


Development and pilot testing of a clinic implementation program delivering physical activity electronic referrals to cancer survivors

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Abstract

Provider physical activity referrals are recommended for cancer survivors, though barriers exist to clinical system integration.

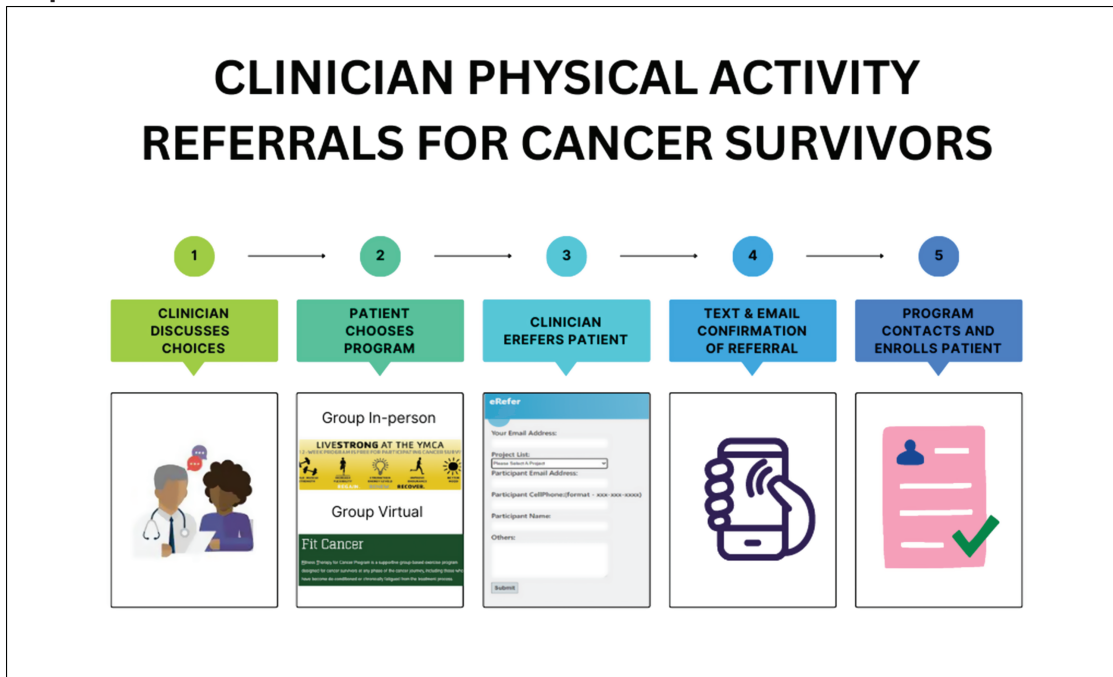
To develop and test ActivityChoice, an electronic referral (eReferral) clinic implementation program referring cancer survivors to physical activity programs of their choice. In Phase 1, we conducted semi-structured interviews with Cancer Center clinicians ($n = 4$) and cancer-focused physical activity program leaders ($n = 3$) assessing adaptations needed to implement an eReferral previously designed for another context. In Phase 2, we pilot-tested clinician-delivered referrals to survivors in two 12-week Plan, Do, Study, Act (PDSA) cycles. We examined feasibility using descriptive statistics (clinicians' adoption and engagement, patient referrals, and physical activity program enrollment) and acceptability through semi-structured interviews with enrolled clinicians ($n = 4$) and referred patients ($n = 9$). ActivityChoice included a secure referral webform, text message/email referral confirmations, clinician training/booster sessions, visual reminders, and referrals to in-person or virtual group physical activity programs. Results for each PDSA cycle respectively included: 41% ($n = 7$) and 53% ($n = 8$) of clinicians adopted ActivityChoice; 18 and 36 patients were referred; 39% ($n = 7$) and 33% ($n = 12$) of patients enrolled in programs, and 30% ($n = 4$) and 14% ($n = 5$) of patients deferred enrollment. Patients and clinicians appreciated the referrals and choices. A printed handout describing both programs was added to the clinic workflow for Cycle 2, which yielded more referrals, but lower program enrollment rates. Clinic-based eReferrals to choices of physical activity programs were feasible and acceptable by clinicians and patients. Added clinic workflow support may facilitate referrals.

Lay summary

Physical activity can improve the health, quality of life, and longevity among cancer survivors. Patients want to receive physical activity referrals and guidance from their cancer care team, but clinicians lack the knowledge, resources, time, and methods to counsel and refer their patients to community-based physical activity programs. One solution is to create a comprehensive electronic referral (eReferral) system giving cancer care clinicians the tools to support and refer their patients. We developed a simple eReferral that allows clinicians to refer patients to existing, evidence-based physical activity programs led by qualified exercise professionals, LIVESTRONG at the YMCA (in-person) and Fit Cancer (virtual). We pilot tested the system with clinicians in two 12-week cycles. Clinicians were excited about the program and like the options they had to offer patients while providing suggestions on how we could better integrate it into their work environment. Patients appreciated the referral from their trusted cancer care clinician and appreciated choices of an in-person and virtual program to accommodate their preferences. To improve patient referrals and enrollment in physical activity programs, a more detailed printed handout that explains the benefits of physical activity in survivorship and describes each of the programs in detail may be helpful.

Keywords Cancer, Implementation, Physical activity, Referrals, Survivorship

Graphical Abstract



Implications

Practice: Clinic-delivered physical activity referrals are feasible and acceptable by cancer care clinicians and cancer survivors.

Policy: Policymakers can support the Commission on Cancer Survivorship Standards Guideline by exploring the added support needed to implement a sustainable process by which survivors receive actual physical activity program referrals rather than general recommendations with medical regimens that could be implemented wide scale.

Research: Future research should be aimed at increasing efficiency of integration into clinic workflow and providing patients with added support for physical activity program choices.

BACKGROUND

The number of cancer survivors is expected to reach 20.3 million by 2026 [1]. Survivors have an increased risk (1.7–18.5 fold) of cardiovascular disease (CVD) incidence [2, 3] and CVD-attributed mortality [4]. Physical activity reduces survivors' CVD risk and mortality [4] is associated with improved health outcomes after cancer diagnoses [5], and is safe and efficacious for survivors [6, 7]. Despite these health benefits and the availability of evidence-based physical activity programs for survivors, less than 10% of survivors will be physically active during and only 20–30% after treatment [8, 9].

The Institute of Medicine and the American Society of Clinical Oncology recommend clinicians refer cancer survivors to physical activity programs as part of survivorship care plans [10, 11]. There are existing physical activity programs such as the LIVESTRONG at the YMCA, which are designed specifically for survivors and are efficacious at increasing their activity levels [12]. However, multi-level barriers to physical activity participation among survivors exist. Cancer survivors report a lack of physical activity guidance, prescriptions, and referrals from their care team. Clinicians cite lack of knowledge of available programs [13], and supportive workflow for referring and follow-up with the survivors [14–16]. Staff of LIVESTRONG at the YMCA also cite the lack of referral

pathways, clinician connections, and program awareness as barriers [17].

Clinic-based referral programs can potentially address these referral barriers and increase survivors' physical activity program participation. Evidence shows oncologists providing verbal/written exercise recommendations plus resources/equipment for an exercise program increased survivors' physical activity levels, compared with only a verbal/written exercise recommendation [18–20]. In other contexts, clinic-based electronic referrals (eReferrals) have been shown to increase program participation (e.g., for participation in a tobacco cessation program by people who smoke) [21]. Clinic-based electronic referrals (eReferrals) allow clinicians to refer and enroll patients in programs easily using their emails or cell phone numbers. The electronic connection can then be used to monitor and motivate patients to participate. Offering physical activity program choices—a patient-centered approach that enhances the patient's autonomy [22]—may increase the likelihood of adoption and engagement of physical activity [23]. However, eReferrals to connect cancer survivors to choices of physical activity programs have not been previously developed and implemented successfully.

To address this gap, we developed ActivityChoice, a clinic-based eReferral program that refers survivors to physical

activity programs. ActivityChoice was adapted from an existing eReferral program our team developed in the context of tobacco cessation. Our adaptations for ActivityChoice included integration of the eReferral into the clinical workflow of a cancer clinic and supporting survivors' choices of referrals to two physical activity programs. In this paper, we report on our iterative approach that included two rapid cycle and user-driven phases to develop ActivityChoice. Because Phase 2 was dependent on Phase 1 results, we first report Phase 1 methods and results followed by Phase 2 methods and results.

METHODS

Study design overview

Our study approach was informed by key informants from the clinic and community, including clinicians, physical activity program leaders, cancer survivors, and community members. Project staff met with these informants throughout the study informally and formally to receive feedback on the overall project, including interview questions, workflow mapping, usability and refinement of the implementation program, and adaptations during pilot testing. This study included two phases. Phase 1 was a formative development phase designed to adapt our team's existing eReferral program to the context of a cancer survivor clinic setting for referring survivors to physical activity programs. This consisted of three steps designed to understand clinician perspectives (via key informant interviews), understand physical activity program leader perspectives (via key informant interviews), and iteratively develop and refine ActivityChoice to be integrated into clinical workflow with feedback from our key informant group (see Fig. 1). In Phase 2 we pilot tested and refined the implementation program using two 12-week Plan, Do, Study, Act (PDSA) cycles with clinicians [24]. PDSA cycles are best used to test ideas on a small scale prior to full implementation [25] and are commonly used for implementation of projects into clinical workflow [26]. This study was approved by the Institutional Review Board at the University of Massachusetts Chan Medical School (#00000522).

Implementation framework

Since the goal of ActivityChoice is to combine health system- and patient-level components from development

through implementation, we used the Practical Robust Implementation Sustainability Model (PRISM) to guide the study. PRISM has four major domains: the intervention, intervention recipients (e.g., patients, clinical staff), implementation and sustainability infrastructure, and the broader environment [27]. In Phase 1 (formative development), we assessed both clinician and physical activity program leaders' perspectives on the intervention implementation. Interview questions mapped on to PRISM domains and focused on identifying the existing resources and additional needs across each domain in order to successfully implement ActivityChoice (see Appendix 1). In Phase 2 pilot-testing, we quantitatively assessed RE-AIM (Reach, Effectiveness, Adoption, Implementation, Maintenance) outcomes [27] of patient reach, clinicians' adoption, and implementation (engagement), while qualitatively assessing contextual factors affecting implementation and maintenance of practices and results over time [27–29].

Physical activity programs

We referred to two physical activity programs. The first was LIVESTRONG at the YMCA program, a 12-week in-person program for cancer survivors led by qualified exercise professionals meeting 2x/week focusing on aerobic, strength, balance, and flexibility exercises [12, 30]. The program has been found to be efficacious at improving survivors' physical activity levels, along with aerobic [12] and physical function [30]. We worked with the YMCA Executive Director of our region who oversaw four YMCA sites within a 30-mile radius of the main hospital campus that offered LIVESTRONG programs. During the onset of the COVID-19 pandemic, many LIVESTRONG programs temporarily shut down (but later re-opened) or had to reduce their class capacity by 50% to increase the opportunity for social distancing. Due to these restrictions, and supported by our Phase 1 findings, we sought a second program that was delivered virtually. Patients then had a choice between LIVESTRONG and Fit Cancer, an 8-week virtual program meeting once per week for cancer survivors. It was designed and delivered by researchers, exercise physiologists, and cancer exercise trainers at Colorado State University. Fit Cancer was originally conducted in person for 8 weeks and demonstrated effectiveness for improving physical activity, fitness, and well-being [31]. Due to COVID-19, the program was pilot tested and moved to a fully online

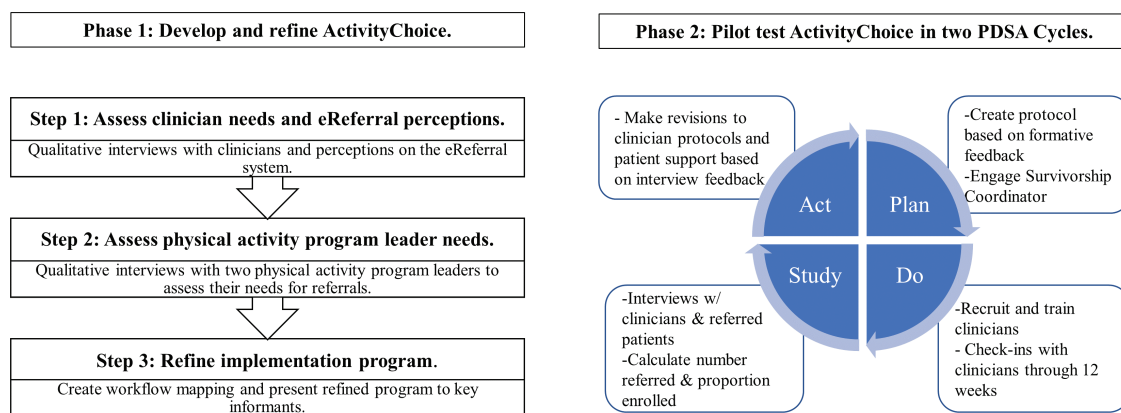


Fig 1 | Overall study design

platform, that as of December 2022, had enrolled over 78 survivors [32]. Once enrolled, participants received resistance bands, a program manual, and an activity tracker.

PHASE 1 METHODS: FORMATIVE PHASE TO ADAPT AND REFINE ACTIVITYCHOICE

Setting and participants

The study was conducted with clinicians from three sites affiliated with the Cancer Center at UMass Memorial Health System in Worcester, MA: one academic medical center (UMass Memorial Medical Center), and two community hospitals (Marlborough Hospital and HealthAlliance-Clinton Hospital). These sites provide cancer care to over 4,000 cancer patients each year. Eligible clinicians were currently providing care visits to cancer patients at one of the three clinic sites, at least 18 years of age, fluent in English, and provided verbal consent to the research staff remotely. We recruited clinicians through our collaborative relationship with the Survivorship Coordinator and Lead Advanced Practice provider of the Cancer Center.

We conducted an interview with the Regional YMCA Executive Director, whom our team had previously worked collaboratively with. In our region, each participating YMCA branch that offers LIVESTRONG programs is overseen by the Regional YMCA Executive Director. This Director supervised LIVESTRONG Coordinators at the four local LIVESTRONG sites and communicated with them regularly on their needs for the program, thus their feedback was critical in understanding the needs of the local LIVESTRONG programs. We also conducted interviews with key informants of the Fit Cancer physical activity program. We interviewed two individuals due to their unique roles. The Program Director was responsible for the development of Fit Cancer and clinic and community relationships, as well as the Program Coordinator was responsible for direct participant connections, including enrollment and leading group sessions.

Phase 1 interview protocol

All participants provided informed consent prior to completing an interview with a member of the study team. For clinicians, we created interview guides using PRISM domains to solicit perspectives related to the implementation of the program in a clinical workflow (see Appendix 1), which included who, when, and how referrals could be placed in a patient's survivorship care. We also asked their perspectives on patient participation in physical activity programs, while also considering the influence of COVID-19 on attending community-based physical activity programs. For a sample of clinicians ($N = 3$), we showed them the existing eReferral tool via screenshare and asked them to provide verbal feedback using a "Think Aloud" [33] protocol approach. We asked them to vocalize their thoughts while they interacted with the system and entered a test patient referral. For the physical activity program key informant semi-structured interviews, we created interview guides to understand their perspectives on barriers to recruiting and enrolling patients from cancer clinics. Open-ended questions and probes asked for their ideal processes and workflow to have referred patients' information sent to them, correspondence with the cancer care team, and follow-up on patients' participation. The interviews were conducted by a study team investigator

(JF), who has extensive training in designing, conducting, and evaluating qualitative interviews with both patient and provider populations. All interviews were on average 30 minutes in length and performed via Zoom video conferencing software.

Phase 1 data analysis

Qualitative data were managed and coded using NVivo version 10 (QSR International). We transcribed interviews verbatim and used a coding start list based on protocol content (deductive) followed by open coding driven by immersion in the data (inductive) [34]. This method using predetermined codes guided data analysis and interpretation, leading to the development of themes and taxonomies. Two researchers (JF, KY) each coded >10% of transcripts. Coding checks were completed to ensure inter-rater reliability. Disputes in coding decisions were discussed within the research team until resolved and a kappa > 0.75 is attained, then the entire dataset was coded. Field notes were also taken by the interviewer during the clinician portion of viewing/testing the eReferral system. These notes were integrated in with the transcripts to identify any existing issues with the system.

PHASE 1 RESULTS

Clinician participants ($n = 4$) were all female, one Physician's Assistant and three Nurse Practitioners, with two from the academic medical center (Hematology/Oncology and Breast clinics) and two from the Community Hospitals (serving all cancer types). Physical activity program leaders were all female, with the regional YMCA Executive Director and the Fit Cancer Program Director and Coordinator. The main themes with illustrative quotes from our interviews with clinicians and the Director/Coordinators of the evidence-based programs ($n = 3$) are shown in Table 1.

In summary, clinicians expressed their survivorship care workflow and protocol differing across clinics. They preferred an electronic format for a referral in lieu of telephone or fax, while one clinician noted specifically using the electronic health record (EHR) for referrals. Physical activity program leaders voiced their desire to make referrals as easy as possible for providers. Two ways they suggested doing this were for them to get a simple email about patient referrals, and then for them to directly contact patients.

ActivityChoice

At the end of Phase 1, we developed and iteratively refined with our key informants the final components for ActivityChoice testing in Phase 2. The components included the following:

- A. *Choice between two programs*: Patients had the choice of joining one of two programs, a group in-person (LIVESTRONG at the YMCA), or a group virtual program (Fit Cancer).
- B. *eReferral workflow integration*: Clinicians conducted referrals using the secure Webform during patient visits. Visit types ranged from pre-, during, and post-treatment to survivorship care planning and follow-ups. They presented the patient with the two program choices and asked their permission to submit the referral. Patients had to be deemed medically cleared to perform physical

Table 1 | Interview themes and sample quotes for clinicians and patients

| Population | Theme | Sample Quote |
|-----------------------------------|---|---|
| Clinicians | Survivorship care protocol and timing varied by clinic and staff member | “We will deliver survivorship care plans typically after radiation, usually when they’re seeing the surgeon around six months follow up.” “Survivorship can mean a lot of different things, and I think a definition of that would also be helpful. I think it could mean different things to different people.” |
| | A simple electronic referral in various formats is preferred | “... electronic form is always easiest, because [it’s hard] waiting on the phone trying to get in touch with people, missing them, or the faxes are always broken. “ “I thought Epic, if we wanted to incorporate survivorship into our navigation tool...” |
| | Feedback on patient referrals was preferred | “It would be nice if we could get a confirmation back from the program, ‘we’ve contacted the patient or been unable to contact the patient’ so that we know if the patient goes” |
| Physical activity program leaders | Want to make provider referrals easier | I think this is something we’re really interested in ...how can we make these processes better for particularly the providers, because we’re always asking, like how can we make it easier for you to send us your patients who we want to provide a service for that could benefit that immensely. Sometimes you feel like, I don’t know what else we can do to make it easier for them. |
| | Once referred, direct patient contact is more efficient | “I feel like if we could contact <patients> and just explain what the process is, it’d be a lot quicker and a lot less on the patient navigator, like on the care navigator.” |
| | Email was the easiest way to receive patient referrals | ...”the easiest way would just be having <clinicians> email us and we can send <patients> the link and then they can just fill it out and then we contact them directly.” |

activity by their physician, and each physical activity program sought medical clearance from the clinician when the patient began the enrollment process.

- C. *Clinician trainings and support*: We conducted brief clinician trainings via Zoom to walk through the eReferral webform and a test patient referral with clinicians. We also provided clinicians with paper handout “Cheatsheets” on how to refer a patient, including our direct contact information if they needed technical assistance.
- D. *Clinicians and physical activity program leader communication*: Clinicians received a confirmation of their patient referral via email through the eReferral system. The study team communicated bi-weekly and as needed with our clinicians to troubleshoot, encourage referrals, or about patients’ needs. We communicated with physical activity program leaders via email regarding patient enrollment as part of the “warm hand-off.”
- E. *Patient communication*: Referred patients received a text message and an email notifying them of the referral from the eReferral system. They were then contacted by the study team to answer any questions the patients had, consent them, and connect them to their program of their choice.

Though one clinician preferred the referrals be done in EHR, others did not have a preference. The original eReferral system allows for collaborators without EHR access to communicate, thus we maintained using the original system outside of EHR.

PHASE 2: PILOT TEST PHASE METHODS

Setting, participants, and protocol

We conducted the two Phase 2 PDSA cycles in the same 3 Cancer Clinics previously described. Similar to Phase 1, we recruited clinicians through our work with the Survivorship Coordinator to take part in the study. In each PDSA Cycle of the study, we conducted recruitment activities. Clinicians who

participated in the first cycle were eligible to participate in the second. We also targeted clinicians who were new to the clinic since the first cycle. Once consented, clinicians were enrolled in the 12-week PDSA cycle.

Each PDSA Cycle used the refined implementation program described above for a period of 12 weeks each. Beginning in the final 2 weeks of PDSA Cycle 1, we conducted semi-structured interviews with patients who were referred (identified by our eReferral system) and clinicians to assess their acceptability of the program and any refinements needed before beginning Cycle 2. We also conducted interviews in the final 2 weeks of Cycle 2. After both cycles, we quantitatively assessed RE-AIM outcomes, including primary outcome reach (number of referred patients, and the number and proportion of patients who enrolled in the programs), clinician adoption (number and proportion of eligible clinicians who enrolled in the study), and implementation (number and proportion of clinicians referring ≥ 1 patient). All referral data were obtained from our eReferral system through each enrolled clinician’s unique username. We obtained the number and names of eligible clinicians from the Survivorship Coordinator during recruitment and were able to calculate the proportion of clinicians adopting ActivityChoice from number enrolled divided by number who were eligible and approached by the study team. We obtained the number of enrolled individuals in each of the physical activity programs by receiving enrollment reports from the YMCA Executive Director and the Fit Cancer Program Coordinator.

Data analysis

For quantitative outcomes, we used Stata Version 15.1 to calculate descriptive statistics of the number of accepted referrals from our eReferral system, proportion of participants who enrolled in programs, and proportion of eligible clinicians who enrolled in the study. For qualitative data, we followed the same data management, transcription, and analyses process we described above for Phase 1.

PHASE 2 PDSA 1 REFERRAL RESULTS

In the PDSA cycle 1, clinician participants ($n = 7$) were all female, two Physician's Assistants and five Nurse Practitioners, with 5 from the academic medical center (Hematology/Oncology = 3, and Breast = 2) and two from the Community Hospitals (serving all cancer types). Clinicians referred 18 patients using the eReferral system out of which 7 participants enrolled in the physical activity program (see Table 2). Table 2 shows the quantitative results of PDSA Cycles 1 and 2 for clinician adoption, clinician engagement, the number of patients referred, and the results for how many patients enrolled or deferred enrollment in programs following referrals. While Cycle 1 enrolled 41% of eligible clinicians, only 57% referred ≥ 1 patient. Of those clinicians, we saw two clinicians had much higher referral numbers than the other two.

PDSA cycle 1 patient feedback

Interviews with referred patients ($N = 6$) revealed the following themes and illustrative quotes:

Patients' experiences with the referral process varied.

Some patients reported smooth processes in the referral from clinicians and physical activity program enrollment, "... it worked fine with the direct communication. When I was doing a clinic visit, I don't remember if they simply gave me the number, or they contacted the person who ran the group. I believe they called me direct for an appointment where she assessed my level. So that all flowed smoothly as far as I'm concerned." However, other patients experienced less of a delay in contact time, "There was a bit of a delay getting connected. I think it was just a lot of timing issues and they didn't have a cohort ready." Some patients were unaware they had a choice of programs, "I can't remember but I didn't make a choice... she asked if I was interested and I just ended up in the program."

Appreciation for both in-person and virtual programs.

Some patients voiced specific personal preference or logistical reason for choosing the virtual or in-person program. One preferring the virtual program stated, "I'm not leaving my cozy little place to get in a car, drive twice a week of fighting a snow-storm or icy roads and hills. I'm not doing that." Another who chose the virtual program reflected, "Yeah it (LIVESTRONG) was from a good way from home...the virtual program was really convenient, and it was during the pandemic. So it kept me

at home." While others preferred the in-person LIVESTRONG program. "...it motivates me to wanna go and do that. And I don't have to sit down. At least I can say, I gotta go to the Y and do this." One patient liked the equipment they had access to at the YMCA for the LIVESTRONG programs "Cause I look forward to every Thursday. Cause I knew I was gonna get some good exercise on the bike and I was gonna lift."

Patients rely on clinicians to facilitate their decision.

Patients relied heavily on the clinicians to guide their decisions about which type of program to participate in. "So when one of the nurses or doctors tell us, okay, they have this program and this program, which one will you interested in? Which one will you like to join and break it down to us. then we think, okay, I can do this one. Is it okay? I will join this." Another patient enrolled in the program after his clinician told him what the program entailed, "she said, there's a nice class at the gym. And I told her, I don't want a class that's just gonna sit around and moan and groan... she told me it wasn't like that, and it turned out to be fantastic."

Interviews from enrolled clinicians ($N = 2$) revealed the following themes and illustrative quotes:

Active referrals and program choices were very beneficial to their patients.

Clinicians noted the importance of providing referrals to patients, "if we just give them the information (without an active referral), it's, you know, it's probably just gonna go in a paper file somewhere." They also noted they liked that their patients had choices to two different types of programs. "It's wonderful to be able to offer this type of thing to our patients and I think the remote option is awesome"

Physical activity referrals can be offered to patients at any point in survivorship.

One Community Hospital clinician noted, "Survivorship is always good timing. In the community here, sometimes our patients are more advanced disease or have other stuff going on. So I'm trying to weave it into the conversation when I'm talking about activity and how people are doing and do they wanna do more? Then I offer that and people are really receptive to hearing about it." Another clinician mentioned, "My other lady that's gonna start, she has pretty advanced myeloma has had a lot of issues and is suddenly feeling better on treatment and has been more active. So is very excited to do more strengthening and things that will help her out so she can keep going on with treatment." One clinician mentioned the importance of looping in primary care, "I think at some point this should be in primary cares. Because you're handing over the patient back to the primary care and then you're in the background and a lot of times they've had all sorts of intensive stuff and they might not know what to look for."

eReferral could be better integrated into workflow.

One clinician mentioned workflow issues, "When I had to <refer>, I ran out back to my desk to get the form with the website. Cuz I don't like when we do use the desktop in these clinic rooms, it doesn't always give you your favorites

Table 2 | Staff adoption and engagement, patient referrals and program enrollment across two 12-week PDSA cycles

| | Cycle 1 (March–May 2021) | Cycle 2 (December 2021– March 2022) |
|---|--------------------------------|---|
| Staff enrolled, frequency (%) | 7 (41.2%) | 8 (53.3%) |
| Staff referring ≥ 1 patient, frequency (%) | 4 (57.1%) | 5 (62.5%) |
| Patient referred, frequency ^a | 18 | 36 |
| Patients enrolled, frequency (%) | 7 (39%) | 12 (33.3%) |
| Deferred enrollment | 4 (30%) | 5 (13.9%) |

^a Unable to determine % due to lack of a denominator.

eRefer

Your Email Address:

Project List:
ActivityLink: Survivor Physical Activity Referral

Participant Email Address:

Participant CellPhone:(format - xxx-xxx-xxxx)

Participant Name:

Others:

Submit

Physical Activity Benefits
Physical activity can improve your:

- Ability to use your body to do things
- Balance
- Risk of heart disease
- Blood flow
- Self-esteem and mental health
- Nausea and fatigue
- Ability to keep social contacts
- Quality of life

Physical Activity Guidelines
The American Cancer Society recommends:

- Take part in regular physical activity
- Avoid inactivity and return to normal daily activities as soon as possible after diagnosis
- Exercise at least 150 minutes per week
- Include strength training exercises at least 2 days per week

Considerations

Location: Would you prefer to be at home (online/virtual) or in-person?
Schedule: When will you be available?
Support: Who/what will you need to help maintain your activity?

LIVESTRONG AT THE YMCA
This 12-week program is for post-diagnosed cancer survivors.

- 12-weeks in-person
- Meets 2x/week
- 5-10 participants per group
- Led by qualified exercise professionals
- Locations in Central MA
- Free membership and childcare

<https://www.ymcaofcm.org/programs/livestrong/>

Fit Cancer
Fitness Therapy for Cancer Program is a supportive group based exercise program designed for cancer survivors at any phase of the cancer journey, including those who have become de-conditioned or chronically fatigued from the treatment process.

- 8-weeks remotely delivered via Zoom
- Meets 1x/week
- 5 participants per group
- Led by qualified exercise professionals
- Provides equipment via mail

<https://www.chhs.colostate.edu/hes/outreach-and-engagement/fit-cancer/>

Fig 2 | Revised eReferral interface and printed handouts

or anything.” During our bi-weekly check-ins, we found clinicians wanted a field added into the eRefer system to enter notes about which program their patient preferred or any other relevant information during the referral process. They also mentioned forgetting the specific details about each of the programs. Our check-ins with the Survivorship Coordinator were also critical to understand how the study findings could influence change in the external environment, particularly as survivorship visits become reimbursable services.

ActivityChoice Refinements

Based on feedback in cycle 1, we made changes for PDSA Cycle 2. To address issues with clinician’s workflow, we educated and demonstrated to clinicians the smartphone option to access the eReferral webform. We also added an “open notes” section to the eRefer tool for clinicians to add in open text where they could provide more information about their patients. To address the variations in referral processes, such as knowing choices existed, and facilitate patient-clinician discussions, we added a printed handout that had information on the specifics of each of the physical activity program. These handouts were given to all enrolled clinicians, who then provided them to their patients when they were conducting their referral (see Fig. 2). We tested these changes in PDSA Cycle 2 as discussed below:

PHASE 2 PDSA CYCLE 2 REFERRAL RESULTS

In the PDSA cycle 2, clinician participants ($n = 8$) were all female, one Physician’s Assistant, five Nurse Practitioners, and one Registered Nurse, with 6 from the academic medical center (Hematology/Oncology = 2, Breast = 2, Gynecology = 1, and Neurology = 1) and two from the Community

Hospitals (serving all cancer types). Clinicians referred 36 patients using the eReferral system out of which 12 participants enrolled in the physical activity program (see Table 2). Similar to Cycle 1, we saw two of the five enrolled clinicians who referred ≥ 1 patient, refer a greater number of patients.

Phase 2 PDSA cycle 2 clinician feedback

In our follow-up interviews with enrolled patients ($N = 3$), we found very similar feedback as we did in Phase 1. However, we added in a question asking patients about seeing the printed handout before their referral and found some could not remember if they actually saw the printed handout with program descriptions or not. “You know what, I think she did... Sometimes my brain is fried... but, um, I think she did, and I might have to look around in my files.” However, they expressed that having printed materials to explain the different programs would be helpful to them. “Having a flyer or some kind of printed material, I like, cause I like to highlight things and read it and I do keep that sort of stuff.” Another patient commented on a receiving a printed handout, “Getting a handout, you know, a little flyer, this is what you can do and any questions call about it or, you know, the different activities you can do.” A follow-up interview with the survivorship coordinator suggested that putting the printed handout into the patient’s survivorship care packet would be a great place for them to see the choices before their care planning visit.

DISCUSSION

In collaboration with clinical, community, and patient partners, we used a multi-phase step iterative process to develop and test a multi-component eReferral implementation program for clinicians to refer cancer survivors to their choice of

a virtual or in-person community-based physical activity programs. At each phase, we received crucial feedback that was used to refine the program for the subsequent phase. In both PDSA cycles, the eReferral increased referrals of survivors to physical activity programs, however; there were variations in the numbers of survivors referred by each clinician, with some clinicians acting as super-referrers. Including multiple physical activity programs were desired by both clinicians and services, but clinicians may need added support to help survivors navigate through the program choices.

There are complexities to integrating systems and processes between clinic and community partners, while also considering the needs of the patients. Our use of an implementation science framework (PRISM) provided the contextual assessment needed to design the program to meet the needs of not just our clinic partners but also our community and patient partners [35]. Our iterative development approach using PDSA cycles allowed us to collect critical feedback from relevant partners multiple times and refine the system and our strategies efficiently. Because we adapted this system to a new setting, it was critical to make contextual adaptations in real-time rather than relying on traditional implementation mapping that identifies implementation strategies that become “frozen” and disseminated across settings despite the potential need for refinements [36, 37]. At the end of the PDSA cycle 1, we increased support for the clinicians to help patients decide between the two program choices and made the eReferral webform more readily accessible. There was a slight increase in the overall frequency of referrals, and though some patients did not see the handout, those who did note its benefit in improving the overall experience, along with clinicians.

Clinicians were relatively receptive to the study efforts with about half of the staff enrolled to participate in each cycle. However, we noticed the occurrence of a few “super-referrers”—clinicians who referred a higher proportion of patients compared to others. Other studies have mentioned the super-referrer phenomenon and the role they play in patient referrals. Clinic champions, those who are able to improve the success of an implementation by changing organizational culture and overcoming resistance to the intervention [38], have shown to be vital for clinician adoption of referrals to physical activity programs for cancer survivors [39]. However, studies have not clearly identified the unique attributes of these super-referrer clinicians, which may be useful in increasing the successes of these clinic-based implementation programs [40–42]. While some clinicians mentioned providing referrals through the EHR, a technology un-tethered to the EHR allowed for quicker adaptations and may increase the potential for dissemination to other healthcare systems and additional community programs. Through our formative work and that of others [43], we also found referrals through the EHR may be accessible by community partners or allow for bi-directional communication with clinicians. In our study, we found most clinicians were receptive to referrals outside of EHR, though one did prefer EHR-based referrals. As our system and EHRs become more advanced, integrating this type of eRefer into EHR may be more feasible and acceptable to staff as some noted in our interviews.

After Cycle 1, we added a printed handout with physical activity program details for the second PDSA cycle, and we saw more referrals take place. However, some patients did not see the printed handout even though they liked the idea

of it. Our results show it is critical to integrate support into clinic workflow to ensure patients receive information and can discuss it with their care team, without causing added burden to the workflow. Providing paper patient handouts to patients prior to visits, such as before survivorship care planning visits, may streamline clinic workflow. Though clinicians reported liking offering referrals at all points of survivorship, schedulers often provide patients paperwork prior to survivorship care planning visits and could remove the clinicians’ burden of providing the printed handout by adding it to the paperwork the patient receives. As noted, patients still wanted to discuss choices with trusted clinicians. Revising our printed handout into a formal patient decision aid and providing them to patients prior to clinic visits could help facilitate their discussion with clinicians during their visit. Decision aids can reduce staff burden and time within the visit [44]. They help patients make choices with their care team [45] as they can match patients’ values to choices [46]. This may have an influence on not only the number of referrals clinicians make due to patient receptivity but also on the proportion of patients who actually enroll in physical activity programs.

We note limitations to the study. Due to the pragmatic nature of the trial and focus on clinician implementation, we lack some patient-level data. First, we lack qualitative data on those who did not accept referrals. As part of the initial clinical workflow, we asked clinicians to document patients who refused the referral and their reasons for not joining the program/refusing referrals, with a waiver of authorization in place. However, we were unable to collect these data, as this added step for clinicians did not fit well into their workflow. We were also unable to determine which patients were not offered the referral, and what factors may have been related to those offered and not offered a referral. This limited our understanding of patients being equitably offered referrals and receiving the support needed to follow through with program enrollment. Though we conducted individual clinician interviews at all clinic sites, we also are limited in our understanding of the organizational needs of each type of setting. Community Hospitals have fewer resources than the Academic Medical Center and may need additional resources and implementation support, which could be identified through an initial organizational needs assessment.

CONCLUSIONS

In conclusion, ActivityChoice was implemented in cancer survivor clinics and demonstrated acceptability from both clinicians and patients. This pilot study shows that electronic referrals to existing physical activity programs for cancer survivors can be integrated into routine clinical care. However, we highlight that added support is needed at the clinic and patient-levels to facilitate referrals and subsequent program enrollment. Additional implementation strategies may provide clinicians with added workflow support to facilitate referrals. Further testing is also needed on patient-level outcomes to determine the clinical effectiveness of the eReferral system.

SUPPLEMENTARY MATERIAL

Supplementary material is available at *Translational Behavioral Medicine* online.

FUNDING

The study was funded through the National Heart, Lung, and Blood Institute (1K12HL138049 and 1K01HL163254).

COMPLIANCE WITH ETHICAL STANDARDS

Conflicts of Interest: All authors declare they have no conflicts of interest.

Human Rights: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration, and its later amendments or comparable ethical standards.

Informed Consent: Informed consent was obtained from all individual participants included in the study.

Welfare of Animals: This article does not contain any studies with animals performed by any of the authors.

Trial Registration: ClinicalTrials.gov Identifier: NCT05216380, Registered 31 January 2022—Retrospectively registered. <https://clinicaltrials.gov/ct2/show/NCT05216380?term=activitylink&draw=2&rank=1>. This study was registered after the study began. The study is registered at ClinicalTrials.gov (NCT05216380). The analysis plan was not formally pre-registered. De-identified data from this study are not available in a public archive. De-identified data from this study will be made available (as allowable according to institutional IRB standards) by emailing the corresponding author. There is no analytic code associated with this study. Some of the materials used to conduct the study are presented in a public archive: <https://erefer.umassmed.edu/>

Appendices

Appendix 1. Phase 1 clinician questions mapped on to PRISM(47) domains

| PRISM domain | Example of key questions relevant to Activity-Choice |
|---------------------------------|--|
| Program (Intervention) | • What steps are needed to prepare key staff to identify and screen patients? To conduct the program? How can the system best be embedded into workflow? |
| Organizational perspective | • How can the program be more patient-centered and less complex for patients? Does it address important patient barriers to response? |
| Patient perspective | • Are there community/outside resources that can enhance intervention? Are patients safe going to in-person programs? |
| External Environment | • How can existing infrastructure be used to handle key implementation/sustainability tasks? |
| Implementation & Sustainability | • Can implementation/sustainability tasks be part of key staff job descriptions? |
| Infrastructure | • Which available systems can best support implementing the program? Do key staff expect the program to be sustainable? |
| Recipients | • What are common knowledge, beliefs and perceived risk patterns among patient recipients? (modifiable factors regarding patient perceived net benefit) |
| Organizational characteristics | |
| Patient characteristics | |

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