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Title: Identifying factors influencing sustainability of innovations in cancer survivorship care: a qualitative study

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ABSTRACT

Objectives: Moving innovations into health care organizations to increase positive health outcomes remains a significant challenge. Even when knowledge and tools are adopted, they often fail to become integrated into the long-term routines of organizations. The objective of this study was to identify factors and processes influencing the sustainability of innovations in cancer survivorship care. **Design:** Qualitative study using semi-structured, in-depth interviews, informed by grounded theory. Data were collected and analyzed concurrently, using constant comparative analysis. **Setting:** 25 cancer survivorship innovations based in six Canadian provinces. **Participants:** Twenty-seven implementation leaders and relevant staff from across Canada involved in the implementation of innovations in cancer survivorship. **Results:** The findings were categorised according to determinants, processes, and implementation outcomes, and whether a factor was necessary to sustainability, or important but not necessary. Seven determinants, six processes, and three implementation outcomes were perceived to influence sustainability. The necessary determinants were 1) management support; 2) organizational and system-level priorities; and 3) key people and expertise. Necessary processes were 4) innovation adaptation; 5) stakeholder engagement; and 6) ongoing education and training. The only necessary implementation outcome was 7) widespread staff and organizational buy-in for the innovation.

Conclusions: Factors influencing the sustainability of cancer survivorship innovations exist across multiple levels of the health system and are often interdependent. Study findings may be used by implementation teams to plan for sustainability from the beginning of innovation adoption initiatives.

Keywords: oncology, health services administration and management, qualitative research

STRENGTHS AND LIMITATIONS OF THIS STUDY

- The sustainability of evidence-based innovations has been described as "one of the least understood and most vexing issues for implementation research" and we provide a comprehensive inquiry of factors and processes influencing the sustainability of innovations in health care.
- We interviewed 27 implementation leaders and relevant staff from 25 cancer survivorship innovations that were implemented across Canadian jurisdictions.
- We used several implementation science frameworks and taxonomies to design our study and analyse and interpret the findings.
- This is a critical area of inquiry, given there is limited empirical data on the processes by which innovations are sustained in clinical settings as well as the considerable investment over the past decade to implement beneficial innovations so more people have access to high-quality health care.

INTRODUCTION

Across Canada, many studies have identified gaps in the delivery of cancer care whereby the care patients receive is not consistent with scientific evidence [1-8]. The Canadian Strategy for Cancer Control estimated that cancer outcomes could improve by as much as 30% by routinely applying existing evidence in practice [9]. Similarly, the World Health Organization estimated that worldwide, one-third of cancer cases could be prevented and another one-third cured if evidence-based practices were consistently implemented and sustained in care [10]. Importantly, even when knowledge and tools are put into practice, they often fail to become integrated into the long-term routines of organizations [11-13]. This poor sustainment means many patients do not benefit from the best care possible [14-16].

The sustainability of evidence-based innovations has been described as "one of the least understood and most vexing issues for implementation research" [17]. In the past decade, a number of researchers have published conceptual models on innovation sustainability in health care [18-21], while recent reviews have provided syntheses of how researchers in the field define and approach sustainability [22, 23]. Nevertheless, there remains limited empirical data on the processes by which innovations are sustained in clinical settings and the factors that influence sustainability [17, 24-26].

Focusing on cancer survivorship care, this study examined whether and how various evidence-based innovations have been sustained. Cancer survivorship was the focus of this study for three reasons: 1) the number of cancer survivors has grown substantially due to advances in early diagnosis and treatment [27]; 2) cancer survivorship has become a strategic policy focus, with Canadian decision-makers seeking ways to deliver care and implement innovations that address the needs and circumstances of this growing population; and 3) cancer research funders in Canada have explicitly stated a need to integrate *what we know* into survivorship programs and policy [28]. The specific objectives were to 1) identify factors influencing sustainability and 2) explore the processes that facilitate the sustainability of innovations in cancer survivorship care.

MATERIALS AND METHODS

Study design

We conducted a qualitative study, informed by the principles of grounded theory [29], on the sustainability of evidence-based innovations in cancer survivorship care that have been implemented across Canadian jurisdictions. An innovation was defined as new knowledge, tools, or interventions (including programs and services) that organizations are using for the first time [30]. An innovation was considered evidence-based if at least one published peer-reviewed study, using an experimental or quasi-experimental design, demonstrated improved outcomes for the target population. This is the criterion used by the National Cancer Institute for Research-Tested Intervention Programs specifically for cancer control and cancer survivorship interventions [31]. Sustainability was defined as the *continuation* of the innovation's activities or outcomes beyond the initial implementation stage or initial funding period [32]. This study was approved by the Nova Scotia Health Authority's Research Ethics Board. All participants provided written informed consent before participating in the study.

Patient and Public Involvement

No patient involved.

Conceptual Frameworks

The study was informed by Scheirer's work on sustainability [32, 33], the dynamic sustainability framework (DSF) [19], and Nilsen's taxonomy of implementation frameworks [34]. Scheirer's work was used during sampling, specifically to identify innovations based on innovation type: those implemented by individual providers; those requiring coordination among multiple staff; new policies, procedures, and technologies; capacity or infrastructure building; collaborative partnerships or coalitions; and broad-

scale system change. The DSF proposes that the "fit" between the innovation (specifically, interventions) and the setting is key to sustainability, and focuses on three main elements: the intervention, practice setting or context, and broader ecological system. This framework informed development of the interview guide (e.g., questions and probes around the innovation, practice setting, and broader health care system) and ongoing analyses/interpretation. Nilsen's taxonomy was used during data analysis only to categorize the resultant findings (see below).

Participants

Participants were implementation leaders and relevant staff from across Canada involved in the implementation of a range of innovations in cancer survivorship care (e.g., self-management tools, physical activity programs, and models of follow-up care). We purposively recruited participants to maximize variation in cancer site, type of innovation [33], and geographic setting. Individual recruitment involved purposive sampling to identify the implementation leader(s) and/or staff member(s) who was most directly involved in the implementation and/or sustainment of the innovation. These individuals were contacted by the lead author (RU) via email and invited to anticipate. Data collection continued until thematic saturation was reached [35].

Data Collection

We conducted one-on-one, semi-structured telephone interviews with participants. An interview guide was developed based on the study objectives and the DSF, using practical guidance from Patton [36] and Rubin and Rubin [37]. The interviews focused on eliciting participants' understandings of the innovation, the process by which it was implemented, whether and how the innovation is sustained, and the multi-level factors affecting its sustained use and impact. One master's trained research associate with experience in qualitative methods (LLM) conducted all interviews, which lasted approximately 40-60

minutes. The interviewer had no prior relationship with any of the participants, and no repeat interviews were conducted. Field notes were taken during interviews to record interviewer observations and perceptions. All interviews were audiotaped and transcribed verbatim.

Data Analysis

Consistent with grounded theory, the interview data were collected and analyzed concurrently. An inductive approach, using constant comparative analysis, was used to analyze the interview transcripts [29]. Analysis involved coding, constant comparison, and identification, organization, and refinement of categories. To help ensure consistency and conceptual clarity throughout the process of coding and categorization, a coding framework (i.e., "codebook") was developed by the lead author (RU) and research associate (LLM). This was achieved through review of three transcripts and a team discussion. Next, the research associate used the codebook to code the remaining transcripts, with regular meetings between the same two individuals to review coding and the consistency of applying the codes to the interview text, consult with field notes, and refine the codebook as needed. Qualitative software (NVivo 10, QSR International, 2012) was used for data management and to facilitate comparison and synthesis of codes. Several full team meetings were also conducted to review coding and discuss emerging findings.

During a final two-day team meeting, the resultant findings were categorised according to determinants, processes, and implementation outcomes, and whether the data suggested a factor was necessary to sustainability or important but not necessary. Drawing on Nilsen's taxonomy of implementation frameworks [34], we categorized factors as those that help us understand and/or explain what influences outcomes (determinants), those that describe the processes that help translate innovations into practice (processes), and those that identify important aspects by which to evaluate the initial implementation (implementation outcomes). Regarding the latter, implementation outcomes

were specifically defined as "the effects of deliberate and purposive actions to implement new treatments, practices and services" [38]. Determining whether a factor was 'necessary' or 'important but not necessary' was an iterative process that involved analyzing participant perspectives on this issue as well as the data on whether and the extent to which a specific innovation was sustained (i.e., *continued* activities or outcomes beyond the initial implementation stage or initial funding period [32], as described above) in the presence or absence of all resultant factors. If innovations were sustained in the absence of a particular factor, then this factor was deemed important but not necessary.

RESULTS

Twenty-seven participants from 25 unique cancer survivorship innovations based in six Canadian provinces (British Columbia, Alberta, Manitoba, Ontario, Quebec, and Nova Scotia) participated in this study. Most, but not all, innovations were sustained to some degree in that activities continued after the initial funding period. The innovations were grouped into five categories, depending on its intended purpose: physical activity programs, psychological support/counselling, transition to survivorship programs, transition to primary care programs, and return to life and lifestyle programs. Eighteen were delivered in-person, four were delivered online, and three were delivered both in-person and online.

Sixteen factors were perceived to influence sustainability: seven determinants, five processes, and four implementation outcomes (Figure 1). Seven of these were deemed necessary, while nine were important but not necessary. Table 1 presents all 16 factors, with brief descriptions. The necessary determinants, discussed in detail below, were 1) management support; 2) organizational and system-level priorities; and 3) key people and expertise. Necessary processes were 4) adaptation; 5) stakeholder engagement; and 6) ongoing education and training. The only necessary implementation outcome was 7) staff and organizational buy-in for the innovation.

Necessary Determinants

Management support

Participants continually voiced their experience that the support of middle and senior managers is imperative to the sustained use of any innovation. Their experience was that even with all other pieces in place, it is extremely challenging to sustain any innovation without management support. As one participated stated, "*Management support, for sure, is very important, especially for growth. Um, very, very important*" [Participant 19]. Participants noted that management support tends to result in ongoing funding, whether this is the direct provision of funds (e.g., out of their program budget) or advocating for funding from other sources. Participants also described how it is often difficult for managers to support innovations in survivorship care because of competing priorities and that survivorship care does not result in quantifiable metrics in the same the way other areas of care do:

> I would say that it's one of the … tougher components for people, for senior management, to buy into because it's a softer metric to try to collect in a way. Because it's not like you've got numbers of patients going through chemo or radiation. It's not, you know, survivorship care is a lot harder to look at that data and try to figure out if it's meaningful or worth it. [Participant 2]

Participants also noted that management support is much higher when an innovation and its sustainment are appropriately resourced and funded. Innovations that do not have secure funding require managers to transfer operational funds and/or allocate other resources (e.g., staff time) away from existing programs and services.

Organizational and system-level priorities

All participants discussed how survivorship care is perceived as a low organizational and health system priority relative to other cancer programs and services. As one participant stated, "*It's not because people aren't interested in [survivorship care], it's just that it's maybe seen, maybe viewed as the nice to*

have, not the need to have" [Participant 2]. As a result, the sustainment of innovations that have been implemented were described as particularly challenging, regardless of the extent to which program components are in place and working well. Participants described several instances whereby survivorship care was prioritized and therefore initial implementation efforts were well supported and resourced. One example of this is a focus on post-cancer treatment transitions mandated by the province of Ontario: "*Having Cancer Care Ontario … starting to really implement comprehensive care that includes the patient, not just the tumour, is really helpful. Because our hospitals are funded by the degree to which they meet these mandates*" [Participant 18]. However, participants noted that even when innovations appeared to be integrated, shifting priorities at the health authority or government level often meant that sustainability was threatened. Speaking about an innovation related to transitioning survivors from active treatment to well follow-up care, one participant explained:

> There had been significant shifting in terms of how our organization was structured and who actually had the authority and power, and their viewpoint on all of it. And, so, we couldn't at that point really proceed with it because the organization was really shifting away from that work. [Participant 11]

Key people and expertise

Participants continually emphasized the importance of two key individuals for ongoing sustainment of innovations: clinical champions and dedicated coordinators (or similar personnel). Ongoing champions were deemed necessary for sustainability. Several innovations illustrated this perspective. One was a program aimed at transitioning low-risk survivors back to primary care after treatment. This program, led by a tremendously well-respected clinical champion, had been in place for more than four years and appeared well integrated within the cancer care setting. However, upon loss of the champion, the program was substantially altered and eventually dwindled to minimal use. Conversely, two other

transition programs, in other jurisdictions, did not secure ongoing funding after the initial pilots, but maintained ongoing activities simply because the clinical champions continued the service, sometimes in a voluntary role (i.e., during evenings and weekends) despite a lack of funding and other resources.

For many programs, participants also described dedicated program coordinators (or staff members with a coordination role) as being a necessary resource for sustainability, playing a complementary role to clinical champions. Their experience was that such a role was necessary to ensure the innovation was running smoothly, including the continuation of activities and tracking of deliverables. As one participant said:

> It could conceivably be just a small team or one person working remotely, coordinating this kind of thing and sort of, like I said, overseeing the [innovation] and making sure that technological and referral purpose is running smoothly. But, it has to be, it does have to be there. It can't run itself. [Participant 7]

Many participants highlighted that certain expertise or skillsets are often needed for an innovation to continue to work efficiently and effectively. An example was the presence of certified exercise professionals for physical activity programs.

Necessary Processes

Adaptation

All participants emphasized that adaptation, not fidelity, is necessary for sustainability. Participants discussed how their task, as leaders and staff of innovations, was to ensure that the innovation evolved and adapted as necessary in their particular setting. Their view was that without adaptation, there was no sustainability. Adaptation was necessary to allow the team/organization to continually meet the needs of patients and to maintain fit with the setting/environment (e.g., changing staff, capacity, resources, policies, and political environment). As one participant stated:

> Our being flexible and adapting to what would work, both for ourselves and our limited resources and time and for our patients. I think if we hadn't adapted the program, we wouldn't still be offering it. So, we had to adapt and change and shorten and condense, while sticking to the hearts and, you know, key concepts of the program. [Participant 17]

Table 2 provides examples of adaptations to each type of innovation. Many were related to delivery mechanisms with the goal of increasing accessibility of the program and/or its feasibility (e.g., changing the frequency or timing of delivery, moving some components to online delivery, changing referral processes). Moreover, it was widely recognized that adaptation was necessary because the evidence base for innovations change. An innovation today, both its components and target population, will likely change as new evidence becomes available: "*I think it's imperative to keep current with the evidence for whatever it is you're offering. And making adaptations with the program that are in keeping with the evidence*" [Participant 6].

Stakeholder engagement

Participants described the engagement of important stakeholders (e.g., physicians, patients, administrators) as essential to sustainability. The data indicated participants viewed engagement as critical for two reasons. First, engagement increases awareness of the innovation, its evidence base, and its potential benefits, and helps to develop trust and a sense of ownership with regard to the innovation. As one participant said:

> … the consultations in advance and the getting the people on board and having their input into how things are gonna look and design, I think that was required in order to get any of them on board for something that would be a voluntary change in practice. [Participant 8]

Second, engagement contributed to the practice-based adaptation of the innovations to optimize fit to the local setting. This engagement occurred through mechanisms such as establishing Steering or

Advisory Committees composed of key stakeholders, conducting needs assessments, meeting with multidisciplinary cancer site teams/tumour boards, consulting with primary care providers/networks, and co-designing with patient and/or physician groups. Participants described engagement as positively changing both the engaged person (through building a sense of ownership and personal investment; discussed below) as well as the innovation itself (through adaptation to the local setting; discussed above), both viewed as essential to sustainability.

Ongoing education and training

Participants across all organizations and jurisdictions emphasized that ongoing education and training was required to sustain their innovations. This was particularly true due to high staff turnover, which was deemed prevalent across organizations and jurisdictions. The nature of academic health care settings, with turnover of learners on an ongoing and frequent basis, was also described as a challenge to sustainability:

> Probably one of the biggest barriers is that there's always new staff that come along, like fellows and residents and stuff like that. So, um, you know, they're often just not even aware. So unless there's some kind of process in place to sort of orient them to those types of things then they won't be delivering it. [Participant 16]

Ongoing training was viewed as particularly important in cancer survivorship care given the absence of formal education and training in survivorship issues for most health care providers. One participant put it this way: "…*teaching, teaching the next one, so that … we can grow our force of people involved in survivorship care. If we don't invest in that then, well then, I'm never gonna have a vacation*" [Participant 24].

Necessary Implementation Outcome

Widespread staff and organizational buy-in

Participants stated that ongoing and widespread staff and organizational buy-in is absolutely necessary for sustainability. One participant summed this up by saying, "*without buy in and support from the physicians, from other nurses, from the other allied health staff, from the receptionist, from everybody, um, the program wouldn't work*" [Participant 23]. Participants discussed many factors during the implementation period that lead to widespread buy-in, including attributes of the innovation itself (e.g., ease of use), how the innovation is initially framed/presented (including its evidence base), stakeholder engagement, and whether it is a priority of senior management. Participants also stated that the overall low priority of survivorship care (relevant to other areas of cancer care) serves to decrease buy-in from at all levels of the organizations.

Important but not necessary

The data suggested 9 factors were important to sustainability, but not necessary. These are presented in Table 1. For example, while resources in the form of funding, equipment, and physical space are very important for many innovations, the data demonstrated that, with the exception of one innovation, the loss of the initial implementation funding, or the lack of additional funding, equipment, or space to expand beyond the implementation phase, did not result in a loss of the innovation if other necessary factors were present (e.g., key people). Similarly, penetration of the innovation into existing workflows and systems, particularly hospital information technology systems, was perceived as important to many of the innovations, yet many innovations were sustained (oftentimes described as continuation of program components and activities) in the absence of penetration when other necessary components were in place.

DISCUSSION

We investigated the factors influencing the sustainability of 25 different types of innovations in cancer survivorship care. The findings revealed a number of factors deemed necessary for sustainability: management support; organizational and system-level priorities; key people and expertise; innovation adaptation; stakeholder engagement; ongoing education and training; and staff and organizational buy-in. These findings are important given the considerable investment over the past decade to implement and scale beneficial innovations within and across Canadian jurisdictions so more people have access to high-quality cancer survivorship care. They point to specific factors implementation teams should consider and plan for to achieve their desired outcomes and maximize the long-term impact of these investments.

Many of the determinants, processes, and outcomes identified in this study align with the emerging literature in this area. A recently developed framework [26] from a 2018 review on sustainability identified four key processes that the evidence suggests are important to sustainability: partnership/engagement, training/supervision, program evaluation, and adaptation. Moreover, program champions, leadership/support, resources/funding, and staffing/turnover were all identified as key inner (organizational) contextual factors that influence sustainability. While the concepts may be phrased differently, our findings markedly align with the existing evidence in this area. There were also several factors identified by participants in this study that are somewhat unique, or not explicitly specified, in the literature. One of these is the speed of implementation, which participants viewed as being important because a slow(er) implementation allows implementation teams the time to plan for and implement in a way that leverages the key elements needed for sustainability. Moreover, we categorized a number of our findings as implementation outcomes, which are necessary for or important to sustainability. While we recognize that sustainability has been described as an implementation outcome itself [38], few researchers have attempted to describe or delineate the

impact of more proximal implementation outcomes (e.g., adoption) on the sustained use of an innovation, yet these proximal outcomes may act as moderators to sustainability (e.g., continuation of program components/activities and/or continuation of desired outcomes). Such relationships could be tested in future research.

The emphasis on the essential role of adaptation for sustainability deserves discussion. Participants were implementation leaders and relevant staff involved in the implementation and/or sustainment of innovations relevant to cancer survivorship care. Their perspectives were largely practice-based, with an acute recognition that one-sized-fits-all innovations do not work for most settings. This is supported by the increasing awareness in the literature that adaptation is common and likely necessary to facilitate sustainability [19, 26, 39, 40]. Many of the described adaptations were made in response to unanticipated challenges, and thus might be better termed modifications [39]. Moreover, many were to form, rather than function [41, 42]. That is, adaptations were made to specific strategies or activities (forms) rather than the intended purposes the innovation aims to achieve (functions). For example, educating and supporting patients to more effectively manage their post-treatment health concerns (function) may be accomplished through various activities, such as one-on-one teaching, individualized care plans, and so on (forms). These types of adaptations demonstrate the importance of 'flexibility within fidelity' [43] or fidelity-consistent adaptations [39] for sustainability. In its methodology standards for studies of complex interventions, the Patient-Centered Outcomes Research Institute (PCORI) in the US advises researchers and implementation teams to clearly delineate an intervention's core functions and forms, and to maintain fidelity to the core functions while documenting adaptations to form [44]. By doing so, we can provide better guidance to those who are implement and evaluate such interventions. This reinforces the need for ongoing evaluation post-implementation to understand the what and why

of adaptations, and how these relate to sustainability; in this study, less than half of the innovations were evaluated post-implementation.

We categorized widespread buy-in as an implementation outcome. We defined widespread buy-in as a commitment to the innovation by a larger group of individuals within the organization or the organization as whole, specifically their commitment to support and engage in an initiative. Although we could find no clear definition or operational specificity of this concept in the existing health literature, the management and business literature does characterize buy-in in terms of one's intellectual and emotional commitment to an organization's cause and/or plan [45], and provides guidance to increase buy-in during organizational change initiatives [46]. While buy-in, as we have defined, can be present during the decision to adopt an innovation and/or its implementation, buy-in is also a desired result of the strategies and activities (e.g., communications, education/training, use of opinion leaders) put in place during implementation. By and large, implementation teams are seeking to achieve buy-in. In this way, it aligns with the definition of implementation outcomes proposed by Proctor, namely "the effects of the deliberate and purposive actions to implement new treatments, practices, and services" [38]. However, buy-in is not one of the eight commonly-used implementation outcomes [38]. We posit that perhaps this construct might be a useful addition to implementation outcomes and thereby efforts to understand how to appropriately operationalize and measure buy-in are needed.

Clearly, many of the factors presented here relate to one another and are not independent influences on sustainability. For example, stakeholder engagement (a process) often serves to increase wide-spread buy-in (an outcome), which then may result in additional resources (a determinant) to sustain an innovation. Such interdependence will be present in the sustainability of any complex innovation, and demonstrates the 'messiness' of both the science and practice in this area. Future research should

attempt to delineate what combination of factors might be most important for different types of innovations.

From a methodological standpoint, during sampling, we attempted to identify and categorize programs based on Scheirer's suggested innovation types: innovations implemented by individual providers; interventions requiring coordination among multiple staff; new policies, procedures, and technologies; capacity or infrastructure building; collaborative partnerships or coalitions; and broad-scale system change [33]. In practice, this was challenging for several reasons. One, there are few innovations in cancer survivorship that are implemented by individual providers. Two, many of the innovations crossed categories. For example, many innovations required coordination across multiple staff, represented new policies, procedures, or technologies, *and* involved collaborative partnerships with community- or research-based groups. Thus, the most appropriate category was difficult to select and we therefore categorized the innovations by function (i.e., its intended purpose) rather than the level or nature of the change. These are not limitations of Scheirer's taxonomy, but demonstrate the complexity that can arise when attempting to fit into pre-existing categories. We continue to advocate for and support the use of existing nomenclature, taxonomies, and frameworks to help build an evidence base in this area. Nonetheless, while such frameworks should guide our work, we cannot be constrained by them when they are not helpful in the context of a particular study.

This study has a number of strengths. First, we interviewed participants from 25 different survivorship innovations across six jurisdictions, which should increase the transferability of findings. Second, we built on others' work in sustainability, including existing taxonomies and frameworks, to advance knowledge in this area. This study also has several limitations. First, this study focused solely on innovations in cancer survivorship. This may limit transferability to innovations in other areas of care,

although there is no inherent reason why innovations in cancer survivorship should differ from innovations in other areas of chronic disease management that aim to address the physical, psychosocial, and economic sequelae of an illness and its treatment. Second, we attempted to discriminate between factors that are more salient or perceived by participants as necessary to sustainability as opposed to factors that are important, but not necessary. This dichotomization may be somewhat artificial and not true for all settings or innovations. We did this in an attempt to avoid a 'laundry list' of every possible determinant of sustainability. It also attempts to address one of the gaps in our understanding of the factors that influence sustainability: namely, are some factors more critical than others [26]? This is a first step toward identifying critical factors (determinants, processes, and implementation outcomes) of sustainability. Future research should also focus on developing metrics and methods to prioritize these factors, and combinations thereof, and link them to appropriate strategies.

In conclusion, this study demonstrated that certain determinants, processes, and implementation outcomes influence the sustainability of innovations in cancer survivorship care. These factors exist across multiple levels of the health system and are often interdependent. They also demonstrate the dynamic nature of sustainability. Three examples of this dynamism are the ongoing nature of adaptation, the shifting nature of priorities that can change the local landscape and resulting support for sustainment, and the turnover of champions and support staff. The findings may be used by researchers, decision-makers, and implementation teams to plan for sustainability during the early implementation of innovations, particularly factors shown to be necessary to the long-term use of innovations.

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AUTHOR CONTRIBUTIONS

Conceptualization, RU, CK, EC, BJP, GK, SAR, and JLB; Methodology, RU, LLM, CK, EC, BJP, GK, SAR, and JLB; Formal Analysis, RU, LLM; Writing – Original Draft Preparation, RU; Writing – Review & Editing, RU, LLM, CK, EC, BJP, GK, SAR, and JLB; Funding Acquisition, RU, CK, EC, BJP, GK, SAR, and JLB. All authors read and approved the final manuscript.

COMPETING INTERESTS

The authors declare no competing interests.

DATA SHARING STATEMENT

This is a qualitative dataset and therefore not publicly available due to confidentiality reasons.

Table 1. Factors influencing the sustainability of cancer survivorship innovations. Bolding represents necessary factors.

	FACTOR	DESCRIPTION
DETERMINANTS	**Management support**	**The support of middle and senior managers is critcal for sustainability. It is difficult to sustain any innovation in the absence of management support.**
	Organizational and system-level priorities	**Survivorship care is generally not an organizational or system-level priority, making sustainability challenging. Even when survivorship is prioritized, shifting priorities at health authority or government levels often mean sustainability is threatened.**
	Key people & expertise	**Key people, namely clinical champions and project/program coordinators, are particularly important to maintaining an innovation's activities and use. Often, certain expertise or skillsets are required for an innovation to work efficiently and effectively.**
	Resources	Resources in the form of funding, physical space, and equipment are often very important to sustainment, particularly to expand a program or service beyond the population served in the initial pilot phase.
	Complexity	Innovations that are simple, require less time to use, and the coordination and/or cooperation of fewer organizational members are easier to sustain.
	Evidence	Scientific evidence of an innovation's effectiveness contributes to sustainability by strengthening the case for funding, increasing its priority level, and strengthening buy-in from frontline staff (mainly physicians).
	Partnerships	Partnerships with other similar organizations, including community-based organizations, are not necessary for sustainability but can be very important as they permit the sharing of resources and expertise.
PROCESSES	**Adaptation**	**Adaptation, not fidelity, is necessary for sustainability. Adaptation is necessary to continually meet the needs of patients and to maintain fit with the local setting.**
	Stakeholder engagement	**The engagement of key stakeholders (e.g., physicians, patients, administrators) is essential to sustainability by developing a sense of ownership over the innovation and allowing for practice-based adaptations that optimize fit with the local setting.**
	Ongoing education and training	**Ongoing education and training is necessary to sustain innovations, particularly due to high levels of staff turnover in cancer care settings.**
	Speed of implementation	The speed of implementation can impact sustainability. Specifically, implementing slowly permits the time to get many of the key elements in place (e.g., training and ongoing supports, metrics and data collection/reporting procedures,

		stakeholder engagement) that support the long-term sustainment of the innovation.
	Feedback and evaluation	Feedback and evaluation, while not necessary, is important to sustainability as it helps to demonstrate the innovation's value, maintain credibility, maintain buy-in, and help secure ongoing resources, including funding.
IMPLEMENTATION OUTCOMES	**Staff and organizational buy-in**	**Widespread and ongoing staff and organizational buy-in is necessary for sustainability. Many factors during the implementation period lead to buy-in.**
	Adds value	Adding value to the organization (e.g., through positive publicity) and its staff (e.g., saving staff time) helps to maintain buy-in, and increases opportunities for partnerships and additional resources.
	Adoption	A lack of adoption, specifically by patients, threatens sustainability. Many survivorship innovations rely on patients being aware that a particular program or resource is available and choosing to access it. Low patient uptake reinforces the perception such innovations are low priority.
	Penetration	Integrating the innovation into the service setting and its existing subsystems is important to sustainability. These systems include existing clinical workflows, including EMRs, physician ordering, and other forms of documentation. Such integration can provide automatic referrals for programs/services and serve as reminders regarding use.

Table 2. Innovation types and examples of adaptations.

INNOVATION TYPE	FUNCTION	EXAMPLES OF ADAPTATIONS
Physical activity programs	To increase physical activity among cancer survivors	Changes in timing and length of delivery; changes in setting (cancer centre versus community)
Psychological support/counselling	To provide cancer survivors with the tools to manage/cope with psychological, emotional, and social distress	Changes in length of sessions; addition of orientation sessions; transition to online delivery, including apps for smartphones
Transition to survivorship programs	To support cancer survivors' transition from active (intensive) cancer treatment to routine follow-up care	Automatic referrals to program; changes in timing of delivery; changes in setting (cancer centre versus community); addition of content (e.g., self-management)
Transition to primary care programs	To support cancer survivors' transition from specialist-led follow-up care to primary care-led follow-up	Tailoring of tools (e.g., specific recommendations, list of community resources) to cancer types; changes in delivery mode (e.g., mailed versus faxed versus emailed communications)
Return to life and lifestyle programs	To help cancer survivors return to a "new normal" after cancer treatment and/or to support lifestyle changes to improve overall health and well-being	Addition of orientation sessions; automatic registration; transition to online delivery; refinement of websites; addition of content (e.g., sexuality and cancer); changes in frequency, timing, and length of delivery

REFERENCES

1. Corkum M, Urquhart R, G K, Hayden JA, Porter G: **Breast and cervical cancer screening behaviours among colorectal cancer survivors in Nova Scotia**. *Curr Oncol* 2014, **21**(5):e670-677.
2. Johnson PM, Malatjalian D, Porter GA: **Adequacy of nodal harvest in colorectal cancer: a consecutive cohort study**. *J Gastrointest Surg* 2002, **6**(6):883-888; discussion 889-890.
3. Porter GA, Urquhart R, Bu J, Johnson PJ, Grunfeld E: **The impact of audit and feedback on nodal harvest in colorectal cancer**. *BMC Cancer* 2011, **11**:2.
4. Rayson D, Urquhart R, Cox M, Grunfeld E, Porter G: **Adherence to clinical practice guidelines for adjuvant chemotherapy for colorectal cancer in a Canadian province: a population-based analysis**. *J Oncol Pract* 2012, **8**(4):253-259.
5. Richardson DP, Porter GA, Johnson PM: **Population-based use of sphincter-preserving surgery in patients with rectal cancer: is there room for improvement?** *Dis Colon Rectum* 2013, **56**(6):704-710.
6. Urquhart R, Folkes A, Porter G, C K, Cox M, R D, E G: **Population-based longitudinal study of follow-up care for colorectal cancer patients in Nova Scotia**. *J Oncol Pract* 2012, **8**(4):246-252.
7. Latosinsky S, Fradette K, Lix L, Hildebrand K, Turner D: **Canadian breast cancer guidelines: have they made a difference?** *CMAJ* 2007, **176**(6):771-776.
8. Cree M, Tonita J, Turner D, Nugent Z, Alvi R, Barss R, King C, Winget M: **Comparison of treatment received versus long-standing guidelines for stage III colon and stage II/III rectal cancer patients diagnosed in Alberta, Saskatchewan, and Manitoba in 2004**. *Clin Colorectal Cancer* 2009, **8**(3):141-145.
9. Canadian Strategy for Cancer Control: **The Canadian Strategy for Cancer Control: a cancer plan for Canada - Discussion Paper**. In. Ottawa, ON: CSCC Governing Council; 2006.
10. World Health Organization: **Bridging the "know-do" gap. Meeting on knowledge translation in global health. Geneva, Switzerland**. In.; 2006.
11. Ejemot RI, Ehiri JE, Meremikwu MM, Critchley JA: **Hand washing for preventing diarrhoea**. *Cochrane Database Syst Rev* 2008(1):CD004265.
12. Wilson KD, Kurz RS: **Bridging implementation and institutionalization within organizations: proposed employment of continuous quality improvement to further dissemination**. *J Public Health Manag Pract* 2008, **14**(2):109-116.
13. Gillissen F, Ament SM, Maessen JM, Dejong CH, Dirksen CD, van der Weijden T, von Meyenfeldt MF: **Sustainability of an Enhanced Recovery After Surgery Program (ERAS) in Colonic Surgery**. *World J Surg* 2014.
14. Kryworuchko J, Stacey D, Bai N, Graham ID: **Twelve years of clinical practice guideline development, dissemination and evaluation in Canada (1994 to 2005)**. *Implement Sci* 2009, **4**:49.
15. Grunfeld E: **Canadian breast cancer guidelines are as effective as possible under the circumstances**. *CMAJ* 2007, **176**(6):785-786.
16. Sheldon TA, Cullum N, Dawson D, Lankshear A, Lowson K, Watt I, West P, Wright D, Wright J: **What's the evidence that NICE guidance has been implemented? Results from a national evaluation using time series analysis, audit of patients' notes, and interviews**. *BMJ* 2004, **329**(7473).
17. Proctor E, Luke D, Calhoun A, McMillen C, Brownson R, McCrary S, Padek M: **Sustainability of evidence-based healthcare: research agenda, methodological advances, and infrastructure support**. *Implement Sci* 2015, **10**:88.

18. Maher L, DH G, Evans A: **Sustainablity model and guide**. In. Coventry, UK: Institute for Innovation and Improvement, National Health Service. Available at: http://www.institute.nhs.uk/sustainability; 2010.
19. Chambers DA, Glasgow RE, Stange KC: **The dynamic sustainability framework: addressing the paradox of sustainment amid ongoing change**. *Implement Sci* 2013, **8**:117.
20. Schell SF, Luke DA, Schooley MW, Elliott MB, Herbers SH, Mueller NB, Bunger AC: **Public health program capacity for sustainability: a new framework**. *Implement Sci* 2013, **8**:15.
21. Shelton RC, Chambers DA, Glasgow RE: **An Extension of RE-AIM to Enhance Sustainability: Addressing Dynamic Context and Promoting Health Equity Over Time**. *Front Public Health* 2020, **8**:134.
22. Lennox L, Maher L, Reed J: **Navigating the sustainability landscape: a systematic review of sustainability approaches in healthcare**. *Implement Sci* 2018, **13**:27.
23. Moore JE, Mascarenhas A, Bain J, Straus SE: **Developing a comprehensive definition of sustainability**. *Implement Sci* 2017, **12**(1):110.
24. Wiltsey Stirman S, Kimberly J, Cook N, Calloway A, Castro F, Charns M: **The sustainability of new programs and innovations: a review of the empirical literature and recommendations for future research**. *Implement Sci* 2012, **7**:17.
25. Scheirer MA: **Is Sustainability Possible? A Review and Commentary on Empirical Studies of Program Sustainability**. *American Journal of Evaluation* 2005, **26**(3):320-347.
26. Shelton RC, Cooper BR, Stirman SW: **The Sustainability of Evidence-Based Interventions and Practices in Public Health and Health Care**. *Annu Rev Public Health* 2018, **39**:55-76.
27. Canadian Cancer Society's Advisory Committee: **Canadian Cancer Statistics 2019**. In. Toronto, OM: Canadian Cancer Society; 2019.
28. Canadian Cancer Research Alliance: **Pan-Canadian framework for cancer survivorship research**. In. Toronto, ON: CCRA; 2017.
29. Strauss AL, Corbin JM: **Basics of qualitative research: grounded theory procedures and techniques**. Thousand Oaks, CA: Sage; 1990.
30. Klein KJ, Sorra JS: **The challenge of innovation implementation**. *Acad Manage Rev* 1996, **21**(4):1055-1080.
31. **Research-Tested Intervention Programs (RTIPs). Available at:** https://rtips.cancer.gov/rtips/index.do **[Accessed May 4, 2020]**
32. Scheirer MA, Dearing JW: **An agenda for research on the sustainability of public health programs**. *Am J Public Health* 2011, **101**(11):2059-2067.
33. Scheirer MA: **Linking sustainability research to intervention types**. *Am J Public Health* 2013, **103**(4):e73-80.
34. Nilsen P: **Making sense of implementation theories, models and frameworks**. *Implement Sci* 2015, **10**:53.
35. Guest G, Bunce A, Johnson L: **How many interviews are enough?** *Field Methods* 2006, **18**(1):59-82.
36. Patton MQ: **Qualitative research & evaluation methods**, 3rd edn. Thousand Oaks, CA: SAGE Publications; 2002.
37. Rubin H, Rubin I: **Qualitative interviewing: the art of hearing data**. Thousand Oaks, CA: Sage Publications; 1995.
38. Proctor E, Silmere H, Raghavan R, Hovmand P, Aarons G, Bunger A, Griffey R, Hensley M: **Outcomes for implementation research: conceptual distinctions, measurement challenges, and research agenda**. *Adm Policy Ment Health* 2011, **38**(2):65-76.
39. Wiltsey Stirman S, Baumann AA, Miller CJ: **The FRAME: an expanded framework for reporting adaptations and modifications to evidence-based interventions**. *Implement Sci* 2019, **14**(58).

40. Aarons GA, Green AE, Palinkas LA, Self-Brown S, Whitaker DJ, Lutzker JR, Silovsky JF, Hecht DB, Chaffin MJ: **Dynamic adaptation process to implement an evidence-based child maltreatment intervention**. *Implement Sci* 2012, **7**:32.
41. Hawe P, Shiell A, Riley T: **Complex interventions: how "out of control" can a randomised controlled trial be?** *BMJ* 2004, **328**(7455):1561-1563.
42. Jolles MP, Lengnick-Hall R, Mittman BS: **Correction to: Core Functions and Forms of Complex Health Interventions: a Patient-Centered Medical Home Illustration**. *J Gen Intern Med* 2019.
43. Kendall PC, Beidas RS: **Smoothing the trail for dissemination of evidence-based practices for youth: Flexibility within fidelity**. *Professional Psychology: Research and Practice* 2007, **38**(1):13-20.
44. **PCORI Methodology Standards for Studies of Complex Interventions. Available at:** https://www.pcori.org/research-results/about-our-research/research-methodology/pcori-methodology-standards - Complex **[accessed May 4, 2020]**
45. Thomson K, de Chernatony L, Arganbright L, Khan S: **The Buy-in Benchmark: How Staff Understanding and Commitment Impact Brand and Business Performance**. *Journal of Marketing Management* 1999, **15**(8):819-835.
46. Kotter JP: **Leading change: Why transformation efforts fail.** . *Harvard Business Review* 1995, **Reprint 95204**:59-67.

FIGURE LEGENDS

Figure 1. Factors influencing the sustainability of cancer survivorship innovations.

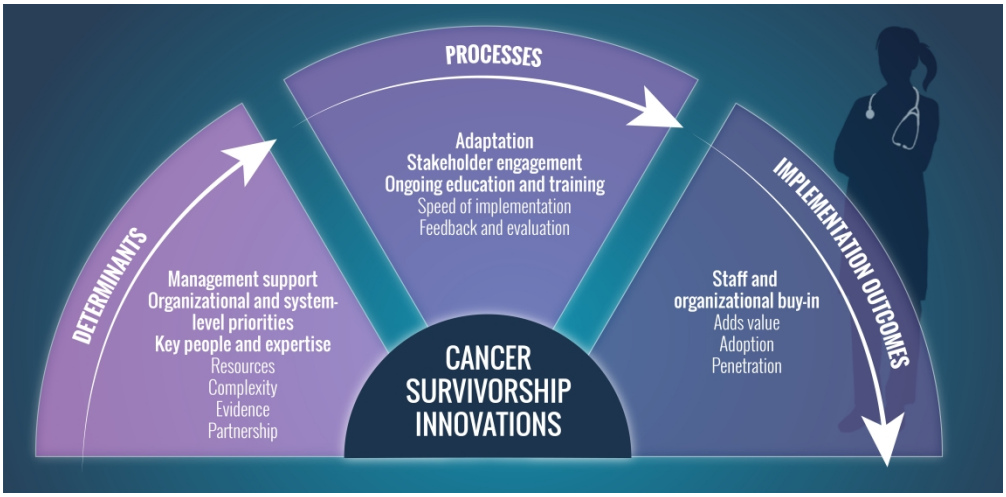

Figure 1. Factors influencing the sustainability of cancer survivorship innovations.

Consolidated criteria for reporting qualitative studies (COREQ): 32-item checklist

No	Item	Guide questions/description	Author response
Domain 1: Research team and reflexivity			
Personal Characteristics			
1.	Interviewer/facilitator	Which author/s conducted the interview or focus group?	Laura L Madden [LLM]; stated in text (methods section)
2.	Credentials	What were the researcher's credentials? *E.g. PhD, MD*	The interviewer [LLM] has a MSc; the lead author [RU] a PhD
3.	Occupation	What was their occupation at the time of the study?	LLM: Research Associate, Department of Surgery RU: Assistant Professor, Department of Surgery
4.	Gender	Was the researcher male or female?	Female
5.	Experience and training	What experience or training did the researcher have?	LLM: Did a qualitative Master's thesis; employed under the PI/lead author (RU) as a Research Associate on qualitative studies. RU: PI, expertise in qualitative research
Relationship with participants			
6.	Relationship established	Was a relationship established prior to study commencement?	There was no relationship between the interviewer [LLM] and either participant prior to study commencement. The lead author [RU] and one other author [JLB] knew some study participants in a

			professional capacity only.
7.	Participant knowledge of the interviewer	What did the participants know about the researcher? e.*g. personal goals, reasons for doing the research*	Many participants would have known that the lead author [RU] and another author [JLB] had research programs in cancer survivorship.
8.	Interviewer characteristics	What characteristics were reported about the interviewer/facilitator? e.g. *Bias, assumptions, reasons and interests in the research topic*	No characteristics are reported about the interviewer. The interviewer was a Research Associate with qualitative research experience but without any background in cancer survivorship or sustainability research.
Domain 2: study design			
Theoretical framework			
9.	Methodological orientation and Theory	What methodological orientation was stated to underpin the study? *e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis*	This study was informed by the principles of grounded theory, specifically Strauss and Corbin (1990), which is cited in the manuscript.
Participant selection			
10.	Sampling	How were participants selected? *e.g. purposive, convenience, consecutive, snowball*	Purposive; stated in text (methods section)
11.	Method of approach	How were participants approached? e.*g. face-to-face, telephone, mail, email*	Email; stated in text (methods section)
12.	Sample size	How many participants were in the study?	27; stated in text (results section)
13.	Non-participation	How many people refused to participate or dropped out? Reasons?	32 people in total were contacted for participation, with 27

			participating in the final study; 2 individuals did not respond to the study invitation while 3 responded stating they were not the best person to interview and provided the name and contact information of a more suitable person.
Setting			
14.	Setting of data collection	Where was the data collected? e.*g. home, clinic, workplace*	Telephone; stated in text (methods section).
15.	Presence of non-participants	Was anyone else present besides the participants and researchers?	No.
16.	Description of sample	What are the important characteristics of the sample? *e.g. demographic data, date*	Given the nature of this study, detailed demographic data are not presented. However, participants were situated in six Canadian provinces and involved in a variety (25) of survivorship innovations.
Data collection			
17.	Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?	The interview guide was pilot tested with 2 individuals.
18.	Repeat interviews	Were repeat interviews carried out? If yes, how many?	No; stated in text (methods section).
19.	Audio/visual recording	Did the research use audio or visual recording to collect the data?	Yes, audio recording; stated in text (methods section).
20.	Field notes	Were field notes made during and/or after the interview or focus group?	Yes; stated in text (methods section).
21.	Duration	What was the duration of the interviews or focus group?	~40-60 minutes; stated in text (methods section).
22.	Data saturation	Was data saturation discussed?	Yes, the interviews continued until data saturation was reached. This

			was determined by constant comparison techniques and research team discussion.
23.	Transcripts returned	Were transcripts returned to participants for comment and/or correction?	No.
Domain 3: analysis and findings			
Data analysis			
24.	Number of data coders	How many data coders coded the data?	Two researchers [LLM, RU] coded the first 3 transcripts, with the remaining transcripts coded by LLM with regular review by RU; stated in text (methods section).
25.	Description of the coding tree	Did authors provide a description of the coding tree?	A codebook, containing code definitions, sample data illustrating application of the code, and decision rules related to each code, was developed by the research team. This was achieved through (1) review of three interview transcripts by RU and LLM; (2) review of codes and discussion between RU and LLM; and (3) subsequent review of codebook and discussion by the entire team; stated in text (methods section).
26.	Derivation of themes	Were themes identified in advance or derived from the data?	Derived from the data; analysis process discussed in text (methods section).
27.	Software	What software, if applicable, was used to manage	Yes, NVivo; stated in text (methods

		the data?	section).
28.	Participant checking	Did participants provide feedback on the findings?	No.
Reporting			
29.	Quotations presented	Were participant quotations presented to illustrate the themes / findings? Was each quotation identified? e.*g. participant number*	Yes (results section).
30.	Data and findings consistent	Was there consistency between the data presented and the findings?	Yes.
31.	Clarity of major themes	Were major themes clearly presented in the findings?	Yes.
32.	Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	Yes, minor themes are presented in both a table and figure, and discussed in brief in the discussion section.

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Title: Identifying factors influencing sustainability of innovations in cancer survivorship care: a qualitative study

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ABSTRACT

Objectives: Moving innovations into health care organizations to increase positive health outcomes remains a significant challenge. Even when knowledge and tools are adopted, they often fail to become integrated into the long-term routines of organizations. The objective of this study was to identify factors and processes influencing the sustainability of innovations in cancer survivorship care. **Design:** Qualitative study using semi-structured, in-depth interviews, informed by grounded theory. Data were collected and analyzed concurrently, using constant comparative analysis. **Setting:** 25 cancer survivorship innovations based in six Canadian provinces. **Participants:** Twenty-seven implementation leaders and relevant staff from across Canada involved in the implementation of innovations in cancer survivorship. **Results:** The findings were categorised according to determinants, processes, and implementation outcomes, and whether a factor was necessary to sustainability, or important but not necessary. Seven determinants, six processes, and three implementation outcomes were perceived to influence sustainability. The necessary determinants were 1) management support; 2) organizational and system-level priorities; and 3) key people and expertise. Necessary processes were 4) innovation adaptation; 5) stakeholder engagement; and 6) ongoing education and training. The only necessary implementation outcome was 7) widespread staff and organizational buy-in for the innovation.

Conclusions: Factors influencing the sustainability of cancer survivorship innovations exist across multiple levels of the health system and are often interdependent. Study findings may be used by implementation teams to plan for sustainability from the beginning of innovation adoption initiatives.

Keywords: oncology, health services administration and management, qualitative research

STRENGTHS AND LIMITATIONS OF THIS STUDY

- The sustainability of evidence-based innovations has been described as "one of the least understood and most vexing issues for implementation research" and we provide a comprehensive inquiry of factors and processes influencing the sustainability of innovations in health care.
- We interviewed 27 implementation leaders and relevant staff from 25 cancer survivorship innovations that were implemented across Canadian jurisdictions.
- We used several implementation science frameworks and taxonomies to design our study and analyse and interpret the findings.
- This is a critical area of inquiry, given there is limited empirical data on the processes by which innovations are sustained in clinical settings as well as the considerable investment over the past decade to implement beneficial innovations so more people have access to high-quality health care.

INTRODUCTION

Across Canada, many studies have identified gaps in the delivery of cancer care whereby the care patients receive is not consistent with scientific evidence [1-8]. The Canadian Strategy for Cancer Control estimated that cancer outcomes could improve by as much as 30% by routinely applying existing evidence in practice [9]. Similarly, the World Health Organization estimated that worldwide, one-third of cancer cases could be prevented and another one-third cured if evidence-based practices were consistently implemented and sustained in care [10]. Importantly, even when knowledge and tools are put into practice, they often fail to become integrated into the long-term routines of organizations [11-13]. This poor sustainment means many patients do not benefit from the best care possible [14-16].

The sustainability of evidence-based innovations has been described as "one of the least understood and most vexing issues for implementation research" [17]. In the past decade, a number of researchers have published conceptual models on innovation sustainability in health care [18-21], while recent reviews have provided syntheses of how researchers in the field define and approach sustainability [22, 23]. Nevertheless, there remains limited empirical data on the processes by which innovations are sustained in clinical settings and the factors that influence sustainability [17, 24-26].

Focusing on cancer survivorship care, this study examined whether and how various evidence-based innovations have been sustained. Cancer survivorship was the focus of this study for three reasons: 1) the number of cancer survivors has grown substantially due to advances in early diagnosis and treatment [27]; 2) cancer survivorship has become a strategic policy focus, with Canadian decision-makers seeking ways to deliver care and implement innovations that address the needs and circumstances of this growing population; and 3) cancer research funders in Canada have explicitly stated a need to integrate *what we know* into survivorship programs and policy [28]. The specific objectives were to 1) identify factors influencing sustainability and 2) explore the processes that facilitate the sustainability of innovations in cancer survivorship care.

MATERIALS AND METHODS

Study design

We conducted a qualitative study, informed by the principles of grounded theory [29], on the sustainability of evidence-based innovations in cancer survivorship care that have been implemented across Canadian jurisdictions. An innovation was defined as new knowledge, tools, or interventions (including programs and services) that organizations are using for the first time [30]. An innovation was considered evidence-based if at least one published peer-reviewed study, using an experimental or quasi-experimental design, demonstrated improved outcomes for the target population. This is the criterion used by the National Cancer Institute for Research-Tested Intervention Programs specifically for cancer control and cancer survivorship interventions [31]. Sustainability was defined as the *continuation* of the innovation's activities or outcomes beyond the initial implementation stage or initial funding period [32]. This study was approved by the Nova Scotia Health Authority's Research Ethics Board. All participants provided written informed consent before participating in the study.

Patient and Public Involvement

No patient involved.

Conceptual Frameworks

The study was informed by Scheirer's work on sustainability [32, 33], the dynamic sustainability framework (DSF) [19], and Nilsen's taxonomy of implementation frameworks [34]. Scheirer's work was used during sampling, specifically to identify innovations based on innovation type: those implemented by individual providers; those requiring coordination among multiple staff; new policies, procedures, and technologies; capacity or infrastructure building; collaborative partnerships or coalitions; and broad-

scale system change. The DSF proposes that the "fit" between the innovation (specifically, interventions) and the setting is key to sustainability, and focuses on three main elements: the intervention, practice setting or context, and broader ecological system. This framework informed development of the interview guide (e.g., questions and probes around the innovation, practice setting, and broader health care system) and ongoing analyses/interpretation. Nilsen's taxonomy was used during data analysis only to categorize the resultant findings (see below).

Participants

Participants were implementation leaders and relevant staff from across Canada involved in the implementation of a range of innovations in cancer survivorship care (e.g., self-management tools, physical activity programs, and models of follow-up care). Recruitment involved a two-phased process. First, we had to identify innovations of interest and, second, recruit leaders and staff involved in those innovations. The identification of innovations was multipronged: 1) viewing of all archived rounds and reviewing of all publications posted on the Canadian Cancer Survivorship Research Consortium (CCSRC) website; 2) multiple PubMed searches with combinations of relevant search terms (e.g., cancer, survivor*, Canada, rehabilitation, interventions, physical activity); and 3) speaking with the individual responsible for survivorship care and programming at all provincial cancer agencies (or their equivalent) to identify additional relevant initiatives in each province. Upon a final list of all potential innovations, we assessed whether each innovation was evidence-based, as per the criterion described above [31].

From those innovations deemed evidence-based, we purposively recruited participants to maximize variation in cancer site, type of innovation [33], and geographic setting. Individual recruitment involved purposive sampling to identify the implementation leader(s) and/or staff member(s) who was most directly involved in the implementation and/or sustainment of the innovation. These individuals

were contacted by the lead author (RU) via email and invited to anticipate. Data collection continued until thematic saturation was reached [35].

Data Collection

We conducted one-on-one, semi-structured telephone interviews with participants. An interview guide was developed based on the study objectives and the DSF, using practical guidance from Patton [36] and Rubin and Rubin [37]. The interview guide is provided as a Supplementary File. The interviews focused on eliciting participants' understandings of the innovation, the process by which it was implemented, whether and how the innovation is sustained, and the multi-level factors affecting its sustained use and impact. One master's trained research associate with experience in qualitative methods (LLM) conducted all interviews, which lasted approximately 40-60 minutes. The interviewer had no prior relationship with any of the participants, and no repeat interviews were conducted. Field notes were taken during interviews to record interviewer observations and perceptions. All interviews were audiotaped and transcribed verbatim.

Data Analysis

Consistent with grounded theory, the interview data were collected and analyzed concurrently. An inductive approach, using constant comparative analysis, was used to analyze the interview transcripts [29]. Analysis involved coding, constant comparison, and identification, organization, and refinement of categories. To help ensure consistency and conceptual clarity throughout the process of coding and categorization, a coding framework (i.e., "codebook") was developed by the lead author (RU) and research associate (LLM). This was achieved through review of three transcripts and a team discussion. Next, the research associate used the codebook to code the remaining transcripts, with regular meetings between the same two individuals to review coding and the consistency of applying the codes

to the interview text, consult with field notes, and refine the codebook as needed. Qualitative software (NVivo 10, QSR International, 2012) was used for data management and to facilitate comparison and synthesis of codes. Several full team meetings were also conducted to review coding and discuss emerging findings.

During a final two-day team meeting, the resultant findings were categorised according to determinants, processes, and implementation outcomes, and whether the data suggested a factor was necessary to sustainability or important but not necessary. Drawing on Nilsen's taxonomy of implementation frameworks [34], we categorized factors as those that help us understand and/or explain what influences outcomes (determinants), those that describe the processes that help translate innovations into practice (processes), and those that identify important aspects by which to evaluate the initial implementation (implementation outcomes). Regarding the latter, implementation outcomes were specifically defined as "the effects of deliberate and purposive actions to implement new treatments, practices and services" [38]. Determining whether a factor was 'necessary' or 'important but not necessary' was an iterative process that involved analyzing participant perspectives on this issue as well as the data on whether and the extent to which a specific innovation was sustained (i.e., *continued* activities or outcomes beyond the initial implementation stage or initial funding period [32], as described above) in the presence or absence of all resultant factors. If innovations were sustained in the absence of a particular factor, then this factor was deemed important but not necessary.

RESULTS

Twenty-seven participants from 25 unique cancer survivorship innovations based in six Canadian provinces (British Columbia, Alberta, Manitoba, Ontario, Quebec, and Nova Scotia) participated in this study. All interviews took place from August 2017 to March 2018. Of the 25 innovations, 20 were sustained to some degree in that activities continued after the initial funding period. Five were not

sustained. The innovations were grouped into five categories, depending on its intended purpose: physical activity programs, psychological support/counselling, transition to survivorship programs, transition to primary care programs, and return to life and lifestyle programs. Eighteen were delivered in-person, four were delivered online, and three were delivered both in-person and online.

Sixteen factors were perceived to influence sustainability: seven determinants, five processes, and four implementation outcomes (Figure 1). Seven of these were deemed necessary, while nine were important but not necessary. Table 1 presents all 16 factors, with brief descriptions. The necessary determinants, discussed in detail below, were 1) management support; 2) organizational and system-level priorities; and 3) key people and expertise. Necessary processes were 4) adaptation; 5) stakeholder engagement; and 6) ongoing education and training. The only necessary implementation outcome was 7) staff and organizational buy-in for the innovation.

Necessary Determinants

Management support

Participants continually voiced their experience that the support of middle and senior managers is imperative to the sustained use of any innovation. Their experience was that even with all other pieces in place, it is extremely challenging to sustain any innovation without management support. As one participated stated, “Management support, for sure, is very important, especially for growth. Um, very, very important” [Participant 19]. Participants noted that management support tends to result in ongoing funding, whether this is the direct provision of funds (e.g., out of their program budget) or advocating for funding from other sources. Participants also described how it is often difficult for managers to support innovations in survivorship care because of competing priorities and that survivorship care does not result in quantifiable metrics in the same the way other areas of care do:

> I would say that it's one of the … tougher components for people, for senior management, to buy into because it's a softer metric to try to collect in a way. Because it's not like you've got numbers of patients going through chemo or radiation. It's not, you know, survivorship care is a lot harder to look at that data and try to figure out if it's meaningful or worth it. [Participant 2]

Participants also noted that management support is much higher when an innovation and its sustainment are appropriately resourced and funded. Innovations that do not have secure funding require managers to transfer operational funds and/or allocate other resources (e.g., staff time) away from existing programs and services.

Organizational and system-level priorities

All participants discussed how survivorship care is perceived as a low organizational and health system priority relative to other cancer programs and services. As one participant stated, "It's not because people aren't interested in [survivorship care], it's just that it's maybe seen, maybe viewed as the nice to have, not the need to have" [Participant 2]. As a result, the sustainment of innovations that have been implemented were described as particularly challenging, regardless of the extent to which program components are in place and working well. Participants described several instances whereby survivorship care was prioritized and therefore initial implementation efforts were well supported and resourced. One example of this is a focus on post-cancer treatment transitions mandated by the province of Ontario: "Having Cancer Care Ontario … starting to really implement comprehensive care that includes the patient, not just the tumour, is really helpful. Because our hospitals are funded by the degree to which they meet these mandates" [Participant 18]. However, participants noted that even when innovations appeared to be integrated, shifting priorities at the health authority or government level often meant that sustainability was threatened. Speaking about an innovation related to transitioning survivors from active treatment to well follow-up care, one participant explained:

> There had been significant shifting in terms of how our organization was structured and who actually had the authority and power, and their viewpoint on all of it. And, so, we couldn't at that point really proceed with it because the organization was really shifting away from that work. [Participant 11]

Key people and expertise

Participants continually emphasized the importance of two key individuals for ongoing sustainment of innovations: clinical champions and dedicated coordinators (or similar personnel). Ongoing champions were deemed necessary for sustainability. Several innovations illustrated this perspective. One was a program aimed at transitioning low-risk survivors back to primary care after treatment. This program, led by a tremendously well-respected clinical champion, had been in place for more than four years and appeared well integrated within the cancer care setting. However, upon loss of the champion, the program was substantially altered and eventually dwindled to minimal use. Conversely, two other transition programs, in other jurisdictions, did not secure ongoing funding after the initial pilots, but maintained ongoing activities simply because the clinical champions continued the service, sometimes in a voluntary role (i.e., during evenings and weekends) despite a lack of funding and other resources.

For many programs, participants also described dedicated program coordinators (or staff members with a coordination role) as being a necessary resource for sustainability, playing a complementary role to clinical champions. Their experience was that such a role was necessary to ensure the innovation was running smoothly, including the continuation of activities and tracking of deliverables. As one participant said:

> It could conceivably be just a small team or one person working remotely, coordinating this kind of thing and sort of, like I said, overseeing the [innovation] and making sure that technological

> and referral purpose is running smoothly. But, it has to be, it does have to be there. It can't run itself. [Participant 7]

Many participants highlighted that certain expertise or skillsets are often needed for an innovation to continue to work efficiently and effectively. An example was the presence of certified exercise professionals for physical activity programs.

Necessary Processes

Adaptation

All participants emphasized that adaptation, not fidelity, is necessary for sustainability. Participants discussed how their task, as leaders and staff of innovations, was to ensure that the innovation evolved and adapted as necessary in their particular setting. Their view was that without adaptation, there was no sustainability. Adaptation was necessary to allow the team/organization to continually meet the needs of patients and to maintain fit with the setting/environment (e.g., changing staff, capacity, resources, policies, and political environment). As one participant stated:

> Our being flexible and adapting to what would work, both for ourselves and our limited resources and time and for our patients. I think if we hadn't adapted the program, we wouldn't still be offering it. So, we had to adapt and change and shorten and condense, while sticking to the hearts and, you know, key concepts of the program. [Participant 17]

Table 2 provides examples of adaptations to each type of innovation. Many were related to delivery mechanisms with the goal of increasing accessibility of the program and/or its feasibility (e.g., changing the frequency or timing of delivery, moving some components to online delivery, changing referral processes). Moreover, it was widely recognized that adaptation was necessary because the evidence base for innovations change. An innovation today, both its components and target population, will likely change as new evidence becomes available: "I think it's imperative to keep current with the evidence for

whatever it is you're offering. And making adaptations with the program that are in keeping with the evidence" [Participant 6].

Stakeholder engagement

Participants described the engagement of important stakeholders (e.g., physicians, patients, administrators) as essential to sustainability. The data indicated participants viewed engagement as critical for two reasons. First, engagement increases awareness of the innovation, its evidence base, and its potential benefits, and helps to develop trust and a sense of ownership with regard to the innovation. As one participant said:

> … the consultations in advance and the getting the people on board and having their input into how things are gonna look and design, I think that was required in order to get any of them on board for something that would be a voluntary change in practice. [Participant 8]

Second, engagement contributed to the practice-based adaptation of the innovations to optimize fit to the local setting. This engagement occurred through mechanisms such as establishing Steering or Advisory Committees composed of key stakeholders, conducting needs assessments, meeting with multidisciplinary cancer site teams/tumour boards, consulting with primary care providers/networks, and co-designing with patient and/or physician groups. Participants described engagement as positively changing both the engaged person (through building a sense of ownership and personal investment; discussed below) as well as the innovation itself (through adaptation to the local setting; discussed above), both viewed as essential to sustainability.

Ongoing education and training

Participants across all organizations and jurisdictions emphasized that ongoing education and training was required to sustain their innovations. This was particularly true due to high staff turnover, which

was deemed prevalent across organizations and jurisdictions. The nature of academic health care settings, with turnover of learners on an ongoing and frequent basis, was also described as a challenge to sustainability:

> Probably one of the biggest barriers is that there's always new staff that come along, like fellows and residents and stuff like that. So, um, you know, they're often just not even aware. So unless there's some kind of process in place to sort of orient them to those types of things then they won't be delivering it. [Participant 16]

Ongoing training was viewed as particularly important in cancer survivorship care given the absence of formal education and training in survivorship issues for most health care providers. One participant put it this way: "…teaching, teaching the next one, so that … we can grow our force of people involved in survivorship care. If we don't invest in that then, well then, I'm never gonna have a vacation" [Participant 24].

Necessary Implementation Outcome

Widespread staff and organizational buy-in

Participants stated that ongoing and widespread staff and organizational buy-in is absolutely necessary for sustainability. One participant summed this up by saying, "without buy in and support from the physicians, from other nurses, from the other allied health staff, from the receptionist, from everybody, um, the program wouldn't work" [Participant 23]. Participants discussed many factors during the implementation period that lead to widespread buy-in, including attributes of the innovation itself (e.g., ease of use), how the innovation is initially framed/presented (including its evidence base), stakeholder engagement, and whether it is a priority of senior management. Participants also stated that the overall low priority of survivorship care (relevant to other areas of cancer care) serves to decrease buy-in from at all levels of the organizations.

Important but not necessary

The data suggested 9 factors were important to sustainability, but not necessary. These are presented in Table 1. For example, while resources in the form of funding, equipment, and physical space are very important for many innovations, the data demonstrated that, with the exception of one innovation, the loss of the initial implementation funding, or the lack of additional funding, equipment, or space to expand beyond the implementation phase, did not result in a loss of the innovation if other necessary factors were present (e.g., key people). Similarly, penetration of the innovation into existing workflows and systems, particularly hospital information technology systems, was perceived as important to many of the innovations, yet many innovations were sustained (oftentimes described as continuation of program components and activities) in the absence of penetration when other necessary components were in place.

DISCUSSION

We investigated the factors influencing the sustainability of 25 different types of innovations in cancer survivorship care. The findings revealed a number of factors deemed necessary for sustainability: management support; organizational and system-level priorities; key people and expertise; innovation adaptation; stakeholder engagement; ongoing education and training; and staff and organizational buy-in. These findings are important given the considerable investment over the past decade to implement and scale beneficial innovations within and across Canadian jurisdictions so more people have access to high-quality cancer survivorship care. They point to specific factors implementation teams should consider and plan for to achieve their desired outcomes and maximize the long-term impact of these investments. From a practice perspective, they can be used to develop and/or select instruments and

tools to assess capacity for sustainability, increase capacity in specific domains, and to assist with the ongoing monitoring of key determinants and processes.

Many of the determinants, processes, and outcomes identified in this study align with the emerging literature in this area. A recently developed framework [26] from a 2018 review on sustainability identified four key processes that the evidence suggests are important to sustainability: partnership/engagement, training/supervision, program evaluation, and adaptation. Moreover, program champions, leadership/support, resources/funding, and staffing/turnover were all identified as key inner (organizational) contextual factors that influence sustainability. While the concepts may be phrased differently, our findings markedly align with the existing evidence in this area. There were also several factors identified by participants in this study that are somewhat unique, or not explicitly specified, in the literature. One of these is the speed of implementation, which participants viewed as being important because a slow(er) implementation allows implementation teams the time to plan for and implement in a way that leverages the key elements needed for sustainability. Moreover, we categorized a number of our findings as implementation outcomes, which are necessary for or important to sustainability. While we recognize that sustainability has been described as an implementation outcome itself [38], few researchers have attempted to describe or delineate the impact of more proximal implementation outcomes (e.g., adoption) on the sustained use of an innovation, yet these proximal outcomes may act as moderators to sustainability (e.g., continuation of program components/activities and/or continuation of desired outcomes). Such relationships could be tested in future research.

The emphasis on the essential role of adaptation for sustainability deserves discussion. Participants were implementation leaders and relevant staff involved in the implementation and/or sustainment of

innovations relevant to cancer survivorship care. Their perspectives were largely practice-based, with an acute recognition that one-sized-fits-all innovations do not work for most settings. This is supported by the increasing awareness in the literature that adaptation is common and likely necessary to facilitate sustainability [19, 26, 39, 40]. In fact, the findings align well with the DSF and its postulation that innovations should not be optimized prior to implementation but rather require (and benefit from) ongoing adaptation and optimization. In this study, innovations were adapted (e.g., components, practitioners, delivery platforms) in response to changes in the practice setting (e.g., staffing, information systems, processes for training) and the broader ecological system (e.g., other practice settings, policies, population characteristics). It is important to note, however, that many of the described adaptations were made in response to unanticipated changes and challenges, and thus might be better termed modifications [39]. These findings reinforce the need for ongoing monitoring and feedback mechanisms to assess not only the innovation itself and related outcomes, but also changes in the setting and system at large to support appropriate and timely adaptation.

It is also important to highlight that many of adaptations described by participants were to form, rather than function [41, 42]. That is, adaptations were made to specific strategies or activities (forms) rather than the intended purposes the innovation aims to achieve (functions). For example, educating and supporting patients to more effectively manage their post-treatment health concerns (function) may be accomplished through various activities, such as one-on-one teaching, individualized care plans, and so on (forms). These types of adaptations demonstrate the importance of 'flexibility within fidelity' [43] or fidelity-consistent adaptations [39] for sustainability. In its methodology standards for studies of complex interventions, the Patient-Centered Outcomes Research Institute (PCORI) in the US advises researchers and implementation teams to clearly delineate an intervention's core functions and forms, and to maintain fidelity to the core functions while documenting adaptations to form [44]. By doing so,

we can provide better guidance to those who are implement and evaluate such interventions. This also reinforces the need for ongoing evaluation post-implementation to understand the what and why of adaptations, and how these relate to sustainability; in this study, less than half of the innovations were evaluated post-implementation.

We categorized widespread buy-in as an implementation outcome. We defined widespread buy-in as a commitment to the innovation by a larger group of individuals within the organization or the organization as whole, specifically their commitment to support and engage in an initiative. Although we could find no clear definition or operational specificity of this concept in the existing health literature, the management and business literature does characterize buy-in in terms of one's intellectual and emotional commitment to an organization's cause and/or plan [45], and provides guidance to increase buy-in during organizational change initiatives [46]. While buy-in, as we have defined, can be present during the decision to adopt an innovation and/or its implementation, buy-in is also a desired result of the strategies and activities (e.g., communications, education/training, use of opinion leaders) put in place during implementation. By and large, implementation teams are seeking to achieve buy-in. In this way, it aligns with the definition of implementation outcomes proposed by Proctor, namely "the effects of the deliberate and purposive actions to implement new treatments, practices, and services" [38]. However, buy-in is not one of the eight commonly-used implementation outcomes [38]. We posit that perhaps this construct might be a useful addition to implementation outcomes and thereby efforts to understand how to appropriately operationalize and measure buy-in are needed.

Clearly, many of the factors presented here relate to one another and are not independent influences on sustainability. For example, stakeholder engagement (a process) often serves to increase wide-spread buy-in (an outcome), which then may result in additional resources (a determinant) to sustain an

innovation. Moreover, both managerial support and organizational- and system-level priorities (necessary determinants) will often reflect the magnitude and nature of resources (important determinant) dedicated to any initiative. Such interdependence will be present in the sustainability of any complex innovation, and demonstrates the 'messiness' of both the science and practice in this area. Future research should attempt to delineate what combination of factors might be most important for different types of innovations.

Several of the study findings also highlight an important issue in cancer survivorship care and programming: namely, that the evidence base for survivorship innovations is of lower quality, and the resulting outcomes are "softer," compared to the evidence base and outcomes in other areas of cancer care (e.g., diagnosis and treatment). While participants in this study stated that evidence of an innovation's effectiveness contributed to sustainability by strengthening the case for funding and helping consolidate buy-in from frontline staff (see Table 1), they also noted that it can be difficult to secure management support for innovations in survivorship care, in part because it does not result in quantifiable metrics like other areas of cancer care. As such, they perceived that survivorship care is viewed as a desirable, but non-essential, service within cancer care organizations. These issues undoubtedly impact the ability to sustain survivorship innovations in practice, particularly where leaders and managers have to decide between funding/resourcing services with hard performance metrics to demonstrate effectiveness versus services with metrics that are less traditional or more difficulty to quantify.

From a methodological standpoint, during sampling, we attempted to identify and categorize programs based on Scheirer's suggested innovation types: innovations implemented by individual providers; interventions requiring coordination among multiple staff; new policies, procedures, and technologies;

capacity or infrastructure building; collaborative partnerships or coalitions; and broad-scale system change [33]. In practice, this was challenging for several reasons. One, there are few innovations in cancer survivorship that are implemented by individual providers. Two, many of the innovations crossed categories. For example, many innovations required coordination across multiple staff, represented new policies, procedures, or technologies, *and* involved collaborative partnerships with community- or research-based groups. Thus, the most appropriate category was difficult to select and we therefore categorized the innovations by function (i.e., its intended purpose) rather than the level or nature of the change. These are not limitations of Scheirer's taxonomy, but demonstrate the complexity that can arise when attempting to fit into pre-existing categories. We continue to advocate for and support the use of existing nomenclature, taxonomies, and frameworks to help build an evidence base in this area. Nonetheless, while such frameworks should guide our work, we cannot be constrained by them when they are not helpful in the context of a particular study.

This study has a number of strengths. First, we interviewed participants from 25 different survivorship innovations across six jurisdictions, which should increase the transferability of findings. Second, we built on others' work in sustainability, including existing taxonomies and frameworks, to advance knowledge in this area. This study also has several limitations. First, this study focused solely on innovations in cancer survivorship. This may limit transferability to innovations in other areas of care, although there is no inherent reason why innovations in cancer survivorship should differ from innovations in other areas of chronic disease management that aim to address the physical, psychosocial, and economic sequelae of an illness and its treatment. Given that the findings also align with the emerging literature on sustainability, conducted across a range of health conditions and settings, the findings are likely transferable. Second, although we undertook a multi-stepped approach to identify innovations that had been implemented across Canada, we cannot be certain that we did not

miss innovations that would have been important to study. Third, we used the National Cancer Institute for Research-Tested Intervention Programs criterion for determining whether an innovation was evidence-based. This criterion is not stringent and it is likely some of the innovations studied were more "evidence-based" than others, which may have implications for sustainability (see Table 1). Fourth, we attempted to discriminate between factors that are more salient or perceived by participants as necessary to sustainability as opposed to factors that are important, but not necessary. This dichotomization may be somewhat artificial and not true for all settings or innovations. We did this in an attempt to avoid a 'laundry list' of every possible determinant of sustainability. It also attempts to address one of the gaps in our understanding of the factors that influence sustainability: namely, are some factors more critical than others [26]? This is a first step toward identifying critical factors (determinants, processes, and implementation outcomes) of sustainability. Future research should also focus on developing metrics and methods to prioritize these factors, and combinations thereof, and link them to appropriate strategies.

In conclusion, this study demonstrated that certain determinants, processes, and implementation outcomes influence the sustainability of innovations in cancer survivorship care. These factors exist across multiple levels of the health system and are often interdependent. They also demonstrate the dynamic nature of sustainability. Three examples of this dynamism are the ongoing nature of adaptation, the shifting nature of priorities that can change the local landscape and resulting support for sustainment, and the turnover of champions and support staff. The findings may be used by researchers, decision-makers, and implementation teams to plan for sustainability during the early implementation of innovations, particularly factors shown to be necessary to the long-term use of innovations.

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Table 1. Factors influencing the sustainability of cancer survivorship innovations. Bolding represents necessary factors.

	FACTOR	DESCRIPTION
DETERMINANTS	**Management support**	**The support of middle and senior managers is critical for sustainability. It is difficult to sustain any innovation in the absence of management support.**
	Organizational and system-level priorities	**Survivorship care is generally not an organizational or system-level priority, making sustainability challenging. Even when survivorship is prioritized, shifting priorities at health authority or government levels often mean sustainability is threatened.**
	Key people & expertise	**Key people, namely clinical champions and project/program coordinators, are particularly important to maintaining an innovation's activities and use. Often, certain expertise or skillsets are required for an innovation to work efficiently and effectively.**
	Resources	Resources in the form of funding, physical space, and equipment are often very important to sustainment, particularly to expand a program or service beyond the population served in the initial pilot phase.
	Complexity	Innovations that are simple, require less time to use, and the coordination and/or cooperation of fewer organizational members are easier to sustain.
	Evidence	Scientific evidence of an innovation's effectiveness contributes to sustainability by strengthening the case for funding, increasing its priority level, and strengthening buy-in from frontline staff (mainly physicians).
	Partnerships	Partnerships with other similar organizations, including community-based organizations, are not necessary for sustainability but can be very important as they permit the sharing of resources and expertise.
PROCESSES	**Adaptation**	**Adaptation, not fidelity, is necessary for sustainability. Adaptation is necessary to continually meet the needs of patients and to maintain fit with the local setting.**
	Stakeholder engagement	**The engagement of key stakeholders (e.g., physicians, patients, administrators) is essential to sustainability by developing a sense of ownership over the innovation and allowing for practice-based adaptations that optimize fit with the local setting.**
	Ongoing education and training	**Ongoing education and training is necessary to sustain innovations, particularly due to high levels of staff turnover in cancer care settings.**
	Speed of implementation	The speed of implementation can impact sustainability. Specifically, implementing slowly permits the time to get many of the key elements in place (e.g., training and ongoing supports, metrics and data collection/reporting procedures,

		stakeholder engagement) that support the long-term sustainment of the innovation.
	Feedback and evaluation	Feedback and evaluation, while not necessary, is important to sustainability as it helps to demonstrate the innovation's value, maintain credibility, maintain buy-in, and help secure ongoing resources, including funding.
IMPLEMENTATION OUTCOMES	**Staff and organizational buy-in**	**Widespread and ongoing staff and organizational buy-in is necessary for sustainability. Many factors during the implementation period lead to buy-in.**
	Adds value	Adding value to the organization (e.g., through positive publicity) and its staff (e.g., saving staff time) helps to maintain buy-in, and increases opportunities for partnerships and additional resources.
	Adoption	A lack of adoption, specifically by patients, threatens sustainability. Many survivorship innovations rely on patients being aware that a particular program or resource is available and choosing to access it. Low patient uptake reinforces the perception such innovations are low priority.
	Penetration	Integrating the innovation into the service setting and its existing subsystems is important to sustainability. These systems include existing clinical workflows, including EMRs, physician ordering, and other forms of documentation. Such integration can provide automatic referrals for programs/services and serve as reminders regarding use.

Table 2. Innovation types and examples of adaptations.

INNOVATION TYPE	FUNCTION	EXAMPLES OF ADAPTATIONS
Physical activity programs	To increase physical activity among cancer survivors	Changes in timing and length of delivery; changes in setting (cancer centre versus community)
Psychological support/counselling	To provide cancer survivors with the tools to manage/cope with psychological, emotional, and social distress	Changes in length of sessions; addition of orientation sessions; transition to online delivery, including apps for smartphones
Transition to survivorship programs	To support cancer survivors' transition from active (intensive) cancer treatment to routine follow-up care	Automatic referrals to program; changes in timing of delivery; changes in setting (cancer centre versus community); addition of content (e.g., self-management)
Transition to primary care programs	To support cancer survivors' transition from specialist-led follow-up care to primary care-led follow-up	Tailoring of tools (e.g., specific recommendations, list of community resources) to cancer types; changes in delivery mode (e.g., mailed versus faxed versus emailed communications)
Return to life and lifestyle programs	To help cancer survivors return to a "new normal" after cancer treatment and/or to support lifestyle changes to improve overall health and well-being	Addition of orientation sessions; automatic registration; transition to online delivery; refinement of websites; addition of content (e.g., sexuality and cancer); changes in frequency, timing, and length of delivery

CONTRIBUTORSHIP STATEMENT

Conceptualization, RU, CK, EC, BJP, GK, SAR, and JLB; Methodology, RU, LLM, CK, EC, BJP, GK, SAR, and JLB; Formal Analysis, RU, LLM; Writing – Original Draft Preparation, RU; Writing – Review & Editing, RU, LLM, CK, EC, BJP, GK, SAR, and JLB; Funding Acquisition, RU, CK, EC, BJP, GK, SAR, and JLB. All authors read and approved the final manuscript.

COMPETING INTERESTS

The authors declare no competing interests.

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DATA SHARING STATEMENT

This is a qualitative dataset and therefore not publicly available due to confidentiality reasons.

REFERENCES

1. Corkum M, Urquhart R, G K, Hayden JA, Porter G: **Breast and cervical cancer screening behaviours among colorectal cancer survivors in Nova Scotia**. *Curr Oncol* 2014, **21**(5):e670-677.
2. Johnson PM, Malatjalian D, Porter GA: **Adequacy of nodal harvest in colorectal cancer: a consecutive cohort study**. *J Gastrointest Surg* 2002, **6**(6):883-888; discussion 889-890.
3. Porter GA, Urquhart R, Bu J, Johnson PJ, Grunfeld E: **The impact of audit and feedback on nodal harvest in colorectal cancer**. *BMC Cancer* 2011, **11**:2.
4. Rayson D, Urquhart R, Cox M, Grunfeld E, Porter G: **Adherence to clinical practice guidelines for adjuvant chemotherapy for colorectal cancer in a Canadian province: a population-based analysis**. *J Oncol Pract* 2012, **8**(4):253-259.
5. Richardson DP, Porter GA, Johnson PM: **Population-based use of sphincter-preserving surgery in patients with rectal cancer: is there room for improvement?** *Dis Colon Rectum* 2013, **56**(6):704-710.
6. Urquhart R, Folkes A, Porter G, C K, Cox M, R D, E G: **Population-based longitudinal study of follow-up care for colorectal cancer patients in Nova Scotia**. *J Oncol Pract* 2012, **8**(4):246-252.
7. Latosinsky S, Fradette K, Lix L, Hildebrand K, Turner D: **Canadian breast cancer guidelines: have they made a difference?** *CMAJ* 2007, **176**(6):771-776.
8. Cree M, Tonita J, Turner D, Nugent Z, Alvi R, Barss R, King C, Winget M: **Comparison of treatment received versus long-standing guidelines for stage III colon and stage II/III rectal cancer patients diagnosed in Alberta, Saskatchewan, and Manitoba in 2004**. *Clin Colorectal Cancer* 2009, **8**(3):141-145.
9. Canadian Strategy for Cancer Control: **The Canadian Strategy for Cancer Control: a cancer plan for Canada - Discussion Paper**. In. Ottawa, ON: CSCC Governing Council; 2006.
10. World Health Organization: **Bridging the "know-do" gap. Meeting on knowledge translation in global health. Geneva, Switzerland**. In.; 2006.
11. Ejemot RI, Ehiri JE, Meremikwu MM, Critchley JA: **Hand washing for preventing diarrhoea**. *Cochrane Database Syst Rev* 2008(1):CD004265.
12. Wilson KD, Kurz RS: **Bridging implementation and institutionalization within organizations: proposed employment of continuous quality improvement to further dissemination**. *J Public Health Manag Pract* 2008, **14**(2):109-116.
13. Gillissen F, Ament SM, Maessen JM, Dejong CH, Dirksen CD, van der Weijden T, von Meyenfeldt MF: **Sustainability of an Enhanced Recovery After Surgery Program (ERAS) in Colonic Surgery**. *World J Surg* 2014.
14. Kryworuchko J, Stacey D, Bai N, Graham ID: **Twelve years of clinical practice guideline development, dissemination and evaluation in Canada (1994 to 2005)**. *Implement Sci* 2009, **4**:49.
15. Grunfeld E: **Canadian breast cancer guidelines are as effective as possible under the circumstances**. *CMAJ* 2007, **176**(6):785-786.
16. Sheldon TA, Cullum N, Dawson D, Lankshear A, Lowson K, Watt I, West P, Wright D, Wright J: **What's the evidence that NICE guidance has been implemented? Results from a national evaluation using time series analysis, audit of patients' notes, and interviews**. *BMJ* 2004, **329**(7473).
17. Proctor E, Luke D, Calhoun A, McMillen C, Brownson R, McCrary S, Padek M: **Sustainability of evidence-based healthcare: research agenda, methodological advances, and infrastructure support**. *Implement Sci* 2015, **10**:88.

18. Maher L, DH G, Evans A: **Sustainablity model and guide**. In. Coventry, UK: Institute for Innovation and Improvement, National Health Service. Available at: http://www.institute.nhs.uk/sustainability; 2010.
19. Chambers DA, Glasgow RE, Stange KC: **The dynamic sustainability framework: addressing the paradox of sustainment amid ongoing change**. *Implement Sci* 2013, **8**:117.
20. Schell SF, Luke DA, Schooley MW, Elliott MB, Herbers SH, Mueller NB, Bunger AC: **Public health program capacity for sustainability: a new framework**. *Implement Sci* 2013, **8**:15.
21. Shelton RC, Chambers DA, Glasgow RE: **An Extension of RE-AIM to Enhance Sustainability: Addressing Dynamic Context and Promoting Health Equity Over Time**. *Front Public Health* 2020, **8**:134.
22. Lennox L, Maher L, Reed J: **Navigating the sustainability landscape: a systematic review of sustainability approaches in healthcare**. *Implement Sci* 2018, **13**:27.
23. Moore JE, Mascarenhas A, Bain J, Straus SE: **Developing a comprehensive definition of sustainability**. *Implement Sci* 2017, **12**(1):110.
24. Wiltsey Stirman S, Kimberly J, Cook N, Calloway A, Castro F, Charns M: **The sustainability of new programs and innovations: a review of the empirical literature and recommendations for future research**. *Implement Sci* 2012, **7**:17.
25. Scheirer MA: **Is Sustainability Possible? A Review and Commentary on Empirical Studies of Program Sustainability**. *American Journal of Evaluation* 2005, **26**(3):320-347.
26. Shelton RC, Cooper BR, Stirman SW: **The Sustainability of Evidence-Based Interventions and Practices in Public Health and Health Care**. *Annu Rev Public Health* 2018, **39**:55-76.
27. Canadian Cancer Society's Advisory Committee: **Canadian Cancer Statistics 2019**. In. Toronto, OM: Canadian Cancer Society; 2019.
28. Canadian Cancer Research Alliance: **Pan-Canadian framework for cancer survivorship research**. In. Toronto, ON: CCRA; 2017.
29. Strauss AL, Corbin JM: **Basics of qualitative research: grounded theory procedures and techniques**. Thousand Oaks, CA: Sage; 1990.
30. Klein KJ, Sorra JS: **The challenge of innovation implementation**. *Acad Manage Rev* 1996, **21**(4):1055-1080.
31. **Research-Tested Intervention Programs (RTIPs). Available at:** https://rtips.cancer.gov/rtips/index.do **[Accessed May 4, 2020]**
32. Scheirer MA, Dearing JW: **An agenda for research on the sustainability of public health programs**. *Am J Public Health* 2011, **101**(11):2059-2067.
33. Scheirer MA: **Linking sustainability research to intervention types**. *Am J Public Health* 2013, **103**(4):e73-80.
34. Nilsen P: **Making sense of implementation theories, models and frameworks**. *Implement Sci* 2015, **10**:53.
35. Guest G, Bunce A, Johnson L: **How many interviews are enough?** *Field Methods* 2006, **18**(1):59-82.
36. Patton MQ: **Qualitative research & evaluation methods**, 3rd edn. Thousand Oaks, CA: SAGE Publications; 2002.
37. Rubin H, Rubin I: **Qualitative interviewing: the art of hearing data**. Thousand Oaks, CA: Sage Publications; 1995.
38. Proctor E, Silmere H, Raghavan R, Hovmand P, Aarons G, Bunger A, Griffey R, Hensley M: **Outcomes for implementation research: conceptual distinctions, measurement challenges, and research agenda**. *Adm Policy Ment Health* 2011, **38**(2):65-76.
39. Wiltsey Stirman S, Baumann AA, Miller CJ: **The FRAME: an expanded framework for reporting adaptations and modifications to evidence-based interventions**. *Implement Sci* 2019, **14**(58).

40. Aarons GA, Green AE, Palinkas LA, Self-Brown S, Whitaker DJ, Lutzker JR, Silovsky JF, Hecht DB, Chaffin MJ: **Dynamic adaptation process to implement an evidence-based child maltreatment intervention**. *Implement Sci* 2012, **7**:32.
41. Hawe P, Shiell A, Riley T: **Complex interventions: how "out of control" can a randomised controlled trial be?** *BMJ* 2004, **328**(7455):1561-1563.
42. Jolles MP, Lengnick-Hall R, Mittman BS: **Correction to: Core Functions and Forms of Complex Health Interventions: a Patient-Centered Medical Home Illustration**. *J Gen Intern Med* 2019.
43. Kendall PC, Beidas RS: **Smoothing the trail for dissemination of evidence-based practices for youth: Flexibility within fidelity**. *Professional Psychology: Research and Practice* 2007, **38**(1):13-20.
44. **PCORI Methodology Standards for Studies of Complex Interventions. Available at:** https://www.pcori.org/research-results/about-our-research/research-methodology/pcori-methodology-standards - Complex **[accessed May 4, 2020]**
45. Thomson K, de Chernatony L, Arganbright L, Khan S: **The Buy-in Benchmark: How Staff Understanding and Commitment Impact Brand and Business Performance**. *Journal of Marketing Management* 1999, **15**(8):819-835.
46. Kotter JP: **Leading change: Why transformation efforts fail.** . *Harvard Business Review* 1995, **Reprint 95204**:59-67.

FIGURE LEGENDS

Figure 1. Factors influencing the sustainability of cancer survivorship innovations.

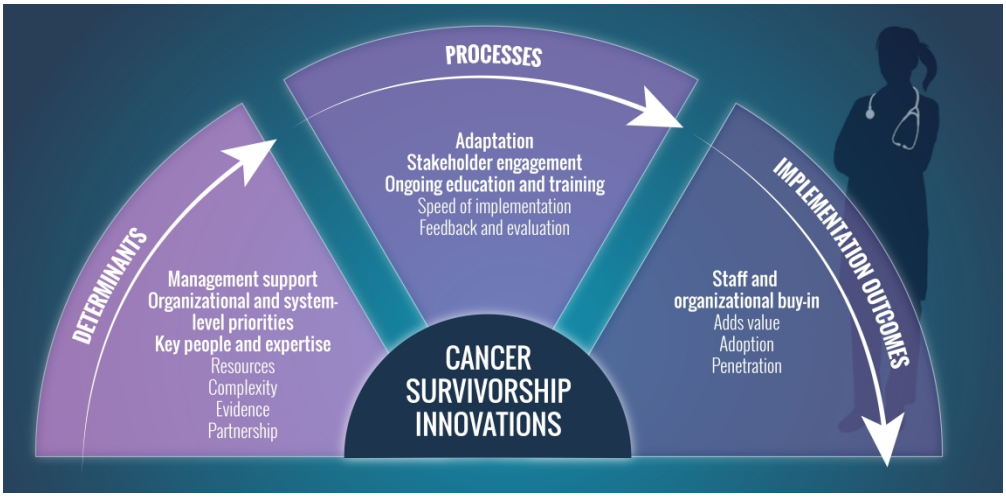

Figure 1. Factors influencing the sustainability of cancer survivorship innovations.

Additional file 1

Draft interview guide for semi-structured interviews.

Setting the stage

1. Can you tell me a bit about *[Innovation X]*?
   Probes
   a. What does *[Innovation X]* entail? What are its components?
   b. Was there any training or education necessary with the implementation?
   c. Were there any policies put into place?
   d. Were there any additional management needs or positions created?
   e. What year was it introduced?
   f. Was there a pilot period? If so, how long was the pilot period?
   g. How long has it been in use (since then)? Is it still in use?
2. How did you first hear about *[Innovation X]*?
   a. What were your initial thoughts?
3. Why was *[innovation X]* implemented here? What need were you trying to address?
   a. Who identified the need for this intervention *[frontline staff, hospital manager/administrators, government]*?
   b. Who proposed *{Innovation X]* as a means of addressing this need *[frontline staff, hospital manager/administrators, government]*?
   c. Did others perceive this need as well?

Implementation

Now I'd like to talk to you a bit about the implementation of [*Innovation X*].

4. Can you tell me about how *[Innovation X]* was implemented?
   Probes
   a. What was your role in the implementation process?
   b. Who else was involved and what were their roles?
   c. How were the relationships between people during the implementation process?
      i. Examples: pre-existing, strength, coming from within or from outside, trust, respect
5. How different was *[Innovation X]* from the existing practices?
   a. Did these differences/similarities affect the implementation process?
   b. If so, how?
6. Would you say that the implementation of *[Innovation X]* was initially successful?
   a. If so, how?
   b. If not, why not?

Sustainability

7. When I talk about sustainability of innovations, what does sustainability mean to you?
8. Would you say *[Innovation X]* has been sustained so far? Why or why not?
    a. Was use impacted once the initially training/support ended?
        i. If so how?
        ii. If not, why not?
9. Has *[innovation X]* been adapted or modified at all?
    a. If so, in what way?
    b. Why were these modifications needed?
10. What did your program/organization do to support the ongoing use or integration of *[Innovation X]* into routine care?
    - Examples: policy or operational changes to integrate *[innovation X]* into normal worker expectations or routines
    b. How did that help with the sustainability of *[Innovation X]*?
    c. Engage: Did your team/program/organization try to engage people in the implementation process or the use of the new innovation?
    d. Execute: Did the implementation process go according to the original plan?
11. What factors do you believe influence the sustainability of *[Innovation X]*?

    Probes:
    a. In what ways?
    b. Both facilitators and barriers.
    c. Characteristics of the innovation?
    d. Characteristics of the people managing/leading/supporting its ongoing use?
    e. Organizational context (ex: staffing, IT, infrastructure, organizational culture, management support, incentives, organizational mandates)?
    f. Broader context (ex: policies, regulations, legal, political, or economic context, patient needs/preferences/characteristics)?
12. Earlier we talked about why *[Innovation X]* was implemented here and the needs it was designed to meet. What would you say has been successful in meeting the needs we talked about?
13. What other impacts has *[Innovation X]* had on your program/organization and the people who work there/with the [I*nnovation*]?
    a. What about on the patients?
14. Has there been an evaluation conducted related to the sustained use and/or impacts of *[Innovation X]*?
    a. Are the findings from those evaluations fed back into [*Innovation X]* and used to adapt it?
        i. If so, how so?
15. What do you think is required to ensure the continued use of *[innovation X]* moving forward?
    a. Examples: attitudes, incentives, removal of specific barriers, financial, human resources, organizational mandates/policies

Consolidated criteria for reporting qualitative studies (COREQ): 32-item checklist

No	Item	Guide questions/description	Author response
Domain 1: Research team and reflexivity			
Personal Characteristics			
1.	Interviewer/facilitator	Which author/s conducted the interview or focus group?	Laura L Madden [LLM]; stated in text (methods section, pg 7)
2.	Credentials	What were the researcher's credentials? *E.g. PhD, MD*	The interviewer [LLM] has a MSc; the lead author [RU] a PhD
3.	Occupation	What was their occupation at the time of the study?	LLM: Research Associate, Department of Surgery RU: Assistant Professor, Department of Surgery
4.	Gender	Was the researcher male or female?	Female
5.	Experience and training	What experience or training did the researcher have?	LLM: Did a qualitative Master's thesis; employed under the PI/lead author (RU) as a Research Associate on qualitative studies; stated in text (methods section, pg 7). RU: PI, expertise in qualitative research
Relationship with participants			
6.	Relationship established	Was a relationship established prior to study commencement?	There was no relationship between the interviewer [LLM] and either participant prior to study commencement; stated in text

			(methods section, pg 7). The lead author [RU] and one other author [JLB] knew some study participants in a professional capacity only.
7.	Participant knowledge of the interviewer	What did the participants know about the researcher? e.*g. personal goals, reasons for doing the research*	Many participants would have known that the lead author [RU] and another author [JLB] had research programs in cancer survivorship.
8.	Interviewer characteristics	What characteristics were reported about the interviewer/facilitator? e.g. *Bias, assumptions, reasons and interests in the research topic*	No characteristics are reported about the interviewer. The interviewer was a Research Associate with qualitative research experience but without any background in cancer survivorship or sustainability research.
Domain 2: study design			
Theoretical framework			
9.	Methodological orientation and Theory	What methodological orientation was stated to underpin the study? *e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis*	This study was informed by the principles of grounded theory, specifically Strauss and Corbin (1990), which is cited in the manuscript (pg. 5)
Participant selection			
10.	Sampling	How were participants selected? *e.g. purposive, convenience, consecutive, snowball*	Purposive; stated in text (methods section, pg. 6)
11.	Method of approach	How were participants approached? e.*g. face-to-face, telephone, mail, email*	Email; stated in text (methods section, pg. 6-7)

12.	Sample size	How many participants were in the study?	27; stated in text (results section, pg. 8)
13.	Non-participation	How many people refused to participate or dropped out? Reasons?	32 people in total were contacted for participation, with 27 participating in the final study; 2 individuals did not respond to the study invitation while 3 responded stating they were not the best person to interview and provided the name and contact information of a more suitable person.
Setting			
14.	Setting of data collection	Where was the data collected? e.*g. home, clinic, workplace*	Telephone; stated in text (methods section, pg. 7).
15.	Presence of non-participants	Was anyone else present besides the participants and researchers?	No.
16.	Description of sample	What are the important characteristics of the sample? *e.g. demographic data, date*	Given the nature of this study, detailed demographic data are not presented. However, participants were situated in six Canadian provinces and involved in a variety (25) of survivorship innovations.
Data collection			
17.	Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?	The interview guide was pilot tested with 2 individuals.
18.	Repeat interviews	Were repeat interviews carried out? If yes, how many?	No; stated in text (methods section, pg. 7).
19.	Audio/visual recording	Did the research use audio or visual recording to collect the data?	Yes, audio recording; stated in text (methods section, pg. 7).
20.	Field notes	Were field notes made during and/or after the interview or focus group?	Yes; stated in text (methods section, pg. 7).

21.	Duration	What was the duration of the interviews or focus group?	~40-60 minutes; stated in text (methods section, pg. 7).
22.	Data saturation	Was data saturation discussed?	Yes, the interviews continued until data saturation was reached. This was determined by constant comparison techniques and research team discussion.
23.	Transcripts returned	Were transcripts returned to participants for comment and/or correction?	No.
Domain 3: analysis and findings			
Data analysis			
24.	Number of data coders	How many data coders coded the data?	Two researchers [LLM, RU] coded the first 3 transcripts, with the remaining transcripts coded by LLM with regular review by RU; stated in text (methods section).
25.	Description of the coding tree	Did authors provide a description of the coding tree?	A codebook, containing code definitions, sample data illustrating application of the code, and decision rules related to each code, was developed by the research team. This was achieved through (1) review of three interview transcripts by RU and LLM; (2) review of codes and discussion between RU and LLM; and (3) subsequent review of codebook and discussion by the entire team; stated in text (methods section, pg.

			7-8).
26.	Derivation of themes	Were themes identified in advance or derived from the data?	Derived from the data; analysis process discussed in text (methods section, pg. 7-8).
27.	Software	What software, if applicable, was used to manage the data?	Yes, NVivo; stated in text (methods section, pg. 7-8).
28.	Participant checking	Did participants provide feedback on the findings?	No.
Reporting			
29.	Quotations presented	Were participant quotations presented to illustrate the themes / findings? Was each quotation identified? e.*g. participant number*	Yes (results section, pg. 9-14).
30.	Data and findings consistent	Was there consistency between the data presented and the findings?	Yes.
31.	Clarity of major themes	Were major themes clearly presented in the findings?	Yes.
32.	Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	Yes, minor themes are presented in both a table and figure, and discussed in brief in the discussion section.

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Title: Identifying factors influencing sustainability of innovations in cancer survivorship care: a qualitative study

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ABSTRACT

Objectives: Moving innovations into health care organizations to increase positive health outcomes remains a significant challenge. Even when knowledge and tools are adopted, they often fail to become integrated into the long-term routines of organizations. The objective of this study was to identify factors and processes influencing the sustainability of innovations in cancer survivorship care. **Design:** Qualitative study using semi-structured, in-depth interviews, informed by grounded theory. Data were collected and analyzed concurrently, using constant comparative analysis. **Setting:** 25 cancer survivorship innovations based in six Canadian provinces. **Participants:** Twenty-seven implementation leaders and relevant staff from across Canada involved in the implementation of innovations in cancer survivorship. **Results:** The findings were categorised according to determinants, processes, and implementation outcomes, and whether a factor was necessary to sustainability, or important but not necessary. Seven determinants, six processes, and three implementation outcomes were perceived to influence sustainability. The necessary determinants were 1) management support; 2) organizational and system-level priorities; and 3) key people and expertise. Necessary processes were 4) innovation adaptation; 5) stakeholder engagement; and 6) ongoing education and training. The only necessary implementation outcome was 7) widespread staff and organizational buy-in for the innovation.

Conclusions: Factors influencing the sustainability of cancer survivorship innovations exist across multiple levels of the health system and are often interdependent. Study findings may be used by implementation teams to plan for sustainability from the beginning of innovation adoption initiatives.

Keywords: oncology, health services administration and management, qualitative research

STRENGTHS AND LIMITATIONS OF THIS STUDY

- The sustainability of evidence-based innovations has been described as "one of the least understood and most vexing issues for implementation research" and we provide a comprehensive inquiry of factors and processes influencing the sustainability of innovations in health care.
- We interviewed 27 implementation leaders and relevant staff from 25 cancer survivorship innovations that were implemented across Canadian jurisdictions.
- We used several implementation science frameworks and taxonomies to design our study and analyse and interpret the findings.
- This study focused solely on innovations in cancer survivorship, which may limit transferability to innovations in other areas of care, although here is no inherent reason why innovations in cancer survivorship should differ from innovations in other areas of chronic disease management.
- This is a critical area of inquiry, given there is limited empirical data on the processes by which innovations are sustained in clinical settings as well as the considerable investment over the past decade to implement beneficial innovations so more people have access to high-quality health care.

INTRODUCTION

Across Canada, many studies have identified gaps in the delivery of cancer care whereby the care patients receive is not consistent with scientific evidence [1-8]. The Canadian Strategy for Cancer Control estimated that cancer outcomes could improve by as much as 30% by routinely applying existing evidence in practice [9]. Similarly, the World Health Organization estimated that worldwide, one-third of cancer cases could be prevented and another one-third cured if evidence-based practices were consistently implemented and sustained in care [10]. Importantly, even when knowledge and tools are put into practice, they often fail to become integrated into the long-term routines of organizations [11-13]. This poor sustainment means many patients do not benefit from the best care possible [14-16].

The sustainability of evidence-based innovations has been described as "one of the least understood and most vexing issues for implementation research" [17]. In the past decade, a number of researchers have published conceptual models on innovation sustainability in health care [18-21], while recent reviews have provided syntheses of how researchers in the field define and approach sustainability [22, 23]. Nevertheless, there remains limited empirical data on the processes by which innovations are sustained in clinical settings and the factors that influence sustainability [17, 24-26].

Focusing on cancer survivorship care, this study examined whether and how various evidence-based innovations have been sustained. Cancer survivorship was the focus of this study for three reasons: 1) the number of cancer survivors has grown substantially due to advances in early diagnosis and treatment [27]; 2) cancer survivorship has become a strategic policy focus, with Canadian decision-makers seeking ways to deliver care and implement innovations that address the needs and circumstances of this growing population; and 3) cancer research funders in Canada have explicitly stated a need to integrate *what we know* into survivorship programs and policy [28]. The specific objectives were to 1) identify factors influencing sustainability and 2) explore the processes that facilitate the sustainability of innovations in cancer survivorship care.

MATERIALS AND METHODS

Study design

We conducted a qualitative study, informed by the principles of grounded theory [29], on the sustainability of evidence-based innovations in cancer survivorship care that have been implemented across Canadian jurisdictions. An innovation was defined as new knowledge, tools, or interventions (including programs and services) that organizations are using for the first time [30]. An innovation was considered evidence-based if at least one published peer-reviewed study, using an experimental or quasi-experimental design, demonstrated improved outcomes for the target population. This is the criterion used by the National Cancer Institute for Research-Tested Intervention Programs specifically for cancer control and cancer survivorship interventions [31]. Sustainability was defined as the *continuation* of the innovation's activities or outcomes beyond the initial implementation stage or initial funding period [32]. This study was approved by the Nova Scotia Health Authority's Research Ethics Board. All participants provided written informed consent before participating in the study.

Patient and Public Involvement

No patient involved.

Conceptual Frameworks

The study was informed by Scheirer's work on sustainability [32, 33], the dynamic sustainability framework (DSF) [19], and Nilsen's taxonomy of implementation frameworks [34]. Scheirer's work was used during sampling, specifically to identify innovations based on innovation type: those implemented by individual providers; those requiring coordination among multiple staff; new policies, procedures, and technologies; capacity or infrastructure building; collaborative partnerships or coalitions; and broad-

scale system change. The DSF proposes that the "fit" between the innovation (specifically, interventions) and the setting is key to sustainability, and focuses on three main elements: the intervention, practice setting or context, and broader ecological system. This framework informed development of the interview guide (e.g., questions and probes around the innovation, practice setting, and broader health care system) and ongoing analyses/interpretation. Nilsen's taxonomy was used during data analysis only to categorize the resultant findings (see below).

Participants

Participants were implementation leaders and relevant staff from across Canada involved in the implementation of a range of innovations in cancer survivorship care (e.g., self-management tools, physical activity programs, and models of follow-up care). Recruitment involved a two-phased process. First, we had to identify innovations of interest and, second, recruit leaders and staff involved in those innovations. The identification of innovations was multipronged: 1) viewing of all archived rounds and reviewing of all publications posted on the Canadian Cancer Survivorship Research Consortium (CCSRC) website; 2) multiple PubMed searches with combinations of relevant search terms (e.g., cancer, survivor*, Canada, rehabilitation, interventions, physical activity); and 3) speaking with the individual responsible for survivorship care and programming at all provincial cancer agencies (or their equivalent) to identify additional relevant initiatives in each province. Upon a final list of all potential innovations, we assessed whether each innovation was evidence-based, as per the criterion described above [31].

From those innovations deemed evidence-based, we purposively recruited participants to maximize variation in cancer site, type of innovation [33], and geographic setting. Individual recruitment involved purposive sampling to identify the implementation leader(s) and/or staff member(s) who was most directly involved in the implementation and/or sustainment of the innovation. These individuals

were contacted by the lead author (RU) via email and invited to anticipate. Data collection continued until thematic saturation was reached [35].

Data Collection

We conducted one-on-one, semi-structured telephone interviews with participants. An interview guide was developed based on the study objectives and the DSF, using practical guidance from Patton [36] and Rubin and Rubin [37]. The interview guide is provided as a Supplementary File. The interviews focused on eliciting participants' understandings of the innovation, the process by which it was implemented, whether and how the innovation is sustained, and the multi-level factors affecting its sustained use and impact. One master's trained research associate with experience in qualitative methods (LLM) conducted all interviews, which lasted approximately 40-60 minutes. The interviewer had no prior relationship with any of the participants, and no repeat interviews were conducted. Field notes were taken during interviews to record interviewer observations and perceptions. All interviews were audiotaped and transcribed verbatim.

Data Analysis

Consistent with grounded theory, the interview data were collected and analyzed concurrently. An inductive approach, using constant comparative analysis, was used to analyze the interview transcripts [29]. Analysis involved coding, constant comparison, and identification, organization, and refinement of categories. To help ensure consistency and conceptual clarity throughout the process of coding and categorization, a coding framework (i.e., "codebook") was developed by the lead author (RU) and research associate (LLM). This was achieved through review of three transcripts and a team discussion. Next, the research associate used the codebook to code the remaining transcripts, with regular meetings between the same two individuals to review coding and the consistency of applying the codes

to the interview text, consult with field notes, and refine the codebook as needed. Qualitative software (NVivo 10, QSR International, 2012) was used for data management and to facilitate comparison and synthesis of codes. Several full team meetings were also conducted to review coding and discuss emerging findings.

During a final two-day team meeting, the resultant findings were categorised according to determinants, processes, and implementation outcomes, and whether the data suggested a factor was necessary to sustainability or important but not necessary. Drawing on Nilsen's taxonomy of implementation frameworks [34], we categorized factors as those that help us understand and/or explain what influences outcomes (determinants), those that describe the processes that help translate innovations into practice (processes), and those that identify important aspects by which to evaluate the initial implementation (implementation outcomes). Regarding the latter, implementation outcomes were specifically defined as "the effects of deliberate and purposive actions to implement new treatments, practices and services" [38]. Determining whether a factor was 'necessary' or 'important but not necessary' was an iterative process that involved analyzing participant perspectives on this issue as well as the data on whether and the extent to which a specific innovation was sustained (i.e., *continued* activities or outcomes beyond the initial implementation stage or initial funding period [32], as described above) in the presence or absence of all resultant factors. If innovations were sustained in the absence of a particular factor, then this factor was deemed important but not necessary.

RESULTS

Twenty-seven participants from 25 unique cancer survivorship innovations based in six Canadian provinces (British Columbia, Alberta, Manitoba, Ontario, Quebec, and Nova Scotia) participated in this study. Table 1 presents participant characteristics. All interviews took place from August 2017 to March 2018. Of the 25 innovations, 20 were sustained to some degree in that activities continued after the

initial funding period. Five were not sustained. The innovations were grouped into five categories, depending on its intended purpose: physical activity programs, psychological support/counselling, transition to survivorship programs, transition to primary care programs, and return to life and lifestyle programs. Eighteen were delivered in-person, four were delivered online, and three were delivered both in-person and online.

Sixteen factors were perceived to influence sustainability: seven determinants, five processes, and four implementation outcomes (Figure 1). Seven of these were deemed necessary, while nine were important but not necessary. Table 2 presents all 16 factors, with brief descriptions. The necessary determinants, discussed in detail below, were 1) management support; 2) organizational and system-level priorities; and 3) key people and expertise. Necessary processes were 4) adaptation; 5) stakeholder engagement; and 6) ongoing education and training. The only necessary implementation outcome was 7) staff and organizational buy-in for the innovation.

Necessary Determinants

Management support

Participants continually voiced their experience that the support of middle and senior managers is imperative to the sustained use of any innovation. Their experience was that even with all other pieces in place, it is extremely challenging to sustain any innovation without management support. As one participated stated, “Management support, for sure, is very important, especially for growth. Um, very, very important” [Participant 19]. Participants noted that management support tends to result in ongoing funding, whether this is the direct provision of funds (e.g., out of their program budget) or advocating for funding from other sources. Participants also described how it is often difficult for managers to support innovations in survivorship care because of competing priorities and that survivorship care does not result in quantifiable metrics in the same the way other areas of care do:

> I would say that it's one of the … tougher components for people, for senior management, to buy into because it's a softer metric to try to collect in a way. Because it's not like you've got numbers of patients going through chemo or radiation. It's not, you know, survivorship care is a lot harder to look at that data and try to figure out if it's meaningful or worth it. [Participant 2]

Participants also noted that management support is much higher when an innovation and its sustainment are appropriately resourced and funded. Innovations that do not have secure funding require managers to transfer operational funds and/or allocate other resources (e.g., staff time) away from existing programs and services.

Organizational and system-level priorities

All participants discussed how survivorship care is perceived as a low organizational and health system priority relative to other cancer programs and services. As one participant stated, "It's not because people aren't interested in [survivorship care], it's just that it's maybe seen, maybe viewed as the nice to have, not the need to have" [Participant 2]. As a result, the sustainment of innovations that have been implemented were described as particularly challenging, regardless of the extent to which program components are in place and working well. Participants described several instances whereby survivorship care was prioritized and therefore initial implementation efforts were well supported and resourced. One example of this is a focus on post-cancer treatment transitions mandated by the province of Ontario: "Having Cancer Care Ontario … starting to really implement comprehensive care that includes the patient, not just the tumour, is really helpful. Because our hospitals are funded by the degree to which they meet these mandates" [Participant 18]. However, participants noted that even when innovations appeared to be integrated, shifting priorities at the health authority or government level often meant that sustainability was threatened. Speaking about an innovation related to transitioning survivors from active treatment to well follow-up care, one participant explained:

> There had been significant shifting in terms of how our organization was structured and who actually had the authority and power, and their viewpoint on all of it. And, so, we couldn't at that point really proceed with it because the organization was really shifting away from that work. [Participant 11]

Key people and expertise

Participants continually emphasized the importance of two key individuals for ongoing sustainment of innovations: clinical champions and dedicated coordinators (or similar personnel). Ongoing champions were deemed necessary for sustainability. Several innovations illustrated this perspective. One was a program aimed at transitioning low-risk survivors back to primary care after treatment. This program, led by a tremendously well-respected clinical champion, had been in place for more than four years and appeared well integrated within the cancer care setting. However, upon loss of the champion, the program was substantially altered and eventually dwindled to minimal use. Conversely, two other transition programs, in other jurisdictions, did not secure ongoing funding after the initial pilots, but maintained ongoing activities simply because the clinical champions continued the service, sometimes in a voluntary role (i.e., during evenings and weekends) despite a lack of funding and other resources.

For many programs, participants also described dedicated program coordinators (or staff members with a coordination role) as being a necessary resource for sustainability, playing a complementary role to clinical champions. Their experience was that such a role was necessary to ensure the innovation was running smoothly, including the continuation of activities and tracking of deliverables. As one participant said:

> It could conceivably be just a small team or one person working remotely, coordinating this kind of thing and sort of, like I said, overseeing the [innovation] and making sure that technological

and referral purpose is running smoothly. But, it has to be, it does have to be there. It can't run itself. [Participant 7]

Many participants highlighted that certain expertise or skillsets are often needed for an innovation to continue to work efficiently and effectively. An example was the presence of certified exercise professionals for physical activity programs.

Necessary Processes

Adaptation

All participants emphasized that adaptation, not fidelity, is necessary for sustainability. Participants discussed how their task, as leaders and staff of innovations, was to ensure that the innovation evolved and adapted as necessary in their particular setting. Their view was that without adaptation, there was no sustainability. Adaptation was necessary to allow the team/organization to continually meet the needs of patients and to maintain fit with the setting/environment (e.g., changing staff, capacity, resources, policies, and political environment). As one participant stated:

> Our being flexible and adapting to what would work, both for ourselves and our limited resources and time and for our patients. I think if we hadn't adapted the program, we wouldn't still be offering it. So, we had to adapt and change and shorten and condense, while sticking to the hearts and, you know, key concepts of the program. [Participant 17]

Table 3 provides examples of adaptations to each type of innovation. Many were related to delivery mechanisms with the goal of increasing accessibility of the program and/or its feasibility (e.g., changing the frequency or timing of delivery, moving some components to online delivery, changing referral processes). Moreover, it was widely recognized that adaptation was necessary because the evidence base for innovations change. An innovation today, both its components and target population, will likely change as new evidence becomes available: "I think it's imperative to keep current with the evidence for

whatever it is you're offering. And making adaptations with the program that are in keeping with the evidence" [Participant 6].

Stakeholder engagement

Participants described the engagement of important stakeholders (e.g., physicians, patients, administrators) as essential to sustainability. The data indicated participants viewed engagement as critical for two reasons. First, engagement increases awareness of the innovation, its evidence base, and its potential benefits, and helps to develop trust and a sense of ownership with regard to the innovation. As one participant said:

> … the consultations in advance and the getting the people on board and having their input into how things are gonna look and design, I think that was required in order to get any of them on board for something that would be a voluntary change in practice. [Participant 8]

Second, engagement contributed to the practice-based adaptation of the innovations to optimize fit to the local setting. This engagement occurred through mechanisms such as establishing Steering or Advisory Committees composed of key stakeholders, conducting needs assessments, meeting with multidisciplinary cancer site teams/tumour boards, consulting with primary care providers/networks, and co-designing with patient and/or physician groups. Participants described engagement as positively changing both the engaged person (through building a sense of ownership and personal investment; discussed below) as well as the innovation itself (through adaptation to the local setting; discussed above), both viewed as essential to sustainability.

Ongoing education and training

Participants across all organizations and jurisdictions emphasized that ongoing education and training was required to sustain their innovations. This was particularly true due to high staff turnover, which

was deemed prevalent across organizations and jurisdictions. The nature of academic health care settings, with turnover of learners on an ongoing and frequent basis, was also described as a challenge to sustainability:

> Probably one of the biggest barriers is that there's always new staff that come along, like fellows and residents and stuff like that. So, um, you know, they're often just not even aware. So unless there's some kind of process in place to sort of orient them to those types of things then they won't be delivering it. [Participant 16]

Ongoing training was viewed as particularly important in cancer survivorship care given the absence of formal education and training in survivorship issues for most health care providers. One participant put it this way: "…teaching, teaching the next one, so that … we can grow our force of people involved in survivorship care. If we don't invest in that then, well then, I'm never gonna have a vacation" [Participant 24].

Necessary Implementation Outcome

Widespread staff and organizational buy-in

Participants stated that ongoing and widespread staff and organizational buy-in is absolutely necessary for sustainability. One participant summed this up by saying, "without buy in and support from the physicians, from other nurses, from the other allied health staff, from the receptionist, from everybody, um, the program wouldn't work" [Participant 23]. Participants discussed many factors during the implementation period that lead to widespread buy-in, including attributes of the innovation itself (e.g., ease of use), how the innovation is initially framed/presented (including its evidence base), stakeholder engagement, and whether it is a priority of senior management. Participants also stated that the overall low priority of survivorship care (relevant to other areas of cancer care) serves to decrease buy-in from at all levels of the organizations.

Important but not necessary

The data suggested 9 factors were important to sustainability, but not necessary. These are presented in Table 2. For example, while resources in the form of funding, equipment, and physical space are very important for many innovations, the data demonstrated that, with the exception of one innovation, the loss of the initial implementation funding, or the lack of additional funding, equipment, or space to expand beyond the implementation phase, did not result in a loss of the innovation if other necessary factors were present (e.g., key people). Similarly, penetration of the innovation into existing workflows and systems, particularly hospital information technology systems, was perceived as important to many of the innovations, yet many innovations were sustained (oftentimes described as continuation of program components and activities) in the absence of penetration when other necessary components were in place.

DISCUSSION

We investigated the factors influencing the sustainability of 25 different types of innovations in cancer survivorship care. The findings revealed a number of factors deemed necessary for sustainability: management support; organizational and system-level priorities; key people and expertise; innovation adaptation; stakeholder engagement; ongoing education and training; and staff and organizational buy-in. These findings are important given the considerable investment over the past decade to implement and scale beneficial innovations within and across Canadian jurisdictions so more people have access to high-quality cancer survivorship care. They point to specific factors implementation teams should consider and plan for to achieve their desired outcomes and maximize the long-term impact of these investments. From a practice perspective, they can be used to develop and/or select instruments and

tools to assess capacity for sustainability, increase capacity in specific domains, and to assist with the ongoing monitoring of key determinants and processes.

Many of the determinants, processes, and outcomes identified in this study align with the emerging literature in this area. A recently developed framework [26] from a 2018 review on sustainability identified four key processes that the evidence suggests are important to sustainability: partnership/engagement, training/supervision, program evaluation, and adaptation. Moreover, program champions, leadership/support, resources/funding, and staffing/turnover were all identified as key inner (organizational) contextual factors that influence sustainability. While the concepts may be phrased differently, our findings markedly align with the existing evidence in this area. There were also several factors identified by participants in this study that are somewhat unique, or not explicitly specified, in the literature. One of these is the speed of implementation, which participants viewed as being important because a slow(er) implementation allows implementation teams the time to plan for and implement in a way that leverages the key elements needed for sustainability. Moreover, we categorized a number of our findings as implementation outcomes, which are necessary for or important to sustainability. While we recognize that sustainability has been described as an implementation outcome itself [38], few researchers have attempted to describe or delineate the impact of more proximal implementation outcomes (e.g., adoption) on the sustained use of an innovation, yet these proximal outcomes may act as moderators to sustainability (e.g., continuation of program components/activities and/or continuation of desired outcomes). Such relationships could be tested in future research.

The emphasis on the essential role of adaptation for sustainability deserves discussion. Participants were implementation leaders and relevant staff involved in the implementation and/or sustainment of

innovations relevant to cancer survivorship care. Their perspectives were largely practice-based, with an acute recognition that one-sized-fits-all innovations do not work for most settings. This is supported by the increasing awareness in the literature that adaptation is common and likely necessary to facilitate sustainability [19, 26, 39, 40]. In fact, the findings align well with the DSF and its postulation that innovations should not be optimized prior to implementation but rather require (and benefit from) ongoing adaptation and optimization. In this study, innovations were adapted (e.g., components, practitioners, delivery platforms) in response to changes in the practice setting (e.g., staffing, information systems, processes for training) and the broader ecological system (e.g., other practice settings, policies, population characteristics). It is important to note, however, that many of the described adaptations were made in response to unanticipated changes and challenges, and thus might be better termed modifications [39]. These findings reinforce the need for ongoing monitoring and feedback mechanisms to assess not only the innovation itself and related outcomes, but also changes in the setting and system at large to support appropriate and timely adaptation.

It is also important to highlight that many of adaptations described by participants were to form, rather than function [41, 42]. That is, adaptations were made to specific strategies or activities (forms) rather than the intended purposes the innovation aims to achieve (functions). For example, educating and supporting patients to more effectively manage their post-treatment health concerns (function) may be accomplished through various activities, such as one-on-one teaching, individualized care plans, and so on (forms). These types of adaptations demonstrate the importance of 'flexibility within fidelity' [43] or fidelity-consistent adaptations [39] for sustainability. In its methodology standards for studies of complex interventions, the Patient-Centered Outcomes Research Institute (PCORI) in the US advises researchers and implementation teams to clearly delineate an intervention's core functions and forms, and to maintain fidelity to the core functions while documenting adaptations to form [44]. By doing so,

we can provide better guidance to those who are implement and evaluate such interventions. This also reinforces the need for ongoing evaluation post-implementation to understand the what and why of adaptations, and how these relate to sustainability; in this study, less than half of the innovations were evaluated post-implementation.

We categorized widespread buy-in as an implementation outcome. We defined widespread buy-in as a commitment to the innovation by a larger group of individuals within the organization or the organization as whole, specifically their commitment to support and engage in an initiative. Although we could find no clear definition or operational specificity of this concept in the existing health literature, the management and business literature does characterize buy-in in terms of one's intellectual and emotional commitment to an organization's cause and/or plan [45], and provides guidance to increase buy-in during organizational change initiatives [46]. While buy-in, as we have defined, can be present during the decision to adopt an innovation and/or its implementation, buy-in is also a desired result of the strategies and activities (e.g., communications, education/training, use of opinion leaders) put in place during implementation. By and large, implementation teams are seeking to achieve buy-in. In this way, it aligns with the definition of implementation outcomes proposed by Proctor, namely "the effects of the deliberate and purposive actions to implement new treatments, practices, and services" [38]. However, buy-in is not one of the eight commonly-used implementation outcomes [38]. We posit that perhaps this construct might be a useful addition to implementation outcomes and thereby efforts to understand how to appropriately operationalize and measure buy-in are needed.

Clearly, many of the factors presented here relate to one another and are not independent influences on sustainability. For example, stakeholder engagement (a process) often serves to increase wide-spread buy-in (an outcome), which then may result in additional resources (a determinant) to sustain an

innovation. Moreover, both managerial support and organizational- and system-level priorities (necessary determinants) will often reflect the magnitude and nature of resources (important determinant) dedicated to any initiative. Such interdependence will be present in the sustainability of any complex innovation, and demonstrates the 'messiness' of both the science and practice in this area. Future research should attempt to delineate what combination of factors might be most important for different types of innovations.

Several of the study findings also highlight an important issue in cancer survivorship care and programming: namely, that the evidence base for survivorship innovations is of lower quality, and the resulting outcomes are "softer," compared to the evidence base and outcomes in other areas of cancer care (e.g., diagnosis and treatment). While participants in this study stated that evidence of an innovation's effectiveness contributed to sustainability by strengthening the case for funding and helping consolidate buy-in from frontline staff (see Table 2), they also noted that it can be difficult to secure management support for innovations in survivorship care, in part because it does not result in quantifiable metrics like other areas of cancer care. As such, they perceived that survivorship care is viewed as a desirable, but non-essential, service within cancer care organizations. These issues undoubtedly impact the ability to sustain survivorship innovations in practice, particularly where leaders and managers have to decide between funding/resourcing services with hard performance metrics to demonstrate effectiveness versus services with metrics that are less traditional or more difficulty to quantify.

From a methodological standpoint, during sampling, we attempted to identify and categorize programs based on Scheirer's suggested innovation types: innovations implemented by individual providers; interventions requiring coordination among multiple staff; new policies, procedures, and technologies;

capacity or infrastructure building; collaborative partnerships or coalitions; and broad-scale system change [33]. In practice, this was challenging for several reasons. One, there are few innovations in cancer survivorship that are implemented by individual providers. Two, many of the innovations crossed categories. For example, many innovations required coordination across multiple staff, represented new policies, procedures, or technologies, *and* involved collaborative partnerships with community- or research-based groups. Thus, the most appropriate category was difficult to select and we therefore categorized the innovations by function (i.e., its intended purpose) rather than the level or nature of the change. These are not limitations of Scheirer's taxonomy, but demonstrate the complexity that can arise when attempting to fit into pre-existing categories. We continue to advocate for and support the use of existing nomenclature, taxonomies, and frameworks to help build an evidence base in this area. Nonetheless, while such frameworks should guide our work, we cannot be constrained by them when they are not helpful in the context of a particular study.

This study has a number of strengths. First, we interviewed participants from 25 different survivorship innovations across six jurisdictions, which should increase the transferability of findings. Second, we built on others' work in sustainability, including existing taxonomies and frameworks, to advance knowledge in this area. This study also has several limitations. First, this study focused solely on innovations in cancer survivorship. This may limit transferability to innovations in other areas of care, although there is no inherent reason why innovations in cancer survivorship should differ from innovations in other areas of chronic disease management that aim to address the physical, psychosocial, and economic sequelae of an illness and its treatment. Given that the findings also align with the emerging literature on sustainability, conducted across a range of health conditions and settings, the findings are likely transferable. Second, although we undertook a multi-stepped approach to identify innovations that had been implemented across Canada, we cannot be certain that we did not

miss innovations that would have been important to study. Third, we used the National Cancer Institute for Research-Tested Intervention Programs criterion for determining whether an innovation was evidence-based. This criterion is not stringent and it is likely some of the innovations studied were more "evidence-based" than others, which may have implications for sustainability (see Table 2). Fourth, we attempted to discriminate between factors that are more salient or perceived by participants as necessary to sustainability as opposed to factors that are important, but not necessary. This dichotomization may be somewhat artificial and not true for all settings or innovations. We did this in an attempt to avoid a 'laundry list' of every possible determinant of sustainability. It also attempts to address one of the gaps in our understanding of the factors that influence sustainability: namely, are some factors more critical than others [26]? This is a first step toward identifying critical factors (determinants, processes, and implementation outcomes) of sustainability. Future research should also focus on developing metrics and methods to prioritize these factors, and combinations thereof, and link them to appropriate strategies.

In conclusion, this study demonstrated that certain determinants, processes, and implementation outcomes influence the sustainability of innovations in cancer survivorship care. These factors exist across multiple levels of the health system and are often interdependent. They also demonstrate the dynamic nature of sustainability. Three examples of this dynamism are the ongoing nature of adaptation, the shifting nature of priorities that can change the local landscape and resulting support for sustainment, and the turnover of champions and support staff. The findings may be used by researchers, decision-makers, and implementation teams to plan for sustainability during the early implementation of innovations, particularly factors shown to be necessary to the long-term use of innovations.

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Table 1. Participant characteristics (N=27).

Characteristic	N (%*)
Sex	
Male	5 (18.5)
Female	22 (81.5)
Jurisdiction*	
British Columbia	4 (14.8)
Alberta	4 (14.8)
Manitoba	1 (3.7)
Ontario	14 (51.8)
Quebec	3 (11.1)
Nova Scotia	1 (3.7)
Professional role	
Researcher	11 (40.7)
Clinician	11 (40.7)
Decision-maker	5 (18.5)
Years in role	
<10	6 (22.2)
10+	21 (77.8)

*Percentages may not add to 100% due to rounding.

**Indicates place of employment of participant; some innovations were pan-Canadian in nature but hosted/led by a program in a specific jurisdiction.

Table 2. Factors influencing the sustainability of cancer survivorship innovations. Bolding represents necessary factors.

	FACTOR	DESCRIPTION
DETERMINANTS	**Management support**	**The support of middle and senior managers is critical for sustainability. It is difficult to sustain any innovation in the absence of management support.**
	Organizational and system-level priorities	**Survivorship care is generally not an organizational or system-level priority, making sustainability challenging. Even when survivorship is prioritized, shifting priorities at health authority or government levels often mean sustainability is threatened.**
	Key people & expertise	**Key people, namely clinical champions and project/program coordinators, are particularly important to maintaining an innovation's activities and use. Often, certain expertise or skillsets are required for an innovation to work efficiently and effectively.**
	Resources	Resources in the form of funding, physical space, and equipment are often very important to sustainment, particularly to expand a program or service beyond the population served in the initial pilot phase.
	Complexity	Innovations that are simple, require less time to use, and the coordination and/or cooperation of fewer organizational members are easier to sustain.
	Evidence	Scientific evidence of an innovation's effectiveness contributes to sustainability by strengthening the case for funding, increasing its priority level, and strengthening buy-in from frontline staff (mainly physicians).
	Partnerships	Partnerships with other similar organizations, including community-based organizations, are not necessary for sustainability but can be very important as they permit the sharing of resources and expertise.
PROCESSES	**Adaptation**	**Adaptation, not fidelity, is necessary for sustainability. Adaptation is necessary to continually meet the needs of patients and to maintain fit with the local setting.**
	Stakeholder engagement	**The engagement of key stakeholders (e.g., physicians, patients, administrators) is essential to sustainability by developing a sense of ownership over the innovation and allowing for practice-based adaptations that optimize fit with the local setting.**
	Ongoing education and training	**Ongoing education and training is necessary to sustain innovations, particularly due to high levels of staff turnover in cancer care settings.**
	Speed of implementation	The speed of implementation can impact sustainability. Specifically, implementing slowly permits the time to get many of the key elements in place (e.g., training and ongoing supports, metrics and data collection/reporting procedures,

		stakeholder engagement) that support the long-term sustainment of the innovation.
	Feedback and evaluation	Feedback and evaluation, while not necessary, is important to sustainability as it helps to demonstrate the innovation's value, maintain credibility, maintain buy-in, and help secure ongoing resources, including funding.
IMPLEMENTATION OUTCOMES	**Staff and organizational buy-in**	**Widespread and ongoing staff and organizational buy-in is necessary for sustainability. Many factors during the implementation period lead to buy-in.**
	Adds value	Adding value to the organization (e.g., through positive publicity) and its staff (e.g., saving staff time) helps to maintain buy-in, and increases opportunities for partnerships and additional resources.
	Adoption	A lack of adoption, specifically by patients, threatens sustainability. Many survivorship innovations rely on patients being aware that a particular program or resource is available and choosing to access it. Low patient uptake reinforces the perception such innovations are low priority.
	Penetration	Integrating the innovation into the service setting and its existing subsystems is important to sustainability. These systems include existing clinical workflows, including EMRs, physician ordering, and other forms of documentation. Such integration can provide automatic referrals for programs/services and serve as reminders regarding use.

Table 3. Innovation types and examples of adaptations.

INNOVATION TYPE	FUNCTION	EXAMPLES OF ADAPTATIONS
Physical activity programs	To increase physical activity among cancer survivors	Changes in timing and length of delivery; changes in setting (cancer centre versus community)
Psychological support/counselling	To provide cancer survivors with the tools to manage/cope with psychological, emotional, and social distress	Changes in length of sessions; addition of orientation sessions; transition to online delivery, including apps for smartphones
Transition to survivorship programs	To support cancer survivors' transition from active (intensive) cancer treatment to routine follow-up care	Automatic referrals to program; changes in timing of delivery; changes in setting (cancer centre versus community); addition of content (e.g., self-management)
Transition to primary care programs	To support cancer survivors' transition from specialist-led follow-up care to primary care-led follow-up	Tailoring of tools (e.g., specific recommendations, list of community resources) to cancer types; changes in delivery mode (e.g., mailed versus faxed versus emailed communications)
Return to life and lifestyle programs	To help cancer survivors return to a "new normal" after cancer treatment and/or to support lifestyle changes to improve overall health and well-being	Addition of orientation sessions; automatic registration; transition to online delivery; refinement of websites; addition of content (e.g., sexuality and cancer); changes in frequency, timing, and length of delivery

CONTRIBUTORSHIP STATEMENT

Conceptualization, RU, CK, EC, BJP, GK, SAR, and JLB; Methodology, RU, LLM, CK, EC, BJP, GK, SAR, and JLB; Formal Analysis, RU, LLM; Writing – Original Draft Preparation, RU; Writing – Review & Editing, RU, LLM, CK, EC, BJP, GK, SAR, and JLB; Funding Acquisition, RU, CK, EC, BJP, GK, SAR, and JLB. All authors read and approved the final manuscript.

COMPETING INTERESTS

The authors declare no competing interests.

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DATA SHARING STATEMENT

This is a qualitative dataset and therefore not publicly available due to confidentiality reasons.

REFERENCES

1. Corkum M, Urquhart R, G K, Hayden JA, Porter G: **Breast and cervical cancer screening behaviours among colorectal cancer survivors in Nova Scotia**. *Curr Oncol* 2014, **21**(5):e670-677.
2. Johnson PM, Malatjalian D, Porter GA: **Adequacy of nodal harvest in colorectal cancer: a consecutive cohort study**. *J Gastrointest Surg* 2002, **6**(6):883-888; discussion 889-890.
3. Porter GA, Urquhart R, Bu J, Johnson PJ, Grunfeld E: **The impact of audit and feedback on nodal harvest in colorectal cancer**. *BMC Cancer* 2011, **11**:2.
4. Rayson D, Urquhart R, Cox M, Grunfeld E, Porter G: **Adherence to clinical practice guidelines for adjuvant chemotherapy for colorectal cancer in a Canadian province: a population-based analysis**. *J Oncol Pract* 2012, **8**(4):253-259.
5. Richardson DP, Porter GA, Johnson PM: **Population-based use of sphincter-preserving surgery in patients with rectal cancer: is there room for improvement?** *Dis Colon Rectum* 2013, **56**(6):704-710.
6. Urquhart R, Folkes A, Porter G, C K, Cox M, R D, E G: **Population-based longitudinal study of follow-up care for colorectal cancer patients in Nova Scotia**. *J Oncol Pract* 2012, **8**(4):246-252.
7. Latosinsky S, Fradette K, Lix L, Hildebrand K, Turner D: **Canadian breast cancer guidelines: have they made a difference?** *CMAJ* 2007, **176**(6):771-776.
8. Cree M, Tonita J, Turner D, Nugent Z, Alvi R, Barss R, King C, Winget M: **Comparison of treatment received versus long-standing guidelines for stage III colon and stage II/III rectal cancer patients diagnosed in Alberta, Saskatchewan, and Manitoba in 2004**. *Clin Colorectal Cancer* 2009, **8**(3):141-145.
9. Canadian Strategy for Cancer Control: **The Canadian Strategy for Cancer Control: a cancer plan for Canada - Discussion Paper**. In. Ottawa, ON: CSCC Governing Council; 2006.
10. World Health Organization: **Bridging the "know-do" gap. Meeting on knowledge translation in global health. Geneva, Switzerland**. In.; 2006.
11. Ejemot RI, Ehiri JE, Meremikwu MM, Critchley JA: **Hand washing for preventing diarrhoea**. *Cochrane Database Syst Rev* 2008(1):CD004265.
12. Wilson KD, Kurz RS: **Bridging implementation and institutionalization within organizations: proposed employment of continuous quality improvement to further dissemination**. *J Public Health Manag Pract* 2008, **14**(2):109-116.
13. Gillissen F, Ament SM, Maessen JM, Dejong CH, Dirksen CD, van der Weijden T, von Meyenfeldt MF: **Sustainability of an Enhanced Recovery After Surgery Program (ERAS) in Colonic Surgery**. *World J Surg* 2014.
14. Kryworuchko J, Stacey D, Bai N, Graham ID: **Twelve years of clinical practice guideline development, dissemination and evaluation in Canada (1994 to 2005)**. *Implement Sci* 2009, **4**:49.
15. Grunfeld E: **Canadian breast cancer guidelines are as effective as possible under the circumstances**. *CMAJ* 2007, **176**(6):785-786.
16. Sheldon TA, Cullum N, Dawson D, Lankshear A, Lowson K, Watt I, West P, Wright D, Wright J: **What's the evidence that NICE guidance has been implemented? Results from a national evaluation using time series analysis, audit of patients' notes, and interviews**. *BMJ* 2004, **329**(7473).
17. Proctor E, Luke D, Calhoun A, McMillen C, Brownson R, McCrary S, Padek M: **Sustainability of evidence-based healthcare: research agenda, methodological advances, and infrastructure support**. *Implement Sci* 2015, **10**:88.

18. Maher L, DH G, Evans A: **Sustainablity model and guide**. In. Coventry, UK: Institute for Innovation and Improvement, National Health Service. Available at: http://www.institute.nhs.uk/sustainability; 2010.
19. Chambers DA, Glasgow RE, Stange KC: **The dynamic sustainability framework: addressing the paradox of sustainment amid ongoing change**. *Implement Sci* 2013, **8**:117.
20. Schell SF, Luke DA, Schooley MW, Elliott MB, Herbers SH, Mueller NB, Bunger AC: **Public health program capacity for sustainability: a new framework**. *Implement Sci* 2013, **8**:15.
21. Shelton RC, Chambers DA, Glasgow RE: **An Extension of RE-AIM to Enhance Sustainability: Addressing Dynamic Context and Promoting Health Equity Over Time**. *Front Public Health* 2020, **8**:134.
22. Lennox L, Maher L, Reed J: **Navigating the sustainability landscape: a systematic review of sustainability approaches in healthcare**. *Implement Sci* 2018, **13**:27.
23. Moore JE, Mascarenhas A, Bain J, Straus SE: **Developing a comprehensive definition of sustainability**. *Implement Sci* 2017, **12**(1):110.
24. Wiltsey Stirman S, Kimberly J, Cook N, Calloway A, Castro F, Charns M: **The sustainability of new programs and innovations: a review of the empirical literature and recommendations for future research**. *Implement Sci* 2012, **7**:17.
25. Scheirer MA: **Is Sustainability Possible? A Review and Commentary on Empirical Studies of Program Sustainability**. *American Journal of Evaluation* 2005, **26**(3):320-347.
26. Shelton RC, Cooper BR, Stirman SW: **The Sustainability of Evidence-Based Interventions and Practices in Public Health and Health Care**. *Annu Rev Public Health* 2018, **39**:55-76.
27. Canadian Cancer Society's Advisory Committee: **Canadian Cancer Statistics 2019**. In. Toronto, OM: Canadian Cancer Society; 2019.
28. Canadian Cancer Research Alliance: **Pan-Canadian framework for cancer survivorship research**. In. Toronto, ON: CCRA; 2017.
29. Strauss AL, Corbin JM: **Basics of qualitative research: grounded theory procedures and techniques**. Thousand Oaks, CA: Sage; 1990.
30. Klein KJ, Sorra JS: **The challenge of innovation implementation**. *Acad Manage Rev* 1996, **21**(4):1055-1080.
31. **Research-Tested Intervention Programs (RTIPs). Available at:** https://rtips.cancer.gov/rtips/index.do **[Accessed May 4, 2020]**
32. Scheirer MA, Dearing JW: **An agenda for research on the sustainability of public health programs**. *Am J Public Health* 2011, **101**(11):2059-2067.
33. Scheirer MA: **Linking sustainability research to intervention types**. *Am J Public Health* 2013, **103**(4):e73-80.
34. Nilsen P: **Making sense of implementation theories, models and frameworks**. *Implement Sci* 2015, **10**:53.
35. Guest G, Bunce A, Johnson L: **How many interviews are enough?** *Field Methods* 2006, **18**(1):59-82.
36. Patton MQ: **Qualitative research & evaluation methods**, 3rd edn. Thousand Oaks, CA: SAGE Publications; 2002.
37. Rubin H, Rubin I: **Qualitative interviewing: the art of hearing data**. Thousand Oaks, CA: Sage Publications; 1995.
38. Proctor E, Silmere H, Raghavan R, Hovmand P, Aarons G, Bunger A, Griffey R, Hensley M: **Outcomes for implementation research: conceptual distinctions, measurement challenges, and research agenda**. *Adm Policy Ment Health* 2011, **38**(2):65-76.
39. Wiltsey Stirman S, Baumann AA, Miller CJ: **The FRAME: an expanded framework for reporting adaptations and modifications to evidence-based interventions**. *Implement Sci* 2019, **14**(58).

40. Aarons GA, Green AE, Palinkas LA, Self-Brown S, Whitaker DJ, Lutzker JR, Silovsky JF, Hecht DB, Chaffin MJ: **Dynamic adaptation process to implement an evidence-based child maltreatment intervention**. *Implement Sci* 2012, **7**:32.
41. Hawe P, Shiell A, Riley T: **Complex interventions: how "out of control" can a randomised controlled trial be?** *BMJ* 2004, **328**(7455):1561-1563.
42. Jolles MP, Lengnick-Hall R, Mittman BS: **Correction to: Core Functions and Forms of Complex Health Interventions: a Patient-Centered Medical Home Illustration**. *J Gen Intern Med* 2019.
43. Kendall PC, Beidas RS: **Smoothing the trail for dissemination of evidence-based practices for youth: Flexibility within fidelity**. *Professional Psychology: Research and Practice* 2007, **38**(1):13-20.
44. **PCORI Methodology Standards for Studies of Complex Interventions. Available at:** https://www.pcori.org/research-results/about-our-research/research-methodology/pcori-methodology-standards - Complex **[accessed May 4, 2020]**
45. Thomson K, de Chernatony L, Arganbright L, Khan S: **The Buy-in Benchmark: How Staff Understanding and Commitment Impact Brand and Business Performance**. *Journal of Marketing Management* 1999, **15**(8):819-835.
46. Kotter JP: **Leading change: Why transformation efforts fail.** . *Harvard Business Review* 1995, **Reprint 95204**:59-67.

FIGURE LEGENDS

Figure 1. Factors influencing the sustainability of cancer survivorship innovations.

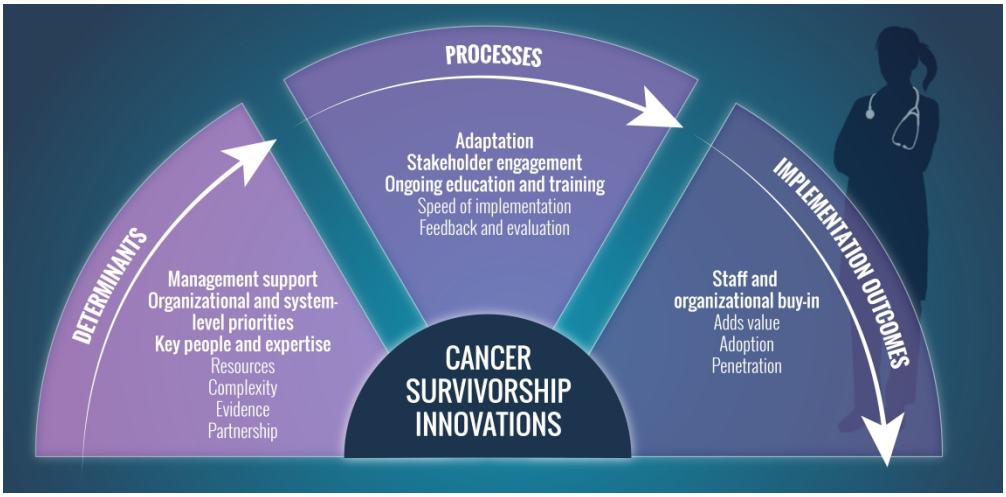

Figure 1. Factors influencing the sustainability of cancer survivorship innovations.

Additional file 1

Draft interview guide for semi-structured interviews.

Setting the stage

1. Can you tell me a bit about *[Innovation X]*?
   Probes
   a. What does *[Innovation X]* entail? What are its components?
   b. Was there any training or education necessary with the implementation?
   c. Were there any policies put into place?
   d. Were there any additional management needs or positions created?
   e. What year was it introduced?
   f. Was there a pilot period? If so, how long was the pilot period?
   g. How long has it been in use (since then)? Is it still in use?
2. How did you first hear about *[Innovation X]*?
   a. What were your initial thoughts?
3. Why was *[innovation X]* implemented here? What need were you trying to address?
   a. Who identified the need for this intervention *[frontline staff, hospital manager/administrators, government]*?
   b. Who proposed *{Innovation X]* as a means of addressing this need *[frontline staff, hospital manager/administrators, government]*?
   c. Did others perceive this need as well?

Implementation

Now I'd like to talk to you a bit about the implementation of [*Innovation X*].

4. Can you tell me about how *[Innovation X]* was implemented?
   Probes
   a. What was your role in the implementation process?
   b. Who else was involved and what were their roles?
   c. How were the relationships between people during the implementation process?
      i. Examples: pre-existing, strength, coming from within or from outside, trust, respect
5. How different was *[Innovation X]* from the existing practices?
   a. Did these differences/similarities affect the implementation process?
   b. If so, how?
6. Would you say that the implementation of *[Innovation X]* was initially successful?
   a. If so, how?
   b. If not, why not?

Sustainability

7. When I talk about sustainability of innovations, what does sustainability mean to you?
8. Would you say *[Innovation X]* has been sustained so far? Why or why not?
    a. Was use impacted once the initially training/support ended?
        i. If so how?
        ii. If not, why not?
9. Has *[innovation X]* been adapted or modified at all?
    a. If so, in what way?
    b. Why were these modifications needed?
10. What did your program/organization do to support the ongoing use or integration of *[Innovation X]* into routine care?
    - Examples: policy or operational changes to integrate *[innovation X]* into normal worker expectations or routines
    b. How did that help with the sustainability of *[Innovation X]*?
    c. Engage: Did your team/program/organization try to engage people in the implementation process or the use of the new innovation?
    d. Execute: Did the implementation process go according to the original plan?
11. What factors do you believe influence the sustainability of *[Innovation X]*?

    Probes:
    a. In what ways?
    b. Both facilitators and barriers.
    c. Characteristics of the innovation?
    d. Characteristics of the people managing/leading/supporting its ongoing use?
    e. Organizational context (ex: staffing, IT, infrastructure, organizational culture, management support, incentives, organizational mandates)?
    f. Broader context (ex: policies, regulations, legal, political, or economic context, patient needs/preferences/characteristics)?
12. Earlier we talked about why *[Innovation X]* was implemented here and the needs it was designed to meet. What would you say has been successful in meeting the needs we talked about?
13. What other impacts has *[Innovation X]* had on your program/organization and the people who work there/with the [I*nnovation*]?
    a. What about on the patients?
14. Has there been an evaluation conducted related to the sustained use and/or impacts of *[Innovation X]*?
    a. Are the findings from those evaluations fed back into [*Innovation X]* and used to adapt it?
        i. If so, how so?
15. What do you think is required to ensure the continued use of *[innovation X]* moving forward?
    a. Examples: attitudes, incentives, removal of specific barriers, financial, human resources, organizational mandates/policies

Consolidated criteria for reporting qualitative studies (COREQ): 32-item checklist

No	Item	Guide questions/description	Author response
Domain 1: Research team and reflexivity			
Personal Characteristics			
1.	Interviewer/facilitator	Which author/s conducted the interview or focus group?	Laura L Madden [LLM]; stated in text (methods section, pg 7)
2.	Credentials	What were the researcher's credentials? *E.g. PhD, MD*	The interviewer [LLM] has a MSc; the lead author [RU] a PhD
3.	Occupation	What was their occupation at the time of the study?	LLM: Research Associate, Department of Surgery RU: Assistant Professor, Department of Surgery
4.	Gender	Was the researcher male or female?	Female
5.	Experience and training	What experience or training did the researcher have?	LLM: Did a qualitative Master's thesis; employed under the PI/lead author (RU) as a Research Associate on qualitative studies; stated in text (methods section, pg 7). RU: PI, expertise in qualitative research
Relationship with participants			
6.	Relationship established	Was a relationship established prior to study commencement?	There was no relationship between the interviewer [LLM] and either participant prior to study commencement; stated in text

			(methods section, pg 7). The lead author [RU] and one other author [JLB] knew some study participants in a professional capacity only.
7.	Participant knowledge of the interviewer	What did the participants know about the researcher? e.*g. personal goals, reasons for doing the research*	Many participants would have known that the lead author [RU] and another author [JLB] had research programs in cancer survivorship.
8.	Interviewer characteristics	What characteristics were reported about the interviewer/facilitator? e.g. *Bias, assumptions, reasons and interests in the research topic*	No characteristics are reported about the interviewer. The interviewer was a Research Associate with qualitative research experience but without any background in cancer survivorship or sustainability research.
Domain 2: study design			
Theoretical framework			
9.	Methodological orientation and Theory	What methodological orientation was stated to underpin the study? *e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis*	This study was informed by the principles of grounded theory, specifically Strauss and Corbin (1990), which is cited in the manuscript (pg. 5)
Participant selection			
10.	Sampling	How were participants selected? *e.g. purposive, convenience, consecutive, snowball*	Purposive; stated in text (methods section, pg. 6)
11.	Method of approach	How were participants approached? e.*g. face-to-face, telephone, mail, email*	Email; stated in text (methods section, pg. 6-7)

12.	Sample size	How many participants were in the study?	27; stated in text (results section, pg. 8)
13.	Non-participation	How many people refused to participate or dropped out? Reasons?	32 people in total were contacted for participation, with 27 participating in the final study; 2 individuals did not respond to the study invitation while 3 responded stating they were not the best person to interview and provided the name and contact information of a more suitable person.
Setting			
14.	Setting of data collection	Where was the data collected? e.*g. home, clinic, workplace*	Telephone; stated in text (methods section, pg. 7).
15.	Presence of non-participants	Was anyone else present besides the participants and researchers?	No.
16.	Description of sample	What are the important characteristics of the sample? *e.g. demographic data, date*	Given the nature of this study, detailed demographic data are not presented. However, participants were situated in six Canadian provinces and involved in a variety (25) of survivorship innovations.
Data collection			
17.	Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?	The interview guide was pilot tested with 2 individuals.
18.	Repeat interviews	Were repeat interviews carried out? If yes, how many?	No; stated in text (methods section, pg. 7).
19.	Audio/visual recording	Did the research use audio or visual recording to collect the data?	Yes, audio recording; stated in text (methods section, pg. 7).
20.	Field notes	Were field notes made during and/or after the interview or focus group?	Yes; stated in text (methods section, pg. 7).

21.	Duration	What was the duration of the interviews or focus group?	~40-60 minutes; stated in text (methods section, pg. 7).
22.	Data saturation	Was data saturation discussed?	Yes, the interviews continued until data saturation was reached. This was determined by constant comparison techniques and research team discussion.
23.	Transcripts returned	Were transcripts returned to participants for comment and/or correction?	No.
Domain 3: analysis and findings			
Data analysis			
24.	Number of data coders	How many data coders coded the data?	Two researchers [LLM, RU] coded the first 3 transcripts, with the remaining transcripts coded by LLM with regular review by RU; stated in text (methods section).
25.	Description of the coding tree	Did authors provide a description of the coding tree?	A codebook, containing code definitions, sample data illustrating application of the code, and decision rules related to each code, was developed by the research team. This was achieved through (1) review of three interview transcripts by RU and LLM; (2) review of codes and discussion between RU and LLM; and (3) subsequent review of codebook and discussion by the entire team; stated in text (methods section, pg.

			7-8).
26.	Derivation of themes	Were themes identified in advance or derived from the data?	Derived from the data; analysis process discussed in text (methods section, pg. 7-8).
27.	Software	What software, if applicable, was used to manage the data?	Yes, NVivo; stated in text (methods section, pg. 7-8).
28.	Participant checking	Did participants provide feedback on the findings?	No.
Reporting			
29.	Quotations presented	Were participant quotations presented to illustrate the themes / findings? Was each quotation identified? e.*g. participant number*	Yes (results section, pg. 9-14).
30.	Data and findings consistent	Was there consistency between the data presented and the findings?	Yes.
31.	Clarity of major themes	Were major themes clearly presented in the findings?	Yes.
32.	Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	Yes, minor themes are presented in both a table and figure, and discussed in brief in the discussion section.