (uncontrolled)	50.7±8.9	100	Breast	I: 43%, II: 33%, III: 14%	4±3 y post Tx	NR	Bilingual Curves staff	CPR; 1 trainer certified	Study physician on call
	>18 y	None	55.7±8.9	20	Breast	0-II: 66.7%	After	80% Caucasian	Curves staff	NR	NR
Drake et al ⁴¹	1-3 mo post Tx	Oncology referral	59.1±10.9	66	67% breast	0-II: 74.2%	After	87% Caucasian	EP	NR	NR
			55.6±10.8	91		(Breast) I: 53%, II: 30%, III: 17%		NR			
Energy Through Motion ²⁴	>18 y During Tx	None	57 (26-77)	69	44% breast, 23% GI, 13% gynecological	NR	During	97% Caucasian	Project leader	NR	NR
ExPINKT ⁵¹	Breast	Treated at Dunedin hospital	18+	100	Breast	NR	NR	NR	Exercise trainer	"Specialized" training	NR
FC Prostate ^{28,32,79}	>6 wk post-prostate Sx	No osteoporosis	68.4±6.2	0	Prostate	40% local, 38% local advanced, 21% metastatic	41% no current Tx 520 (213-982) d on ADT; 3.4±3.4 y post Dx	50% college or higher	Existing football coaches	Training manual 12-h prostate cancer seminar	Existing football club organizational structure
FitSTEPS for Life ^{25,47,48,52}	Any	None	65.44±12.6 (17-89)	72	50% breast	I: 20%; II: 20%; III: 13%; IV: 9%; NR: 38%	31% During	NR	Center staff, kin	Exercise science degree, ~40 h of FSFL training	ACSM exercise trainer
	>18 y	Able to ambulate 8 ft	65.2±10.8	74	52% breast, 13% lung	I: 29%; II: 24%; III: 6%; IV: 12%	25% During	55% <\$40,000 32% university	NR	NR	NR
Get Fit-Stay Fit ³⁷	Any F	None	56.61 (46-80)	100	90% breast	NR	After	NR	NR	NR	NR

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Table 2 (Continued)

Program Name	Participants	Design Other Eligibility	Age	% F	Cancer Type	Delivery Stage	Tx Status	SES	Staff	Staff Training	Additional Staff
Kirkham et al ^{53,54}	Adult	None	58 (20-78)	81	58% breast, 10% gynecological	0: 2%, I: 15%, II: 27%; III: 25%; V: 6%; NR: 25%	46% during 11 (1-174) mo post Dx	NR	Exercise trainer	Cancer-specific exercise certification	NR
Korstjens et al ^{55,56}	Adult >2 mo post Tx	"Discrepancy between present and optimal level of functioning, physical, psychological and/or social constrictions"	50.6±9.5	78	54% breast, 11% blood/lymphoma	NR	1±2 y post Tx	NR	Two expert PTs	NR	Education session professionals
Lee et al ^{60,61}	F Breast 0-III >1 mo post Tx	Medical clearance	53.8±9.6	100	Breast	I: 25%, II: 55% III: 20%	9±13 mo post Tx	89% white	Certified exercise instructor, RD, SW	NR	PTs, lymphedema therapists consulted
LifeSpring ⁸⁰	>18 y	None	54.6±12.3	91	63% breast	11% metastatic	<2 y post Dx	NR	PT or EP	Background in cancer	Content experts (education)
Life Now Exercise Program ^{39,49}	<2 y post Tx	No neutropenia, severe anemia, bone metastases or MSK, CVD, neuro contraindications; medical clearance	61±12	70	~40 types Breast: 43% Prostate: 13%	NR	36% during	NR	EP (4-y university degree)	Life Now Instructor course. 10-h online theory, 8-h practical in-person workshop	NR
LiveStrong YMCA ^{42-45,50,66,74}	F Breast	None	59.7±10.4 (46-82)	100	Breast	NR	5±6 y post Tx	NR	YMCA certified instructors	LIVESTRONG certification	PT, lymphedema therapist
	Any	None	59.0±12.2	92	75% breast	NR	5±1 y post Tx	NR			NR
	>90 d post Tx	None	57.7±10.3 (28-91)	82	56% breast	NR	3 (1-33) y post Tx 6 (1-48) y post Dx	50% working			Researcher, PT, psychologist
Moving Forward ⁶⁵	Any	None	57±12	83	48% breast, 10% colorectal	NR	62% <2 y post Tx	43% working			NR
	>18 y <12 mo post Tx	None	NR 54.4 (37-65)	NR 95	NR 43% breast, 10% multiple myeloma	NR	NR <12 mo post Tx	NR	3 PTs, licensed personal trainer	Educated on exercise and cancer	NR SW
Ng et al ⁶⁷	27-60 y F Breast >4 wk post Sx, >3 wk post CT/RT	Medical clearance No orthopedic contraindications, supplemental O ₂ , central catheter	48±8	100	Breast	0: 5%, I: 38%, II: 48%, III: 9%	4±3 y post Tx	NR	Certified triathlon coaches,	NR	Volunteer clinicians (physicians, PTs, EPs, nurses)
Ottawa Regional Cancer Foundation ³¹	>18 y F Breast	None	55.3 (40-69)	100	Breast	NR	After	57% income > \$100,000	Skilled instructor	"Extensive knowledge about cancer and exercise"	NR
Packel et al ⁷¹	>18 y	None	53.6	50	43% breast, 19% multiple myeloma	NR	10% on active treatment	NR	4 volunteer PTs	PTs given in-services on CRF	Nutritional counselor
RENEW ^{27,73}	18-39 y	Medical clearance if on active treatment	32.6 (22-39)	88	38% breast, 25% bowel, others	NR	88% finished active treatment	NR	Personal trainer	Level 4 cancer rehabilitation certification	NR
Running Room ³⁰	>18 y F Breast	None	45 (31-61)	100	Breast	NR	2.5 (1-6) y post Tx	All had university degree	2 group run leaders	"Experience" in running, cancer survivorship	Guest speakers
Step It Up! Survivors ⁷²	Any	NR	60.4 (44-79)	NR	70% breast	NR	4 mo-30 y	93% white	Walk leaders	NR	NR
Strength After Breast Cancer ^{26,33}	F Breast post Tx	No contraindications	55.1±10.5	100	Breast	DCIS: 7%, I: 29%, II: 36%, III/IV: 23%	27.5 mo post Dx	Professional: 55%; retired: 8%	PT, OT, or RN	Program-specific online training	NR
			56.5±11	100	Breast	I: 28% II: 1% III: 11%	After	25% <\$20,000			

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Table 2 (Continued)

Program Name	Participants	Design	Other Eligibility	Age	% F	Cancer Type	Delivery Stage	Tx Status	SES	Staff	Staff Training	Additional Staff
The Gathering Place ^{68,70}	>18 y F I-III Breast <12 mo post Tx African American	Pre-exercise screening, stress test	Pre-exercise screening, stress test	53.5±10.8 (20-85)	81	32 types; 59% breast, 10% colorectal	IV: 13%	During	NR	Exercise specialists and exercise trainers	ACSM oncology certification	SW, PT (lymphedema assessment)
UW WellFit ⁶⁸	Any adult during Tx	None	None	54.9±9.9	82	56% breast	I: 19%, II: 23%, III: 21%, IV: 9%	38% during 17.0% unknown 580±819 d post Dx	44% working, 21% retired	Certified EPs	NR	NR
Wellspring ^{29,76}	>18 y	Medical clearance	Medical clearance	54.9±9.9	82	56% breast	I: 19%, II: 23%, III: 21%, IV: 9%	38% during 17.0% unknown 580±819 d post Dx	44% working, 21% retired	PTs, Kin, or EPs (2/8-10 participants)	8-h Cancer Smart rehabilitation and exercise course	NR
Wurz et al ⁸¹	>18 y F post Tx breast	None	None	55.3	100	Breast	NR	Within previous few months	NR	Trained fitness instructor	NR	NR
YWCA Encore ⁷⁷	>18 y F Breast, >8 wk post Tx	Physician consent	Physician consent	Int: 58±11 Cont: 54±11	100	All breast	0: 3%, I: 22%, II: 20%, III: 19%, IV: 19%	Int: 53±67 mo Cont: 33±69 mo post Tx	35% university or college	Encore coordinator and assistant	NR	NR

Abbreviations: ACSM: American College of Sports Medicine; ADT, androgen deprivation therapy; BMI, body mass index; CEP, clinical exercise physiologist; Cont, control; CPR, cardiopulmonary resuscitation; CRF, cancer related fatigue; CSEP, Canadian Society for Exercise Physiology; CT, chemotherapy; CVD, cardiovascular disease; DCIS, ductal carcinoma in situ; Dx, diagnosis; EP, exercise physiologist; F, female; FSFL, FitSteps For Life; GI, gastrointestinal; H&N, head and neck; Int, intervention; kin, kinesiologist; MSK, musculoskeletal; NP, nurse practitioner; NR, not reported; OT, occupational therapist; PT, physical therapist; RD, registered dietitian; RN, registered nurse; RT, resistance training; Rx, prescription; SES, socioeconomic status; SW, social worker; Sx, surgery; Tx, treatment.

gyms or community centers (38%).^{28,30,32,35,36,39,41,43-46,50,53,54,64,74,76,77,79,62,63,72} Others were delivered by cancer support organizations or foundations (21%),^{25,31,34,40,47,48,52,65,69,70} cancer centers (15%),^{24,71,80,81} and affiliated clinics (15%),^{26,37,55,56,78} and 3 programs were delivered through partnerships with a university.^{57-59,68} Other services offered by the delivering organizations included other exercise or sport programs,^{28,30,39} other cancer support programs,^{40,62-65,69,76} education sessions,^{55,57,60,80} or nutrition education.^{46,62,63} One organization offered “various” unspecified services.³⁸ Twenty-three programs did not report whether other services were offered.^{24-27,31,34,35,37,41,43,47,50,51,53,67,68,71-74,77,78,81} To implement the interventions, additional resources including electronic medical record changes,²⁴ cancer-specific football training manual and coaches training,³² and medical supervision⁷⁸ were required. Organizations received funding from membership and for-service fees^{28,46,53} and foundation grants^{27,47,73} (see table 3; supplemental table S1, available online only at <http://www.archives-pmr.org/>).

Outer setting

Programs were most commonly based in the United States (42%),^{24-26,37,38,43-48,50,52,65,67,69-71,74,78,80} followed by Canada (32%),^{30,31,35,36,40,53,54,57-63,68,76,81} Europe (12%),^{27,28,32,34,55,56,73,79} Australia (9%),^{39,64,77} and New Zealand.⁵¹ Nearly half of the programs (47%) reported some degree of collaboration or relationship with health care providers, hospital, or oncology service to support the development and/or delivery of the community-based program.^{24-26,28,32,35,36,38-41,52,62-64,67,68,71,78-80} Several programs reported collaboration with the oncology service only for participant recruitment or referral into the program (15%),^{43-46,50,51,69,70,74,76} whereas others did not describe any formal contact or relationship. External funding sources to support the programs were identified, including charitable foundations (35%),^{25,39,41,43-45,47,48,50,52,57-59,64,65,74,76,80} grants (9%),^{24,28,32,38,79} and the public health care system (3%)³⁹ (see table 4; supplemental table S1, available online only at <http://www.archives-pmr.org/>).

Implementation process

Programs originated from within the hospital or by clinical staff (24%),^{24,25,35,36,40,41,47,48,52,62-64,80} by researchers or from a previous research study (21%),^{26,28,32,38,39,57-59,68,72,79} from within existing community organizations (18%),^{30,43-46,50,53,54,74,76,77} or from a motivated individual (3%).³⁴ The remaining programs (35%) did not describe the origin of the program. The ways in which the programs were designed and refined were described in a variety of ways, such as use education sessions with medical professionals,^{24,25,40,48,52,78,80} use of evidence on cancer and physical activity,^{26,33,39,43,44,45,49,50,62,63,66,69,70,74,78} collaboration with community-based organizations,^{28,32,53,72,79} use of behavior change theory,^{35,36,38} use of an institutional knowledge translation program,^{62,63} and through capacity building and technical assistance from the research team.⁷² Only 14 programs gave some description of stakeholder engagement that was required for program implementation and maintenance^{24-26,28,32,35,36,38-40,43-45,47,48,50,52,62-64,68-70,72,74,79}; for example, the use of a tailored multidimensional implementation strategy²⁴ or ongoing support and mentorship.^{35,36} Importantly, 7 programs (21%) described differences between the original program design and program delivery^{25,26,38,40,46-48,67,68}; for example, variations in content delivery, changes needed to scheduling, and additional supports added to increase adherence (see table 5; supplemental table S2, available online only at <http://www.archives-pmr.org/>).

Table 3 Inner setting

Characteristics of the Delivering Organizations	Other Services Offered	Additional Staff or Resources Required	Organizational Funding
Cancer center ^{24,62,63,71}	General exercise programs ^{30,39,49}	EMR changes ²⁴	Membership fees ^{28,32,46,51,53,54,75,79}
Affiliated clinic or program ^{26,33,37,40,55,56,60,61,78,80,81}	Nutrition ^{46,62,63}	Referrals ^{24,62,63}	Foundation ^{25,27,47,48,52,73}
Cancer foundation/charity ^{25,27,31,34,47,48,52,69,70,73}	Psychoeducation ^{55,56,65}	Infrastructure from for-profit programs ^{28,30,32,35,36,79}	Private funding ⁴⁰
For-profit, non-cancer ^{28-30,32,35,36,39,41,43-46,49,50,53,54,64-66,74-77,79}	Education ^{57-61,80}	Training manuals ^{28,32,72,79}	NR ^{24,26,29-31,33-39,41,43-45,49,50,55-72,74,76-78,80,81}
University ^{51,57-59,68}	Various programs to support cancer survivors ^{29,38,40,62-64,69,70,76}	HCP ^{38,40,55,56,60,61,64,65,67,69-71,78}	
Various ^{38,72}	NR ^{24-28,31-37,41,43-45,47,48,50-54,66-68,71-75,77-79,81}	Exercise trainer ^{25,47,48,52}	
NR ⁶⁷		NR ^{26,27,29,31,33,34,37,39,41,43-46,49-51,53,54,57-59,66,68,73-77,80,81}	

Abbreviations: EMR, electronic medical record; HCP, health care provider; NR, not reported.

Table 4 Outer setting

Geographic Locations	Contact/Relationships With Health Care Providers, Hospital, Oncology Service	Access/Referral Structures	Additional Staff	External Funding
United States ^{24-26,33,37,38,43-48,52,65-67,69-72,74,78,80}	In-depth team relationship with oncology team ^{24,38,40,80}	Self-enroll ^{27,30,39,49,73,77}	None ^{24,28,32,72,79}	Grant ^{24,28,32,38,72,75,79}
Canada ^{29-31,35,36,40,53,54,57-63,68,75,76,81}	Researchers, fitness staff, patient advocates ^{28,32,79}	Referral only ^{25,41,46-48,52,55,56,62-65,67,69,70,78,80}	Staff liaison ^{26,33}	Government ^{39,49}
Denmark ^{28,32,79}	Researchers, hospital, fitness center ^{35,36,39,41,49,62-65,68}	Combination ^{24,26,28,29,32-36,38,40,51,57-61,68,71,76,79}	HCP ^{35,36,80}	Foundation/charity ^{25,27,29,39,41,43-45,47,48,50,52,57-59,64,65,69,70,73,74,80,76}
UK ^{27,34,73}	HCP interaction ^{62,63,67,71,78}	NR ^{31,37,43-45,50,53,54,66,74,75,81}	Program coordinator /registration staff ^{38,39,49}	NR ^{26,30,31,33-37,40,46,51,53-56,60-63,67,68,71,77,78,81}
Australia ^{38,49,64,77}	Staff liaison ^{26,33}		Clinic director ⁴⁰	
Netherlands ^{55,56}	Referral only ^{25,29,46-48,52,57-59,69,70,76}		NR ^{25,27,29-31,34,37,41,43-45,47,48,50-71,73-78,81}	
New Zealand ⁵¹	NR ^{27,30,31,34,37,43-45,50,51,53-56,60,61,66,72-75,77,81}			

Abbreviations: HCP, healthcare provider; NR, not reported.

Table 5 Process

Program Origin	Program Development	Engagement	Noted Difference Between Design and Delivery	Implementation Outcomes
Institutional initiative ^{24,25,40,47,48,52}	Interprofessional team ^{24,40}	Clinicians ^{24,26,28,32,33,35,36,38,40,64,68-70,79}	Additional training ^{26,33}	Acceptability ⁷²
Research study or university ^{26,28,32,33,39,49,57-59,68,79}	HCP ^{25,47,48,52,78,80}	Organizational leaders ^{24,25,47,48,52,62,63}	Additional staff ²⁶	Adaptations ^{26,33}
Existing community-based program ^{28-32,43-46,50,53,54,62-64,66,72,74-77,79}	Phased approach ²⁴	Patients/family members ^{26,38}	Recruitment ^{26,72}	Adoption ^{33,72}
Individual ³⁴	Community partnerships ^{28,32,72,79}	Researchers ^{26,35,36,38,40,43-45,50,66,68-70,72,74}	Schedule ^{38,72}	Appropriateness ^{33,72}
HCP expertise ^{35,36,41,80}	Theory-based ^{35,36,38}	Community organizations ^{25,28,32,35,36,38,39,47-49,52,64,69,70,72,79}	Need for rehabilitation services ⁴⁰	Attendance ^{25,27,29,43-48,50,52-54,57-59,66,73-76}
NR ^{27,37,51,55,56,60,61,65,67,69-71,73,78,81}	Evidence-based ^{26,33,39,43-45,49,50,62,63,66,69,70,74,78}	NR ^{27,29,30,31,34,37,41,46,51,53-61,67,71,73,75-78,80,81}	Not all additional content offered ⁴⁶	Barriers/facilitators ^{27,33,34,49,51,73,75,81}
	NR ^{27,30,31,34,37,41,46,51,55-61,64,65,67,68,71,73,75-77,81}		Scaling out ^{25,47,48,52}	Cost/cost-effectiveness ^{33,39,57-59,72}
			Individual tailoring ⁶⁷	Feasibility ^{33,62,63,72}
			Evaluation measures ⁶⁸	Fidelity ³³
			Participant incentives ⁷²	Knowledge, attitudes, beliefs ²⁴
			Location ⁷²	Penetration ^{33,72}
			NR ^{24,27,28-32,34-37,39,41,43-45,49-51,53-66,69-71,73-81}	Provider satisfaction ^{26,43-45,50,74}
				Reach ^{26,33}
				RE-AIM ^{28,32,38,39,42,57-59,79}
				Safety ³⁹
				Satisfaction ^{24,27,34-36,43-45,50,57-59,62-64,73-75,77,80,81}
				Sustainability ^{33,72}
				None ^{30,31,37,40,41,55,56,60,61,65,67-71,78}

Abbreviations: HCP, health care provider; NR, not reported.

The primary purposes of 14 of 58 included publications was to report on program development and implementation and/or implementation outcomes.^{24,26,32,33,35,38-40,42,47,50,57,72,80} The RE-AIM framework guided the evaluation of 5 (15%) programs,^{28,38,39,42,57} and Proctor's Implementation Outcomes Framework⁸² guided 2 evaluations.^{33,72} Other implementation-related outcomes included acceptability at the patient or provider level (35%),^{24,26,27,34-36,50,57-59,64,73,75,77,80,81} adoption (26%),^{26,39,46-48,53,54,57-59,74,76,77} costs (12%),^{26,28,39,57} and feasibility (6%).^{26,62,63}

Discussion

The purpose of this review was to summarize the implementation characteristics described in the literature on community-based exercise interventions for survivors of cancer. By synthesizing and mapping the existing published literature on real-world exercises programming for survivors of cancer, several gaps are highlighted that may inform future research and practice-based initiatives. Through our search of published literature, we identified 58 published reports of 34 unique exercise programs for survivors of cancer that have been implemented outside of a hospital or research setting. There is a need for community-based programming for survivors of cancer to provide a safe and effective space for exercise in line with published guidelines. To inform future program development, there is a need to understand which types of programs may be most implementable in a real-world setting and provide some examples of how this may be done.

Many of the studies identified were single-arm pre-post evaluations. Given this, it is not possible to identify which factors may be associated with program implementation success or which factors may best promote broad implementation, scalability, and sustainability. Although each of these programs can be deemed a success because they have delivered community-based exercise programming to their local population of survivors of cancer, based on the limited implementation data available in most publications it is impossible to say which programs would lend themselves best to broad implementation and what critical components should be built into new community-based programs. In a recent narrative review, Czosnek et al provided an overview of the use of implementation science within the field of exercise in health care settings, including clinical populations such as diabetes, cardiac rehabilitation, and cancer.⁸³ Although several examples exist, the authors call for the use of implementation science methods, frameworks, and outcome measures to better guide the integration of exercise into the health care setting. Although clinical populations other than survivors of cancer may be further ahead in the availability of clinical exercise services, equitable access and uptake are still low, highlighting the need for implementation science to understand and address factors that contribute to program success such as reach and adoption.^{84,85}

Intervention characteristics

Overall, intervention characteristics were well described, and exercise programs identified in this review were diverse. A wide variety of staff, settings, and exercise prescriptions were employed. In line with published guidelines,⁵⁻⁸ most programs included both aerobic and resistance training, rather than one or the other, and several unique models of exercise were also identified (eg, triathlon training,⁶⁷ football,^{28,32} and a run-walk program for breast cancer survivors³⁰). Exercise programming was

commonly coupled with other supportive care interventions, such as dietary counseling, education, and self-management. Previous health promotion literature targeting the general population shows that including multiple behavior change programs can be as effective or more effective than single-behavior strategies and may be a more efficient use of resources⁸⁶; however, to date the literature on single vs multiple behavior change research in older adults and survivors of cancer in community-based settings is mixed.^{87,88} Based on the programs reviewed, it is unclear whether intervention characteristics were determined primarily through user needs, program designers, or available resources. A one-size-fits-all approach is unlikely to be successful across settings and in the heterogeneous population that has survived cancer; however, a greater understanding of how these factors interplay in program design and delivery—for example, through more qualitative data describing both user and provider experiences with programs—would be of great use to future program designers.

Individuals

Many programs included a fairly young sample of cancer survivors (mean age ~50y), with female survivors of breast cancer highly represented. This is in line with the efficacy literature, where a large proportion of the evidence comes from young, early-stage survivors of breast cancer.^{4,89} Although the programs included were community based, most reported the need for physician clearance or referral or to meet prespecified criteria to be eligible to enroll. Though the literature has shown that exercise is safe and effective for many survivors of cancer, knowledge gaps remain about the most important considerations for screening and the safety and efficacy of exercise for people with multiple comorbidities, advanced cancer, and less commonly diagnosed cancer types and older adults.^{90,91} For these populations, supervised cancer rehabilitation programming may be most appropriate.¹¹ More work is needed to understand how these complex individuals should be appropriately triaged to either a community or clinical rehabilitation setting¹¹ and how to design and implement programs that are acceptable to underserved populations (such as men).

Inner and outer settings

In comparison to information on intervention and individual characteristics, less information was reported on implementation factors in the inner and outer setting. Of the publications identified in our search, only 14 had a primary objective to report on program development and delivery; thus, extraction of information relevant to the inner and outer setting CFIR domains was limited because descriptions of these factors are not typically included in other types of research. Implementation characteristics related to the inner and outer settings are important considerations for those looking to initiate a community-based exercise program because they include factors such as structural characteristics, culture, readiness for implementation, patient needs, resources, external policies, and incentives.¹⁵ Further research and reporting in this area may help to explain program success across various settings.

Most programs were run in partnership with a cancer-specific organization (eg, cancer center, clinic, foundation, etc) and some examples of for-profit organizations that developed cancer-specific programming were described (eg, Running Room, Curves). In terms of organizational resources required, additional staff training related to cancer was most common. External funding

from the outer setting has important implications for the implementation characteristic of cost. Of the programs reviewed, most that reported information about program cost to participants were free, at least for a period of time. Reducing financial barriers to participation may be particularly important to this population given the documented financial toxicity of cancer treatment,⁹² and exploring partnerships to offset this cost may be particularly important for program sustainability.

Most of the programs identified some type of relationship between health care providers, hospitals, and/or researchers in program design and delivery, suggesting that partnerships are important to facilitate successful program implementation. However, these findings may be biased because we included only community-based exercise programs that have been reported in the scientific literature, where some type of academic affiliation led to the publication. An environmental scan of existing programs outside of the literature was outside of the scope of this review but would be important to identify inner and outer setting characteristics of those without academic affiliations.

A recent study by Kauffeldt et al (unpublished data, 2020) aimed to qualitatively explore the barriers and facilitators to community-based exercise program implementation for survivors of breast cancer using the CFIR. Consistent with the findings from this review, most programs included were supervised by qualified exercise professionals (eg, registered kinesiologists, exercise physiologists, physical therapists) and delivered aerobic and resistance training components in line with published exercise guidelines for cancer survivors. Further, this study confirmed that there are multiple barriers faced by program providers when implementing community-based exercise programs for survivors of breast cancer. Notably, the barriers to exercise program implementation operated within the outer setting domain of the CFIR (eg, lack of available program facilities, limited knowledge regarding the benefits of exercise for survivors of cancer, limited support from the cancer care team, and negative attitudes toward exercise for survivors of cancer). If most barriers to exercise program implementation occur within the outer setting, reporting on information within this domain may be of even more importance for those looking to design and implement a new program and would be missing from reports of successfully developed programs.

Process

Like the inner and outer settings, very little information was reported within the process domain. This is a missed opportunity to share information on program development and the success of implementation. Of those that did report process information, multidisciplinary and multisectoral engagement between community organization, researchers, and hospital/clinical staff was commonly stated as contributing to program implementation. These findings are consistent with recent findings from a qualitative study exploring constructs relevant to implementation in the context of adapting an evidence-based exercise intervention for survivors of cancer to rural community sites using the CFIR.⁹³ Community and organizational stakeholders identified engaging strategies, including health care provider support and referral, champions, and community partner relationships, as key facilitators to the implementation process.

Within the literature identified in this scoping review, attendance and absolute referral numbers along with participant satisfaction were the most common implementation outcomes reported. Unfortunately, attendance and referral numbers were

often specific to the research component and may not have been representative of the program overall because of ethical considerations for data usage. Participant satisfaction was also generally high, although also often limited to those who consented to be part of the research project. Two included studies were conducted using hybrid or pragmatic trial designs to inform both implementation and effectiveness.^{26,28} Utilization of innovative trial design is an opportunity for future research using high-quality implementation science to inform best practices for implementation. To our knowledge, 1 such study is currently underway. McNeely et al are conducting a 5-year hybrid effectiveness implementation trial, with plans to enroll 2500 cancer survivors in 7 cities across Alberta, Canada, to a community-based exercise program in a number of different settings.⁹⁴ Participant enrollment began in 2017, with planned completion in 2022. Implementation findings from this trial will provide valuable information to both program planners and those involved in front-line program delivery.

Study limitations

This scoping review, guided by a well-established implementation science framework, presents a summary of implementation characteristics related to intervention and individual characteristics, inner and outer settings, and implementation process of community-based programs for survivors of cancer. A limitation of this work is our reliance on information included within the scientific publications. Although we did contact authors of conference abstracts identified for any additional publications, we did not contact authors for missing data from the publications themselves. An initial objective was to explore factors associated with successful and effective programs. Given the heterogeneity of programs, populations, and outcomes assessed, this was not possible.

Conclusions

As both the evidence and real-world practice of community exercise programming for survivors of cancer grows, we encourage the robust reporting of implementation characteristics. This will contribute to the understanding of which factors are associated with successful implementation to build recommendations for best practices for implementation across settings. Based on the available literature to date, partnership and collaboration between existing community exercise facilities and exercise professionals, clinicians, oncology services and hospitals, and not-for-profit or charitable organizations appear to be important factors for development and successful and sustainable delivery of community-based exercise programs.

Supplier

- Covidence systematic review management software, Veritas Health Information.

Keywords

Exercise; Implementation science; Neoplasms; Rehabilitation; Translational medical research

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Appendix 1. Search Strategy – MEDLINE

1. exp Neoplasms/
2. cancer.mp.
3. cancer survivor*.mp.
4. oncolog*.mp.
5. 1 or 2 or 3 or 4
6. exercise/ or exp high-intensity interval training/ or exp physical conditioning, human/ or exp plyometric exercise/ or exp resistance training/ or exp running/ or exp swimming/ or exp walking/
7. physical activity.mp.
8. (cancer adj rehab*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]
9. exercise therapy/ or exp plyometric exercise/ or exp resistance training/
10. exercise.mp.
11. 6 or 7 or 8 or 9 or 10
12. community.mp.
13. community-based.mp.
14. home.mp.
15. remote.mp.
16. distance-based.mp.
17. (knowledge adj translation).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]
18. implementation.mp.
19. (program adj development).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]
20. (program adj planning).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]
21. (program adj evaluation).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]
22. 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21
23. 5 and 11 and 22
24. (cancer adj prevention).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]
25. (cancer adj risk).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]
26. 24 or 25
27. 23 not 26
28. limit 27 to english language

Supplementary Table 1 Inner and Outer Setting

Program Name	Inner Setting				Outer Setting				
	Characteristics of the Delivering Organization	Other Services Offered	Additional Staff or Resources Required	Organizational Funding	Geographic Location	Contact/Relationship With Health Care Providers, Hospital, Oncology Service	Access/Referral Structure	Additional Staff	External Funding
ActivOnco ¹	Hope and Cope Wellness Centre, community-based centre close to Jewish General Hospital and Segal Cancer Centre	Diverse programs to improve quality of life for patients and caregivers	Hospital PTs; Complex patients referred rehab	Privately funded	Montreal, CAN	Hospital and Wellness centre in close proximity; HCP assist with referral and also deliver elements of the program:	35% Onc, 36% other HCP, 15% self-referral, 14% staff or volunteer	Clinical director (PT)	NR
Beauty ²⁻⁴	Community-based program offered through the Health and Wellness Lab at the University of Calgary	Educational sessions	NR	NR	Calgary, CAN	HCPs refer	HCP, self-referral (Breast Cancer Supportive Care Foundation, posters, events, word of mouth)	NR	Wings of Hope Foundation, non-profit volunteer-fundraising
Bronx Oncology Daily Living (BOLD) Healthy Living Program ⁵	Various community sites; local cancer centre, medical centres, churches, American Cancer Society office	Various	HCP deliver program at community sites	NR	Bronx, USA	Psychosocial Oncology Program and Montefiore cancer centre developed program; Participants recruited within system; Program coordinator works cancer centre	Referrals within the Montefiore Medical System, the PSOP, and community sites	Program coordinator manages staff, implementation, data collection and entry	Mount Sinai School grant
Cancer Rehabilitation Strengthening and Conditioning program ⁶	Park Nicollet Heart and Vascular Fitness Center, adjacent to Methodist Hospital	NR	Medical supervision	NR	Minneapolis, USA	Program PTs part of the healthcare team, could access patient medical records	Referred by Oncs in response to fatigue, muscle weakness, myopathy, low back pain, neuropathy, ADL or balance problems	NR	NR
CanWell, ^{7,8}	Local YMCA (Les Chater) for-profit community-based exercise organization	NR	YMCA staff	NR	Hamilton, CAN	Stated collaboration between university, acute care hospital, YMCA	Physician, nurse, psychologist, or self-referral	Hospital staff PT or NP onsite 2h/w	NR
CaRE @ Home, ^{9,10}	Centre for Health and Wellness and Cancer Survivorship, Toronto General Hospital	In-person exercise, nutrition and other programming	Centre staff, physiatrist for clearance	NR	Toronto, CAN	Survivorship centre linked with Princess Margaret Cancer Centre; all participants must be screened by physiatrist	Physician referral	NR	NR
Chemo Club ¹¹	Private fitness center, staffed by volunteer professionals;	Free support, information, advice, and access to safe and supervised complimentary therapies	PT, exercise physiologist, trained nurse, Group leader is key influencer	NR	Perth, AUS	Collaboration between head of hematology and local fitness center owner	Referred from physician or Solaris Care, supportive care center	NR	Funded through donations
CU Fitter ^{TM12}	Cancer United, a registered cancer support charity; program delivered by a cancer survivor	NR			West Sussex, UK	NR	HCP (38%), Ads (20%), Friend (15%), Support group (10%), other exercise group (8%)	NR	NR
Curves ^{13,14}	Curves, international commercial weight loss programming organization	Nutrition	NR	For-profit	New York City, USA	Participants recruited through Columbia University Medical Centre breast oncology clinic	Referral through breast clinic	Study physician on call	NR
		NR			Large urban city, Canada	Screening/referral via surgical oncologist (study only)	Physician referral (study only); otherwise, not included	NR	Grant
Drake et al ¹⁵	Privately owned fitness studio	NR			Metropolitan center	Coordination between advanced practice nurse (cancer centre) and EP at fitness studio	Referral through Onc coordinated by advanced practice nurse	NR	Proceeds from community bicycle race

(continued on next page)

Supplementary Table 1 (Continued)

Program Name	Inner Setting				Outer Setting				
	Characteristics of the Delivering Organization	Other Services Offered	Additional Staff or Resources Required	Organizational Funding	Geographic Location	Contact/Relationship With Health Care Providers, Hospital, Oncology Service	Access/Referral Structure	Additional Staff	External Funding
Energy Through Motion ¹⁶	Holden Comprehensive Cancer Centre	NR	EMR changes Referrals to cancer services as needed	NR	Iowa City, USA	Inter-professional project team with input from medical onc Implementation prompts to increase referrals	Self-referral (flyer) Clinician referral (Implementation prompts used) Researcher recruitment (infusion centre)	None	Grant
ExpINKT ¹⁷	University of Otago	NR	NR	NR	Dunedin, New Zealand	Intent for oncologist or oncology nurse to refer	"Most" from word of mouth, hospital flyers	NR	NR
FC Prostate ¹⁸⁻²⁰	Existing local Danish football clubs	NR	Training manual; disease-specific coach training Existing football club organizational structure	Membership fees	Urban Centre, DEN	Multi-organizational Researchers conducted data collection/analysis; Clinical team recruited; Danish cancer society and football association provided training, organizational structures; Patient advocates connected with participants	Referral from outpatient urology Self-referral (rehab centres)	None	Grant \$404 USD/ person
FitSTEPS for Life ²¹⁻²⁴	Not-for-profit Cancer Foundation for Life (CFFL), established in 2001 to address cost, safety, suitability of exercise programs delivered within a community centre	NR	Exercise space and trainer	Foundation funded	Texas, USA	Referrals from Onc to CFFL clinical director for screening and scheduling	HCP referral	NR	Not-for-profit
Get Fit-Stay Fit ²⁵ Kirkham ²⁶⁻²⁷	Oncology Community Outreach Program Fee-for-service fitness centers with cancer-specific programming	NR NR	NR NR	NR Fee-for-service	Northeastern USA Vancouver & White Rock, CAN	NR NR	NR NR	NR NR	NR NR
Korstjens ²⁸⁻²⁹	Rehabilitation centre	Psychoeducation	Professionals lead education	NR	Netherlands	NR	Specialist or GP referral	NR	NR
Lee ³⁰⁻³¹	Breast Health Centre in the community	Education	RD, SW, PTs, lymphedema therapists consulted as necessary	NR	Winnipeg, CAN	NR	HCP, flyers at outpatient clinics, local newsletter	NR	NR
LifeSpring ³²	Community medical centre	Education	NR	NR	Nebraska, USA	Developed by clinical nurse specialist and director of health enhancement services. Led by PT Interdisciplinary team (medical and survivors) had input on program design	Onc referral	Content experts led educational sessions	Foundation funds (t-shirts, bands, snacks, PT, education material, honorariums)
Life Now Exercise Program ³³⁻³⁴	Range of community-based exercise clinics that span Western Australia	Other exercise programs	NR	NR	Western Australia	HCPs notified patients Oncology clinicians/staff education, program flyers at hospitals, cancer centers, community, media	Self-enroll by telephone to Cancer Council Western Australia	Cancer Council Western Australia	AUS public health system, Cancer Council Australia
LiveStrong YMCA ³⁵⁻⁴¹	YMCA	NR			Savannah River, USA Across USA Seattle, USA	NR HCP refer patients to LIVESTRONG and part of the expert panel that developed the program. Researchers trained YMCA trainers NR	HCPs refer patients or self-referral Self-referral Self-referral	NR NR NR	LIVESTRONG Foundation

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Supplementary Table 1 (Continued)

Program Name	Inner Setting				Outer Setting				
	Characteristics of the Delivering Organization	Other Services Offered	Additional Staff or Resources Required	Organizational Funding	Geographic Location	Contact/Relationship With Health Care Providers, Hospital, Oncology Service	Access/Referral Structure	Additional Staff	External Funding
Moving Forward ⁴²	The Gathering Place, non-profit, community-based cancer support center to support, educate, empower individuals and families	Psychosocial support	Clinical SW	NR	New York, Philadelphia, USA USA Beachwood, USA	NR Program developed and supervised by 3 PTs	NR HCP referral	NR NR	Foundation funding
Ng et al ⁴³	NR	NR	Volunteer clinicians at each workout	NR	USA	HCP volunteered to be present during workout sessions	Integrated community-based healthcare system	NR	NR
Ottawa Regional Cancer Foundation program ⁴⁴	Ottawa Regional Cancer Foundation	NR			Ottawa, CAN	NR			
Packel et al ⁴⁵	Abramson Cancer Center of the U of Penn	NR	Nutritional counsellor	NR	Philadelphia, USA	Referrals through healthcare provider and patient & family services	Onc, NP, nurse referral through Patient & Family Services, self-referral with PT Rx from physician	NR	NR
RENEW ⁴⁶⁻⁴⁷ Running Room ⁴⁸	Trekstock cancer charity For-profit running store	NR Instructor-led run/walk programs for all fitness levels	NR Infrastructure from other clinics	NR NR	London, UK Ottawa, CAN	Recruitment posters NR	Self-enroll Self-enroll	NR NR	Foundation funding NR
Step It Up! Survivors ⁴⁹	8 community organizations; local health department (3), community cancer centre (3), nonprofit cancer organization (1), physical therapy practice (1)	Various	Toolkit	NR	Oregon, USA	NR	Varied	NR	\$15,000 small grant through existing community partnership program
Strength After Breast Cancer ^{50,51}	PT clinic associated with cancer center	NR			Pennsylvania, USA	Staff liaison in cancer center; Researchers trained PTs	Onc/NP (37%), PT (51%) Self-referral (8%)	Oncology staff liaison	NR
The Gathering Place ^{52,53}	The Gathering Place, non-profit, community-based cancer support center to support, educate, empower individuals and families	Variety of programs/ services to address social, emotion, spiritual, physical needs	PT, SW	NR	Ohio, USA	Referral from collaborating onc	Physician referral	NR	Foundation funding
UW WellFit ⁵⁴	Manulife Wellness Centre, Lyle Hallman Institute for Health Promotion at the University of Waterloo	NR			Waterloo, CAN	Partnership between university and cancer center	Onc, supportive care nurse referral; brochures at cancer center, support groups	NR	NR
Wellspring ^{55,56}	Wellspring is a network of community-based cancer survivorship programs.	Comprehensive survivorship services (not specified)	NR	NR	Toronto and Hamilton, CAN	Oncologist or family physician referral	Physician or self-refer with medical clearance	NR	Foundation funded
Wurz ⁵⁷	Maplesoft Centre for Cancer Survivorship Care	NR			Ottawa, CAN	NR			
YWCA Encore ⁵⁸	> 40 metropolitan and regional YMCA locations	NR	Pool	NR	New South Wales, AUS	NR	Self-referral, Local program coordinator recruited for study	NR	NR

Supplementary Table 2 Implementation Process

Program Name	Program Origin	Program Development	Engagement	Noted Difference Between Design and Delivery	Implementation Outcomes
ActivOnco ¹	During development of wellness program, noted a need for exercise screening, prescription and risk management	A hospital-based group of PTs with training in oncology were progressively introduced to various populations of cancer patients to screen for exercise eligibility and rehabilitation	Program implementation relied on multidisciplinary team's awareness and advocacy for patients. Clinical and scientific overviews were provided to specific tumour site groups to guide appropriate referrals	Bottlenecks in transfer of patients who required rehabilitation services (27%) and lack of oncology-specialized community resources were a significant impediment to providing PA guidance and referral.	None
Beauty ²⁻⁴	Launched in 2011, program developers are researchers at University of Calgary focused on knowledge translation	NR	NR	NR	RE-AIM guided, Attendance, participant satisfaction, cost
Bronx Oncology Daily Living (BOLD) Healthy Living Program ⁵	Began with formative research completed by an expert panel of HCP (psychologist, biomedical researchers, dieticians, exercise physiologists, fitness trainers).	Educational curricula built upon Bloom's taxonomy of cognitive development; used evidence-based diabetes/cancer recommendations; social-ecological framework, self-management toolkit and buddy system for accountability and motivation; Cultural and medical; Resources largely adapted from free, publicly available	Planning meetings with HCP team, community stakeholders, members of the Bronx REACH program and cancer survivors	Due to holidays that interfered with holding classes at site locations, 2 of the 4 12-week programs had less than 24 classes; however, all 12 curriculum modules were delivered by combining modules into an extended class (90–120 min).	RE-AIM
Cancer Rehabilitation Strengthening and Conditioning program ⁶	NR	Cancer Survivorship Model of Care was used as a guide. Primary PT attended a weeklong cancer rehab training focused on teaching professionals how to implement and manage cancer rehabilitation centers	NR	NR	None
CanWell ^{7,8}	Designed using exercise and cancer experience of hospital staff	Built upon social cognitive theory to enhance self-efficacy of staff and patients.	YMCA staff in exercise and data collection training; ongoing mentorship from PT and NP; Ongoing partnership between university, hospital and YMCA	NR	Participant satisfaction
CaRE @ Home ^{9,10}	In-person program offered at cancer survivorship centre. Recognized need to due to declines in participation from referred participants due to travel time, transportation costs	Series of iterative steps proposed by National Cancer Institute's Research-Tested Intervention Program to adapt the in-person program to online deliver	Cancer centre's educational design and knowledge translation program	NR	Feasibility (recruitment, retention, adherence), acceptability (satisfaction)
Chemo Club ¹¹	Joint initiative between Head of Hematology & manager /owner of Aspire Fitness Centre	NR	Collaboration between hospital and local business	NR	Participant satisfaction
CU Fitter ^{TM12}	Developed by a cancer survivor through funding from registered cancer charity	NR	NR	NR	Participant satisfaction, barriers and facilitators
Curves ^{13,14}	Used existing CURVES weight loss program	NR	NR	Many locations did not consistently offer the nutritional course.	Attendance and adherence NR Attendance, satisfaction, barriers to exercise
Drake et al ¹⁵	Fitness program designed by an advanced practice oncology nurse and an EP.	NR	NR	NR	None
Energy Through Motion ^{©16}	Institutional initiative to integrate PA into practice, 'evidence-based practice project'	Phased approach to create awareness and interest, build knowledge and commitment, promote action and adoption, and pursue integration and sustained use (following the implementation guide). An interprofessional project team, (advanced practice nurse, RNs, nurse managers, clerical staff, a psychologist, and a physical therapist) was formed. Two medical oncologists provided input on project plan.	Process of 1) connecting with clinicians, organizational leaders and key stakeholders and 2) building organizational system support (e.g., presenting at staff meetings, clinician pocket guides, integration into EMR, using tablets to capture PA data and present program videos to patients, slogan and logo.	NR	Patient knowledge, attitudes, beliefs; Participant satisfaction/program evaluation
ExpINKT ¹⁷	NR	NR	NR	NR	Barriers to exercise

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Supplementary Table 2 (Continued)

Program Name	Program Origin	Program Development	Engagement	Noted Difference Between Design and Delivery	Implementation Outcomes
FC Prostate ¹⁸⁻²⁰	FC Community-prostate trial built upon feasibility study of clinically based program	Collaborate with local clubs to integrate into existing club structure	Collaborate with local clubs, urology clinics	NR	RE-AIM guided
FitSTEPS for Life ²¹⁻²⁴	Established by the not-for-profit Cancer Foundation for Life to ensure patients with cancer have the potential to improve QoL, physical and mental function regardless of cancer type or stage, comorbid disease or disability	Retired onc Dr. Kimmel developed a conditioning program following a hybrid business-service model. Practicing oncs in the community made a financial commitment for start-up costs and promised to refer patients to FSFL	Board or directors assembled to gain buy-in and community, included community members (expertise in fund raising, finance, exercise, research, law, business) CFLL collaborates with local doctors, area hospitals, cancer centers, churches, and other community organizations that provide patient referrals and facilities	In the first year (15 referrals) Dr Kimmel delivered treadmills to patients' homes, gave exercise instruction and evaluation. As the program grew, it expanded to a church, followed by community centres, cancer centres. An in-patient hospital unit also donated space	Referrals, attendance
Get Fit-Stay Fit ²⁵	Program had run for over five years, but no evaluation had been completed	NR	NR	NR	No
Kirkham ^{26, 27}	For profit business	Established community-based fee-for-service exercise programs	NR	NR	Attendance
Korstjens ^{28, 29}	Program launched in 1996, evaluation completed in 2006	NR	NR	NR	None
Lee et al ^{30, 31}	NR	NR	NR	NR	None
LifeSpring ³²	Developed in 2007 to impact fatigue from evidence in oncology nursing and PT on the impact of exercise on cancer-related fatigue	Brainchild of oncology nurse specialist and director of health enhancement services, created using cardiac rehab as a model	NR	NR	Satisfaction
Life Now Exercise Program ^{33, 34}	Originated from a need to implement an exercise program for people with cancer in a real-world, standard practice setting	Built upon international guidelines for best practice including physiological and psychosocial benefits, accessibility and long-term feasibility.	Formal processes for identifying sites, establishing site agreements, training and supporting EPs to deliver program, engaging and screening patients, safety, program evaluation	NR	RE-AIM, uptake, safety, Cost effectiveness Barriers to exercise
LiveStrong YMCA ³⁵⁻⁴¹	In 2007, the LIVESTRONG Foundation and YMCA of the USA created LIVESTRONG at the YMCA, a program to support people affected by cancer in reaching their health and well-being goals. Pilot tested in 10 US cities In 2008. USA cities	Developed based on the American College of Sports Medicine roundtable on exercise guidelines for cancer survivors. Expert panel convened, program developed, and pilot tested in line with Institute for Healthcare Improvements Breakthrough Series	LIVESTRONG provided training and materials for program development. YMCA Community Program Director and researchers specifically developed a multimodal program	NR	None
Moving Forward ⁴²	NR	NR	NR	NR	RE-AIM
Ng et al ⁴³	NR	NR	NR	The same group training plan was given to everyone, exercise was individually progressed within the allotted group and individual sessions	None
Ottawa Regional Cancer Foundation program ⁴⁴	Pre-existing exercise program run out of Ottawa Regional Cancer Foundation	NR	NR	NR	None
Packel et al ⁴⁵	Program was designed to address unmet needs of patients going through the cancer experience	NR	NR	NR	None

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Supplementary Table 2 (Continued)

Program Name	Program Origin	Program Development	Engagement	Noted Difference Between Design and Delivery	Implementation Outcomes
RENEW ^{46, 47}	NR	NR	NR	NR	Satisfaction, barriers and facilitators, attendance
Running Room ⁴⁸	Offered by the running room across Canada starting in 2005	NR	NR	NR	None
Step It Up! Survivors ⁴⁹	Researchers adapted evidence-based guide for community walking programs, creating a program implementation toolkit	Capacity building (technical assistance and small-grant funding) provided to local organizations for implementation	Ongoing engagement with research team for technical assistance, including regulatory approvals, train-the-trainer webinar, monthly webinars on recruitment, retention, motivation of group leaders and participants, adaptation logs, program sustainability	Addition of participant incentives, expansion of walking group eligibility to cancer prevention, securing indoor locations due to poor air quality, high ambient temperatures, increasing frequency of groups,	Adoption, acceptability, appropriateness, feasibility, fidelity, cost, penetration, sustainability
Strength After Breast Cancer ^{50, 51}	Evidence of safety and efficacy from RCT (PAL). Adapted to increase accessibility	Original RCT program was revised with the input of oncology clinicians, PTs, and survivors to improve the feasibility and implementation within a large NCI designated cancer center and associated PT clinic	Oncology clinicians, PTs, cancer survivors, researchers	Additional PT training; added a staff liaison in oncology setting to assist with referrals; PT clinics implemented calls to referred survivors to increase assessment rates from 39% to 65%.	Provider feedback on intervention, payment, eligibility, referral; program adaptations; adoption, sustainability, fidelity, reach, appropriateness, cost, feasibility, penetration
The Gathering Place ^{52, 53}	NR	Protocol based on Resistance Training Strategies for Individuals with Cancer protocol and ACSM guidelines	Program engages academic, clinical and community partners	NR	None
UW WellFit ⁵⁴	Developed with support of onc to initiate exercise as part of a "holistic plan to enhance and maintain health"		Ongoing working partnership between the University of Waterloo and Grand River Regional Cancer Centre	During the pilot phase, as part of program start-up, post-cardiovascular assessments were not implemented	None
Wellspring ^{55, 56}	Member interest motivated WellSpring, a network of community-based cancer survivorship programs, to develop an exercise program	NR	NR	NR	Attendance Barriers to exercise
Wurz et al ⁵⁷	NR	NR	NR	NR	Barriers to exercise, program satisfaction
YWCA Encore ⁵⁸	Available for women with breast cancer for more than 20 years in Australia	NR	NR	NR	Satisfaction, participation

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