Implementation and evaluation of a patient-focused eHealth intervention, My Kidneys My Health, in primary care and general nephrology clinics

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Abstract

Background: Care for mild to moderate chronic kidney disease (CKD) entails self-management from patients and clinical support from primary care and nephrology. In response to a gap in resources for this population, My Kidneys My Health was co-developed to support self-management of CKD. While this is a patient-facing tool, health care providers play a critical role in the implementation of patient resources

Objective: This study develops and evaluates strategies to implement My Kidneys My Health into routine primary care and general nephrology clinical care.

Methods: Health care providers working in Alberta, Canada who support patients with CKD were invited to participate in our multi-step study, guided by the Quality Implementation Framework. Step 1: we followed qualitative descriptive methodology to identify barriers and enablers to implementation using a directed content analysis and a deductive coding approach. Participants were invited to complete semi-structured interviews from October 2021 to May 2022. Step 2: we identified, prioritized, co-developed, and launched implementation strategies based on behaviour change theory. Participants from Step 1 were invited to use the materials during the implementation period (May to October 2022). Utilization was tracked through Google Analytics and document distribution tracking. Step 3: we conducted follow-up interviews with participants (October to December 2022) to evaluate implementation based on the Reach, Effectiveness, Adoption, Implementation, and Maintenance framework, following the same qualitative approach as Step 1. Effectiveness was out of scope of this study.

Results: 14 health care providers participated in Step 1 qualitative interviews (42.9% from nephrology clinics, 35.7% from primary care). Participants shared an individual-level readiness and interest in sharing My Kidneys My Health with their patients. The key barriers to implementation included awareness, memory, time, motivation, and innovation accessibility. Implementation strategies were co-designed and implemented by Step 1 participants (i.e., educational sessions and materials, reminders, implementation coaching). 9 health care providers participated in Step 3 qualitative interviews. Participants shared their approach to tailoring implementation based on their patients and integrating the resource into their current practices. The resources developed were highly utilized by participants, with positive feedback on their usability. Participants expressed motivation to continue sharing My Kidneys My Health; however, awareness and accessibility require further adaptations can improve sustainability of implementation. Our rigorous approach allowed us to address behaviour change and sustainability of implementation of My Kidneys My Health, as well as identifying appropriate and tailored implementation strategies

Conclusions: There is a readiness to implement self-management supports for patients with early-stage CKD. A theory-informed approach and strategic implementation strategies can support sustainability. Clinical Trial: n/a

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Abstract

Background: Care for mild to moderate chronic kidney disease (CKD) entails self-management from patients and clinical support from primary care and nephrology. In response to a gap in resources for this population, *My Kidneys My Health* was co-developed to support self-management of CKD. While this is a patient-facing tool, health care providers play a critical role in the implementation of patient resources.

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Conclusions: There is a readiness to implement self-management supports for patients with early-stage CKD. A theory-informed approach and strategic implementation strategies can support sustainability.

Keywords:

Chronic kidney disease; self-management; implementation science; mhealth

Introduction

Care for chronic kidney disease (CKD), a progressive disease, is complex. It entails management of CKD and comorbid conditions [1], where patients are required to balance their medical management with demands of daily life to slow disease progression [2]. Ninety-five percent of people with mild to moderate CKD are managed in the primary health care setting (e.g., primary care providers [PCPs], pharmacists) with more advanced CKD managed by nephrologists [3,4] and supported by allied health providers (i.e., nurse practitioners, nurses, pharmacists, dietitians, social workers) [5-7].

Patients and health care providers have called for strategies to address needs of patients with mild to moderate CKD to delay progression and improve quality of life [8-13]. Given the complexity of CKD and its treatment, patients are often required to become actively engaged in self-management of their illness. While numerous electronic health (eHealth) self-management interventions are available for patients with CKD, they focus on later stages of CKD and are predominantly designed without patient input [9,14-16]. To address these knowledge gaps, we undertook a theory-informed, person-centered approach to develop an eHealth tool, the *My Kidneys My Health* website, that is concordant with patients' values, needs, and preferences for CKD self-management support [13]. Guided by the Knowledge-to-Action Framework, this website was developed as part of a larger multi-phase research program including patients, caregivers, health care providers, researchers, and policies makers (Canadians Seeking Solutions and Innovations to Overcome Chronic Kidney Disease [Can-SOLVE CKD] Network) [13,17].

My Kidneys My Health [18] is a patient-facing tool co-designed with patients and caregivers through a user-centered design process specifically to provide support for their self-management of CKD [13]. This website supports self-management by "informing" (chronic kidney disease related information); "activating" (prompts/tools to encourage action to manage chronic kidney disease and enhance quality of life); and "collaborating" (links/tools that lead to interaction and engagement with health care providers and peers) [13,19]. Upon completion of feasibility testing [20], the website became publicly available in March 2021 and remains an openly accessible website for credible and accessible information.

Novel strategies are needed to support patient and caregiver access to and utilization of *My Kidneys My Health*. Health care providers play a critical role in the care and support of self-management for patients with mild to moderate CKD, particularly in primary care as their first point of access. As such, they offer a potentially effective implementation setting to reach patients. We therefore undertook a rigorous, theory informed process to develop and evaluate strategies for implementing the *My Kidneys My Health* website into routine clinical care in primary care and general nephrology clinic settings (i.e., care for people with kidney disease not on dialysis) by health care providers in the province of Alberta, Canada. Ultimately, we aim to understand implementation to inform spread and scale-up in these primary care and general nephrology settings.

Methods

We conducted a multi-step study, guided by the Quality Implementation Framework [21], to develop and evaluate the implementation plan of *My Kidneys My Health* based on behaviour change theory. Three steps were completed (Figure 1): 1) site assessments, 2) implementation, and 3) evaluation, with the ongoing application and dissemination of lessons learned. An evaluation plan and logic model were developed to guide the planning and execution of these steps (Multimedia Appendix 1). Steps 1 and 3 followed qualitative descriptive methodology [22,23], where we conducted semi-structured interviews and completed a directed content analysis using a deductive coding approach [24]. Our qualitative methods are reported using the Consolidated Criteria for Reporting Qualitative Research (COREQ) guidelines [25]. Telephone interviews were conducted by experienced qualitative interviewers (SJ, MD), audio recorded, and transcribed verbatim by a trained transcriptionist, removing identifying information.

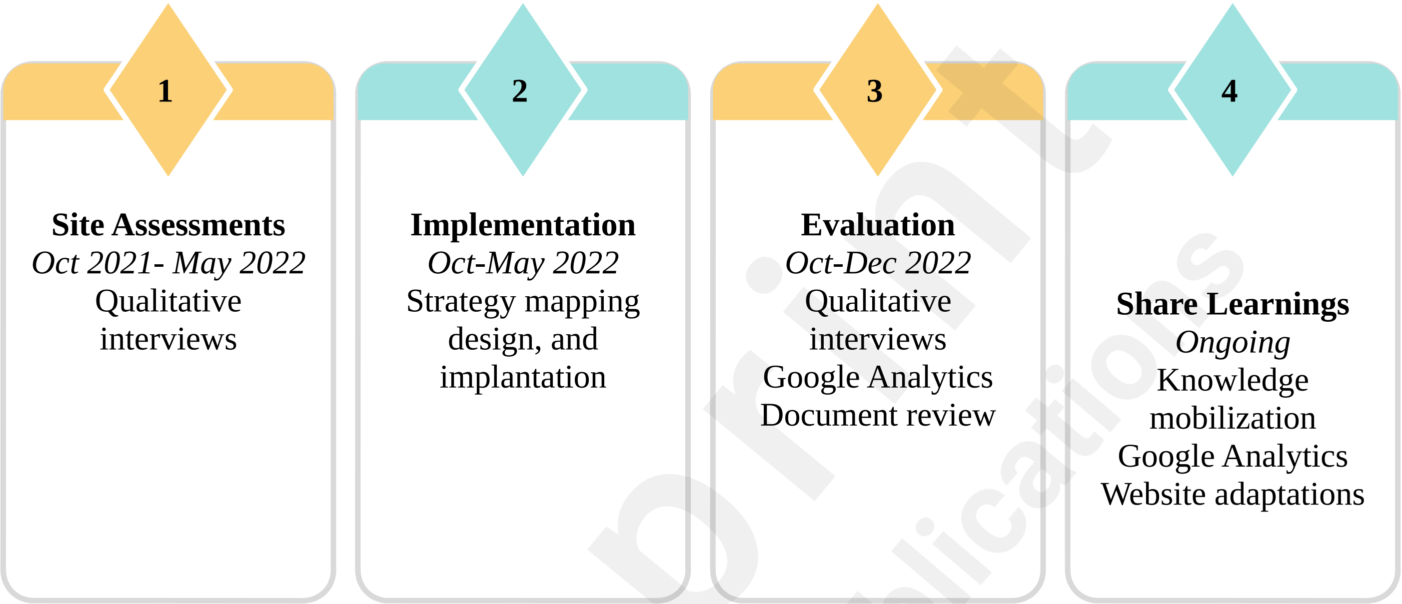


Figure 1. Quality Improvement Framework (QIF) guiding implementation and sustainability of My Kidneys My Health

After familiarization with the data, each transcript was entered into NVivo 11 (QSR International Pty Ltd, version 11, 2016), and independently and iteratively coded (SJ, MD) through a deductive approach based on the frameworks described in Steps 1 and 3 below [24]. Consensus meetings were held iteratively to ensure consistency and refinement of our coding. Our research team including five patient partners with lived experience with CKD who supported this work from the inception of the larger multi-phased project [9-13,16,26-28]. Specific to this study, they provided feedback on research materials, implementation strategies, and informed interpretation of results. Ethics approval was obtained from the University of Calgary, Alberta (#REB21-0930).

Participants and Setting

At the time of the study, Alberta's provincial delivery system, Alberta Health Services, is divided into five health zones (North, Edmonton, Central, Calgary, and South) that serve remote, rural, and urban jurisdictions and support care to marginalized groups. Within these zones, Alberta Kidney Care North and South provide clinical services to people followed by nephrologists and multidisciplinary care to individuals with advanced CKD. Most PCPs provide community care supported by 39 Primary Care Networks. Alberta Kidney Care and primary care clinics vary in their size, remuneration, available resources, and staff composition (e.g., access to multidisciplinary team).

Patients with mild to moderate CKD receive care in many settings, including primary care and nephrology. Using a purposive sampling strategy, we invited health care providers (e.g., primary care physicians, nephrologists, allied health professionals) working in Alberta, Canada who provide direct clinical care and education to patients with CKD to participate, as well as clinic administrators who oversee site operations with key decision-making roles. Recruitment information was circulated through local Primary Care Networks, as well as Alberta Kidney Care North and South. We aimed to recruit 25 to 30 interview participants for Steps 1 and 3, based on previous similar studies [29,30].

Step 1: Site Assessments

Health care providers, decision makers, and administrators were invited to participate in a telephone interview between October 2021 and May 2022 to identify perceived barriers and enablers to the implementation of *My Kidneys My Health* in clinical practice. The semi-structured interview guide (Multimedia Appendix 2) was designed to assess readiness [31] and potential sustainability of the intervention [32]. Directed content analysis was guided by the Capability Opportunity Motivation Behaviour System Framework (COM-B) [33], which was further framed by the Consolidated Framework for Implementation Research (CFIR) [34,35] and the Theoretical Domains Framework (TDF) [36] to identify specific barriers and enablers. From these codes, we created overarching categories of barriers and enablers used to inform the identification and creation of implementation strategies.

Step 2: Implementation

The barriers and enablers identified in Step 1 were mapped to potential strategies and used to develop an implementation plan (Figure 2). The CFIR 2.0 provided a framework to inform appropriate strategies [35,37], and the Theory and Techniques Tool [38] was used to map the mechanism of action and behaviour change techniques for specific approaches. Implementation strategies were then prioritized based on the Acceptability, Practicability, Effectiveness, Affordability, Side effects, and Equity tool (APEASE) [39] to identify feasible approaches that would meet the context of this study.

With the support of a graphic designer and feedback from our patient partners, strategies were developed using the Action, Actor, Context, Target, Time (AACTT) framework [40] and Evidence-Based System for Implementation Supports [31]. Additionally, we engaged a national CKD Clinic Network’s knowledge broker, as well as local health partner organizational networks in Alberta, iteratively throughout the development of strategies. Each strategy incorporated features that allowed us to track uptake (e.g., QR codes, tracking sheets) to support the evaluation in Step 3. The implementation strategies were launched in July 2022 for participants from the Step 1 site assessment interviews, facilitated by the study coordinator (SJ), and tracked throughout the implementation period (May to December 2022).


Barrier/
Facilitator

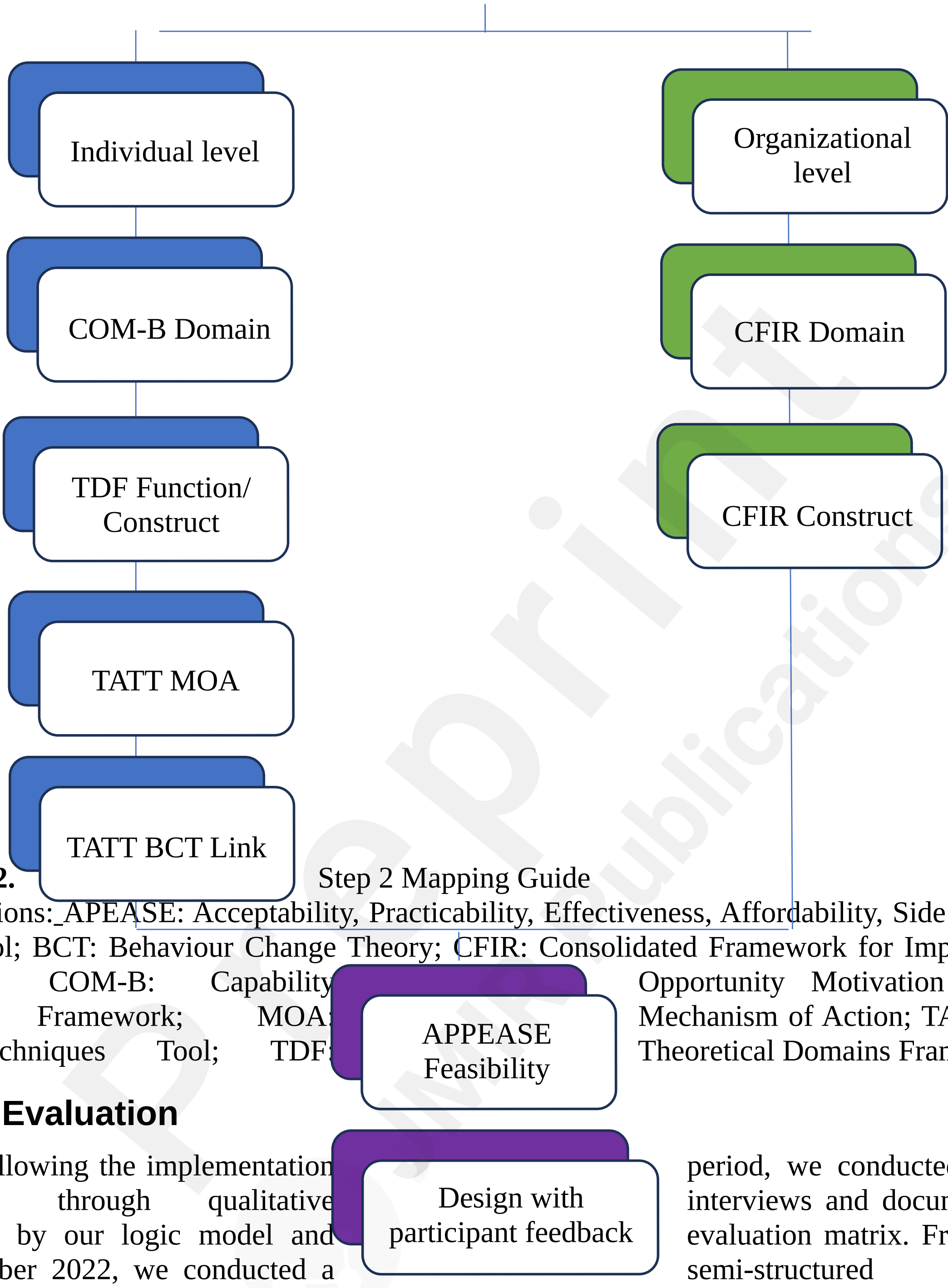


Figure 2. Step 2 Mapping Guide
Abbreviations: APEASE: Acceptability, Practicability, Effectiveness, Affordability, Side effects, and Equity tool; BCT: Behaviour Change Theory; CFIR: Consolidated Framework for Implementation Research; COM-B: Capability Opportunity Motivation Behaviour System Framework; MOA: Mechanism of Action; TATT: Theory and Techniques Tool; TDF: Theoretical Domains Framework

Step 3: Evaluation

Following the implementation period, we conducted a process evaluation through qualitative interviews and document review as guided by our logic model and evaluation matrix. From October to December 2022, we conducted a semi-structured telephone interviews to understand how *My* *Kidneys My Health* was implemented, based on the Reach, Effectiveness, Adoption, Implementation, and Maintenance (RE-AIM) framework (Multimedia Appendix 3). The RE-AIM framework is a planning and evaluation framework with five individual-level and setting-level dimensions: reach, effectiveness, adoption, implementation, and maintenance [41]. Effectiveness is beyond the scope of this evaluation. Remaining barriers and enablers were also probed. We recruited previous participants, as well as incorporating snowball sampling for additional participants due to the changing landscape of health care in Alberta, including changes in personnel and roles. The deductive qualitative analysis was guided by the RE-AIM framework.

Website traffic and utilization data were extracted from Google Analytics to track the usage of the printed materials through their unique QR codes during the implementation period. Trends in new users, average time on website, and pages visited were monitored. The volume of materials shared with participants was documented (i.e., number of materials shared virtually and printed, whom they were shared with), to supplement the Google Analytics data and inform the uptake of the materials by the providers and recipients. The implementation plan was iteratively informed by the feedback we received from participants, partners, and behaviours of website users via Google Analytics.

Results

Step 1: Site Assessments

Fourteen health care providers were interviewed for an average duration of 33 minutes, including five nephrologists (35.7%), four pharmacists (28.6%), and two primary care physicians (14.3%) (Table 1). Participants were largely working in general nephrology clinics (42.9%) and primary care (35.7%), from large urban centres (78.6%). Most participants were female (64.3%).

Table 1. Step 1 Participant Demographics (n=14) *

	# (%)
Current primary role	
Nephrologist	5 (35.7)
Pharmacist	4 (28.6)
Primary care physician	2 (14.3)
Nurse	2 (14.3)
Nurse practitioner	1 (7.1)
Setting	
General nephrology clinic	7 (50)
Primary care practice	5 (35.7)
Specialty nephrology clinic (e.g., glomerular nephritis)	1 (7.1)
Other (non-ambulatory care)	2 (14.3)
Geographical location	
Large urban centres (> 100,000)	11 (78.6)
Medium rural population centres (30,000 to 99,000)	1 (7.1)
Small rural population centres (<30,000)	2 (14.3)
Age	
Under 40	6 (42.9)
Over 40	7 (50)
Prefer not to answer	1 (7.1)
Current employment status	
Full-time	9 (64.3)
Part-time	5 (35.7)
Team members within practice (select all that apply)	
Nurse	11 (78.6)
Dietitian	11 (78.6)
Social worker	10 (71.4)
Pharmacist	10 (71.4)
Administrator	8 (57.1)
Nephrologist	6 (42.9)

Primary care physician	5 (35.7)
Nurse practitioner	4 (28.6)
Sex	
Female	9 (64.3)
Male	4 (28.6)
Prefer not to answer	1 (7.1)
Gender	
Woman	9 (64.3)
Man	4 (28.6)
Prefer not to answer	1 (7.1)
Years in clinical practice?	
0 to 5 years	2 (14.3)
6 to 10 years	3 (21.4)
11 to 15 years	3 (21.4)
16+ years	6 (42.9)
Familiar with CKD self-management online resources for patients	
CKD Clinical Pathway	13 (92.9)
My Kidneys My Health website	11 (78.6)
Kidney Foundation of Canada website	10 (71.4)
Other (ORN, BCRA, MRP, KFRE)	2 (14.3)

*Step 1: 3 respondents did not complete survey. Abbreviations: BCRA: British Columbia Renal Agency; CKD: Chronic Kidney Disease; KFRE: Kidney Failure Risk Equation; MRP: Manitoba Renal Program; ORN: Ontario Renal Network.

Barriers and enablers were categorized under the COM-B domains, highlighting a readiness for participants to implement the website into practice (Table 2).

Table 2. Step 1 Barriers and Enablers Interview Results

B/F	Description and Suggestions	Quotations
B	**1.1 Memory – forgetting to share intervention** - People are busy - Resource overload - Excitement then goes to backburner Participant suggestions: - Integrate into clinical practices (waiting room, EMRs, documentation reminders, bookmarking)	HCP2: "I think it's not that people don't want to use it, it's just getting them to remember about it and to, so if there was easy ways that could be facilitated and easy ways for the care team to give it to the patient, I think those would be the big things"
F	**1.2 Skills – fits within existing role and abilities** - Matches patient education role - Technical ability and familiarity with sharing online resources Participant suggestions: *None*	HCP1: "one of our main roles at the Primary Care Network from nursing perspective is to provide patient education and support to disease self-management and so I think it fits well for that because we do in addition to providing education, provide resources and so this is a good online resource"

B	**1.3 Awareness – lack of knowledge** • Participants were not aware of website • Unfamiliar with content Participant suggestions: • Continuous dissemination (multi-modal, leadership support)	HCP5: “I kind of know the gist of the layout, but I'm not at all familiar with the functionality and all the features of it”
F	**2.1 Communication with patients – multi-modal and personalized** • Letters, emails, verbal, handouts • Highlight education and resources based on patient needs Participant suggestions: • Integrate into existing practices (in clinic, pre/ post-clinic communications)	HCP4: “ideally patients have access to it prior to their first clinic visit so they can review general CKD self-management and then there’s an opportunity to discuss at the first clinic visit. And, then basically any time there’s an issue … refer to it.”
B	**2.2a Time – lack of time in clinic** • New intervention can be overwhelming; not enough time to review in detail Participant suggestions: • Training for MOAs, chronic disease management nurses through PCNs • Leadership support	HCP7: “I think the one barrier is just time. I think, I could spend an hour doing that with each patient and I think it would be very beneficial, but it’s just not effective”
F	**2.2b Time – intervention saves time** • Tailored use saves time in clinic: simplifies practice, supplements education Participant suggestions: • Personalize messaging	FG1 HCP5: “instead of spending like 30 minutes with them, I can spend 10 minutes and then tell them go and read this website and then we chat again next time I see you or send me your questions... That would simplify my practice, save my time...”
F	**3.1 Values – alignment with intervention** • Content, format, personalization, reliability, meeting provider values • Familiarity and ownership with intervention Participant suggestions: • Make it easy to share (specify content, methods, population to share with)	HCP1: “So, it would fit exactly in terms of how I practice and what my goals are.”
F	**4.1 Content – useful information** • Content supports self-management • Format is easy to navigate, visually appealing • Reliable information, trusted partners, open access Participant suggestions: • Support navigation (topic areas beyond homepage; provider-page including shareable resources)	HCP6: “It definitely fits into my values and norms because I feel it provides a lot of really great information and it just gives that extra information for that patient, so many are wanting to find stuff online, so it gives a credible resource to go to.”
B	**5.1 Other resources – competing resources** • Clinicians: overwhelmed, forget, frustrated • Patients: lack of consistency, confusion • Some see complementarity of intervention	HCP5: “We have dietitians, mental health therapists and kinesiologists on our team, so the only potential barrier I could

	• Other resources: local, provincial, national, international (e.g., Alberta Health Services, BC Renal Agency, KFOC, KDIGO) Participant suggestions: • Distinguish website (convenience, relevance , integrating with other resources)	perceive is if the information on their relevant pages conflicted with information that they already provide or with any national guidelines.”
B	**5.2a Perception of patients – accessibility concerns** • Demographic factors: age, language • Access: internet, device to navigate website • Uptake: knowledge, memory, sustainability • Information: too much, conflicting Participant suggestions: • Accessible materials (printer/email-friendly, tearaways/notepads, language translation, personalization for local context)	FG1 HCP2: “That’s our average age of our patients is 72 and while the website seems to be relatively accessible there should be a paper equivalent to be available also.”
F	**5.2b Perception of patients – meeting needs** • Patient self-efficacy, interest in their health • Appeal based on layout and design • Health and technology literacy Participant suggestions: *None*	FG1 HCP7: “so I do think there is a big need for it. I think patients a lot of the time ask us for electronic information”
6. Inner Setting		
F	**6.1 Implementation climate – clinical readiness** • Culture for change for delivery best care • Sharing of resources between staff • Key players: nurses (LPNs), primary care physicians (PCNs local context), MH, social workers, dietitian, managers, pharmacists; multidisciplinary team Participant suggestions: • Utilize existing systems • Engage key players • Different communications (email, 1:1, in-service)	HCP1: “I would say currently at our organization and in Alberta there are initiatives on transitions of care. We have been biased because I work in that field, but you know, just focusing on how do we better bridge the gap between acute and primary care is something that is a priority.”
F	**6.2 Leadership engagement – support intervention** • Advocacy role: promote resource, support education (not all leaders see this role) • Regulator role: validate materials, approve appointment time, protocols Participant suggestions: • Raise leadership awareness: highlight benefits (lack of burden to staff), engage different levels (senior leadership, directors, managers)	HCP4: “So I think in terms of like which leadership is going to pass it along, it’s going to be allied health leadership is going to be the ones, or like chronic disease management nurses, or you know, like community pharmacists.”
F	**6.3 Communications – influence of trusted coworkers** • Internal: emails, informal colleague communications, presentations, in-services, information boards, resource inventories • Inter-disciplinary: emails, EMR, case conferences, referrals, consult notes, letters	HCP3: “typically if there is a really good resource that comes across somebody’s table and they want to share it … typically the managers will review it and just make sure kind of it lines up with national guidelines and it’s

	Participant suggestions: - Integrate dissemination into communication systems	evidence based.”
B & F	**6.4 Workplace context – varied** - Physical infrastructure: in-person (computers, waiting room) vs. virtual - Varied IT use and model of care Participant suggestions: - Utilize referral systems in place - Increase options to share: Options for virtual appointments, printable materials	HCP4: “Bringing in like a computer or laptop and then having to like worry about sanitizing it especially if they are on any kind of precautions while they are in hospital. So, using the tool for teaching can be a little bit trickier in hospital right now…”

Capability: Participant awareness of *My Kidneys My Health* presented as a main barrier to implementation. Prior to the study, most participants were not aware of the website. Those who were aware had limited knowledge of website content and features, and shared uncertainty in how to present it to patients. Once participants were made aware of *My Kidneys My Health*, they shared that it aligned with their perceptions of their clinical roles, abilities, and values with regards to empowering patient self-management and sharing educational materials, including digital resources. Despite participant motivation to share the website, some participants were concerned about their capability to implement due to competing resources (i.e., other patient educational materials), remembering to share *My Kidneys My Health* in clinical practice, and the effort required to share the resource given their busy workload.

Opportunity: Conversely, some participants believed that sharing *My Kidneys My Health* with patients would not increase time in appointments and may in fact simplify their educational component of appointments with patients as a supplementary tool, thereby saving time. These participants planned to personalize their integration within the clinic visit by sharing the relevant sections of the website to meet the specific needs of patients based on CKD status or questions identified in conversation. Participants identified that there were existing multi-modal communication opportunities with patients (e.g., letters, emails, verbal, physical demonstration), as well as flexible opportunities (e.g., prior to, during, or after appointments). Those who identified time as a barrier to implementation defined their approach to be reviewing the website in detail and indicated that including a new resource would require additional efforts.

Motivation: Participants reported that the relevance and reliability of content, personalization of information, and formatting of the website aligned with their clinical values for caring for their patients. They also saw alignment with perceived patient needs for accessible information that would support patient self-efficacy in their self-management. In addition, the influence of participants’ *inner setting* was considered. Specifically, trusted colleagues and leadership supported participant uptake of resources; however, the impact of the physical context of their appointments posed some concerns (e.g., access to a computer, telephone appointments). The influence of *outer setting* barriers posed a potential challenge to motivation, specifically related to competing resources and participants’ perception of patient comfort with self-management. Though participants found the website to be straightforward and easy to navigate, accessibility of the website was questioned based on patient ability or access. Specifically, that uptake would require access to internet, access to an electronic device, ability to navigate the website, and interpretation of the information. Furthermore, participants identified that patients may require additional language translation options to meet their needs. Finally, concern was raised regarding whether patients would use the website after being introduced to it.

Step 2: Implementation

The implementation period included the mapping, prioritizing, design, and launch of the implementation strategies identified based on Step 1 results. In May 2022, the barriers and enablers were mapped onto individual and external setting implementation strategies, then prioritized based on the feasibility measured by the APEASE framework [39]. Five barriers and enablers from Step 1 and associated strategies were prioritized: awareness, memory, time, motivation, and innovation accessibility (Table 3). Participant recommendations and accommodating enablers were considered when planning the implementation strategies. With the support of a graphic designer, and review by patient partners, implementation strategies were tailored based on the participant needs and the prioritized barriers. The distribution of these implementation strategies was tracked using Google Analytics and documentation of resource distributions and educational outreach. Unique QR codes were incorporated into each material, which allowed us to track the how many website users came from each resource through Google Analytics.

Table 3. Step 2 Implementation Mapping Results

Top Barriers	**Domain & Construct**	**Mechanism of Action**	**Interventions & Behaviour Change Links**	**APPEASE**	**Accommodating Facilitator**
Memory	Capability, Psychological Enablement, Training	Memory, attention, and decision processes	Reminders & prompts/cues Commitment	2. Med	Participant advice: Integrate reminders into practice, accessible
Awareness	Capability, Psychological; Inner Setting Access to Knowledge & Information	n/a	Distribute educational materials Instruction Info about health consequences, social env restructuring	1. High	Existing educational opportunities in clinic
Time	Opportunity, Physical Enablement	Environmental context and resources	Problem solving Social support (practical) Restructuring physical environment	2. Med	Leadership allowing more time; non-appointment opportunities (e.g., waiting room); Model; Roles who have time
Motivation	Motivation, reflective Education	Motivation Discrepancy: current behaviour vs. goals	Goal setting (outcome) and review Incentive (outcome) Educational	1. High	Adaptability and benefits of tool, influence of trusted coworkers, local opinion

			materials		leaders
Accessibility	Innovation Innovation Adaptability Innovation Design	Beliefs about consequences	Develop educational materials Identify early adopters Conduct local needs assessment Problem solving	1. High to 3. Low	Familiarity of website, collaborative care models, personalizing implementation to audience

First, we completed five educational sessions tailored to various clinical audiences (i.e., local and provincial renal and primary care groups) and six academic research activities (e.g., local, national, and international presentations; a manuscript) to address awareness, time concerns, and motivation to share *My Kidneys My Health*. For example, a presentation was provided to a Primary Care Network in Alberta, which included primary care providers and allied health professionals who care for patients with CKD. The session outlined the evidence-based and patient co-design approach of the website, as well as the content, features, and flow of information on the website. To mitigate time and motivational barriers, we provided a case example of how the website could be shared with a patient who had been recently diagnosed with CKD compared to a patient with CKD who had a health change that could be supported by the website, demonstrating opportunities within existing clinic workflow. A detailed how-to implementation guide and a one-page summary of *My Kidneys My Health* were also developed to support provider knowledge of the website, the content available, and how they could incorporate it into their practice. These could be shared amongst providers and allowed us to raise awareness for providers who could not attend education sessions.

In addition, we developed a multi-faceted reminder system for providers which included monthly emails from the implementation coach (SJ, a member of the research team to support participants virtually with implementation) and visual cues built into existing routines. A bundle of educational materials was sent to participants, including posters and postcards with information about the website, as well as one-page educational materials about CKD for patients. These materials were also sent electronically, for participants to share virtually or in print for patients. Participants were recommended to place these posters and postcards in their clinic as being given a visual cue to share the website, or to prompt patients and caregivers to learn more about *My Kidneys My Health*. Additionally, the website was shared through external partners in their patient dissemination materials (e.g., QR code was embedded in the Blood Tribe Department of Health materials), as well as newsletters and web postings (e.g., through the Canadian Primary Care Sentinel Surveillance Network).

Step 3: Evaluation

Towards the end of the implementation period, nine health care providers either returned or were recruited through snowballing to participate in a post-implementation telephone interview (average length of 27 minutes). Sampling continued until no new concepts related implementation experiences were identified in interviews. As with Step 1, participants were mainly female, nephrologists or allied health care providers, from general nephrology and primary care clinics in large urban centres (Table 4).

Table 4. Step 3 Participant Demographics (n=8) *

	# (%)

Current primary role	
Nephrologist	3 (37.5)
Pharmacist	2 (25)
Nurse	1 (12.5)
Nurse practitioner	1 (12.5)
Decision maker	1 (12.5)
Setting	
General nephrology clinic	4 (50)
Primary care practice	2 (25)
Other (non-ambulatory care)	2 (25)
Geographical location	
Large urban centres (> 100,000)	7 (87.5)
Small rural population centres (<30,000)	1 (12.5)
Age	
Under 40	4 (50)
Over 40	4 (50)
Current employment status	
Full-time	6 (75)
Part-time	2 (25)
Team members within practice (select all that apply)	
Nurse	7 (87.5)
Dietitian	7 (87.5)
Social worker	6 (75)
Administrator	5 (62.5)
Pharmacist	4 (50)
Nephrologist	4 (50)
Primary care physician	2 (25)
Nurse practitioner	2 (25)
Other (e.g., exercise therapist)	2 (25)
Sex	
Female	7 (87.5)
Male	1 (12.5)
Gender	
Woman	7 (87.5)
Man	1 (12.5)
Years in clinical practice?	
0 to 5 years	2 (25)
6 to 10 years	2 (25)
11 to 15 years	4 (50)
16+ years	0 (0)
Familiar with CKD self-management online resources for patients	
CKD Clinical Pathway	8 (100)
My Kidneys My Health website	7 (87.5)
Kidney Foundation of Canada website	6 (75)
Other (KFRE)	1 (12.5)

*Step 3: 1 respondent did not complete survey
Abbreviations: CKD: Chronic Kidney Disease; KFRE: Kidney Failure Risk Equation

Implementation process was evaluated based on the RE-AIM framework, triangulating the interview data with material distribution tracking and Google Analytics data as a signal regarding implementation impacts (Table 5). Evaluating the effectiveness of the website (e.g., change in self-management behaviours) was beyond the scope of this study.

Table 5. Step 3 RE-AIM Definitions and Interview Results

Domain & Definition	Results	Quotations
Reach The number and types of providers who implemented *My Kidneys My Health* into practice, description of recipients	Health care provider description: • Shared website: those who provide education to patients (nephrologists, chronic disease educators, pharmacists • Did not share: those in acute care settings, leadership roles Providers share website with: • Patients who are: comfortable with computers and internet, motivated to address their health, need information (e.g., new patients, change in health status) • Caregivers who support patients	HCP8: "I'm sometimes hesitant when there's people that I know who are like, oh, no I don't go on the internet very often. I don't really know how to navigate."
Effectiveness Beyond the scope of this paper.	n/a	n/a
Adoption How the implementation of *My Kidneys My Health* was tailored to patient characteristics and context, including description of overall implementation strategies used.	Tailoring strategies: • Factors: Young vs. older patients, technology vs non-technology confident patients, health status • Technology-confident: open website right away • Less technology-confident patients: shared postcard to use later with family, walked through website together, hesitated	HCP9: "I guess the ones that are like really comfortable, they'll bring up the website right in clinic as opposed to holding onto that postcard and you know, wanting to consult with their middle aged daughter about like how to get to the website and stuff."
Implementation How providers shared *My Kidneys My Health* in their clinical practice, including feedback on implementation strategies.	How it was implemented: • Shared with patients: walked through website during appointment, emailed resources post-appointment, described website and shared take-home resources • Shared with colleagues: at rounds, discussions, postcards • Follow-up with patients on next visit to answer questions Feedback on strategies: • Barriers: clinic set-up to show computer,	HCP5: "as I'm looking at patient, I see the poster out of the corner of my eye it kind of reminds me to talk about it if I might have otherwise forgotten. And, then again having that presentation a

	unsure if patients follow their direction, memory to continue incorporate it - Enablers: supports education, ability to address digital access (printable content, postcards), materials/presentation are effective reminders	couple of weeks of ago just kind of brought the whole website and the whole program to the forefront of my brain again"
Maintenance Factors that may support or inhibit continued implementation of *My Kidneys My Health*, as well as suggestions based on sustainable strategies.	Benefits: - For patients: empowers patient, family education - For providers: supports with education, answering questions, engaging patients, saves time in long run Suggestions: - More printable materials with bigger font sizes - Continuous reminders - Utilize waiting rooms (e.g., TV, iPads, nurses or MOA)	HCP7: "it's almost like you pay, you invest that time at the beginning … you end up saving yourself time in the long run, but empowering them with information."

Reach: Seven out of nine participants implemented *My Kidneys My Health*, working in nephrology clinics, chronic disease management, or related to diabetes care optimization. Two participants did not implement the website into their clinical care routine, due to lack of awareness and the setting where they provided care (acute care unit). Among those who implemented it, *My Kidneys My Health* was shared with patients and caregivers of varying ages and CKD status, including high-risk and newly diagnosed patients. Participants believed that certain clinical roles would be very impactful in implementing the resource, including chronic disease nurses and diabetes educators, as well as clinic staff who are the first points of contact with patients such as medical office assistants.

Adoption: Participants tailored their implementation based on patient access and comfort with computers. For example, if a patient was less comfortable with using the website, the health care provider oriented them to the relevant website pages, provided paper-based information, or shared the website with a caregiver. Participants tailored implementation based on patient age or disease status but felt that ultimately the information should be shared with these patients to meet their self-management needs. Of paper-based printable resources, 950 postcards, 25 posters, and 400 one-pagers were distributed by the implementation participants. Individualized QR codes proved to be an effective method of tracking dissemination, as we identified over 118 website users were brought to the website via our printable resources.

Implementation: Most participants shared the resource during clinical appointments in-person or virtually, by Zoom or telephone. Barriers to implementation included the physical environment, such as lack of computer or computer speed in clinic rooms, impacting their overall time for education in appointments. Printable materials presented an alternative option to support patient education during or after appointment times when the website was not accessible. Participants found reminders of the resources and website to be helpful mechanisms of action to support implementation, including the PCN presentation during the implementation phase which reviewed website content and interactive features.

Maintenance: All participants shared that they would like to continue implementation of *My*

Kidneys My Health into clinical practice by sharing it with their colleagues and/or patients. Providers found the website usable with clear and comprehensive self-management information for patients. Motivating factors to continue sharing the website included its design as well as the potential for impacts on patient outcomes. As predicted by Step 1 participants, the website was believed to be a beneficial educational tool for patients to use outside of appointments and participants felt it empowered patients to manage their own health, as well as ask questions. One participant was concerned about patient uptake of resources in general, including this website, while others believed that navigating the website with the patient would increase the uptake of the website. Additionally, participants also provided suggestions to improve sustainability of the implementation. These included creating more paper-based, printable materials; periodic and multimodal dissemination; and highlighting aspects of the website such as the My Questions List feature. Continuous dissemination and reminders appeared to be effective in addressing capability and awareness of health care providers, as we also continue to adapt implementation strategies based on the feedback received.

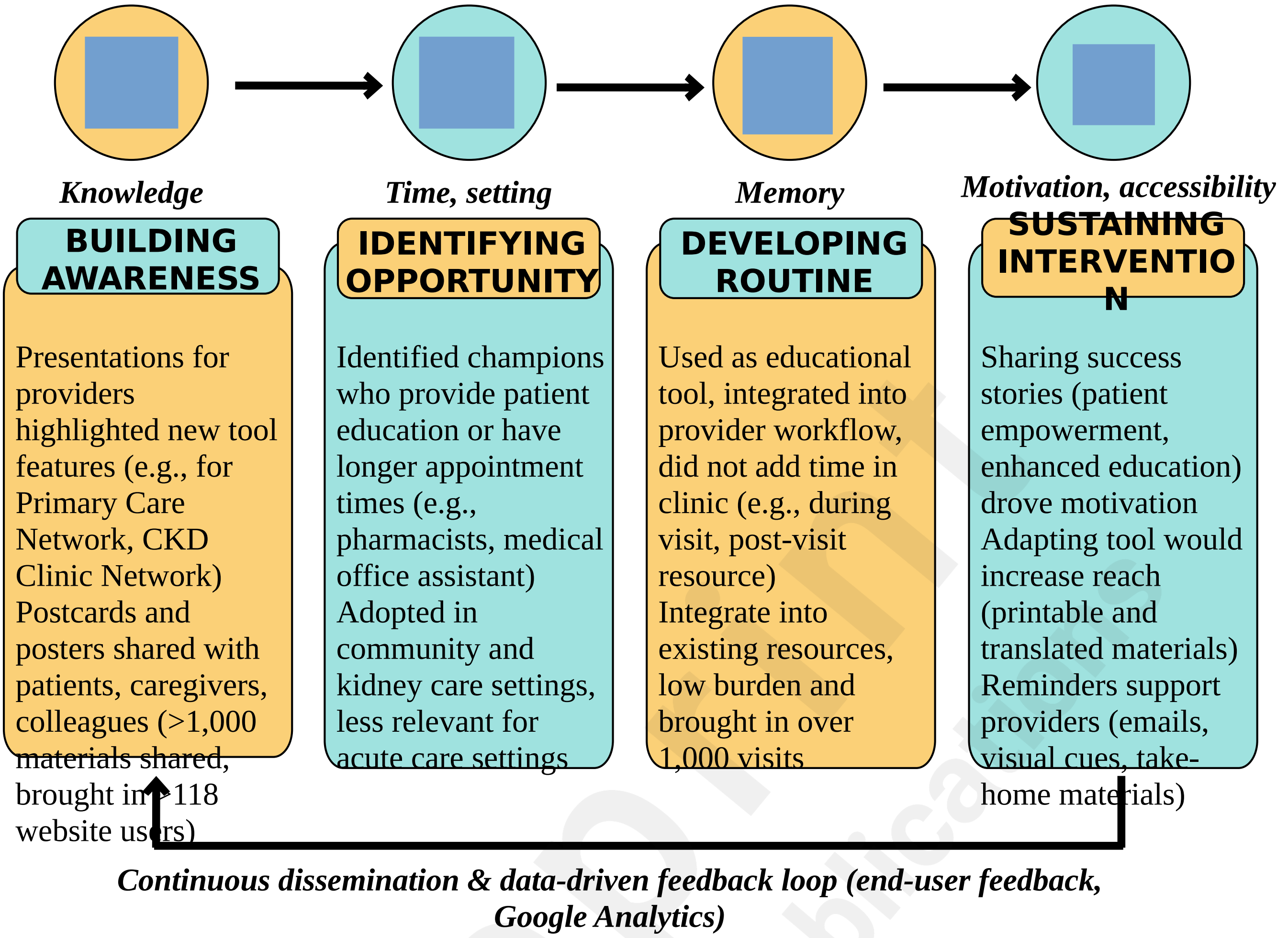
Long-term plans were also developed to address accessibility concerns related to *My Kidneys My Health*. The positive feedback received on the printable materials spurred further creation of printable materials that summarize website content and will be translated into other languages besides English, addressing concerns regarding accessibility of website and language translation. This included creating additional printed materials, translating educational materials into additional languages, and conducting a needs assessment with diverse populations (e.g., Indigenous communities in Alberta) to identify culturally relevant adaptations to the website. These strategies are to be developed based on the results from the evaluation phase and will be housed on the website for easy access for patients and health care providers.

Discussion

Summary of findings

Following the Quality Implementation Framework [21], we systematically assessed, planned, and evaluated the implementation of a patient-facing eHealth tool, *My Kidneys My Health,* into primary care and nephrology settings in Alberta. This rigorous approach led us to addressing behaviour change and sustainability of implementation of the tool itself, as well as identifying appropriate and tailored implementation strategies (Figure 3). We identified that there is readiness to implement an eHealth tool to support patient education and self-management, specifically for early stages of CKD. Further, health care providers can be an effective method of disseminating a patient-facing tool in clinical practice.

Delivering educational sessions were more successful in engaging health care teams and building awareness to implement the tool, over passive dissemination strategies. We were also able to address various barriers through case studies in our presentations. Participants shared enthusiastic support of the printable materials, which were shared with colleagues, patients, and caregivers. Multi-modal strategies enabled providers to tailor their implementation based on the patient needs. Consistent with our findings, continuous dissemination and iterative strategies can be effective in implementation [42]. However, further embedding reminders and ease of access to *My Kidneys My Health* materials would be integral to sustaining this intervention further.



Presentations for providers highlighted new tool features (e.g., for Primary Care Network, CKD Clinic Network) Postcards and posters shared with patients, caregivers, colleagues (>1,000 materials shared, brought in >118 website users)

Identified champions who provide patient education or have longer appointment times (e.g., pharmacists, medical office assistant) Adopted in community and kidney care settings, less relevant for acute care settings

Used as educational tool, integrated into provider workflow, did not add time in clinic (e.g., during visit, post-visit resource) Integrate into existing resources, low burden and brought in over 1,000 visits

Sharing success stories (patient empowerment, enhanced education) drove motivation Adapting tool would increase reach (printable and translated materials) Reminders support providers (emails, visual cues, take-home materials)

Continuous dissemination & data-driven feedback loop (end-user feedback, Google Analytics)

Figure 3. Implementation Cycle

Implications for research and clinical practice

While digital chronic illness self-management tools for patients have been studied in clinical settings [43,44], there has not been the implementation of such a tool for CKD where patients may be interacting with health care providers in specialty and primary care settings. Most studies that examine patient portals found that the intervention was not delivered by an individual care provider or administrator [45], which could limit the uptake of such tools by patients who may need encouragement and support to access these resources. Our study prospectively assessed provider readiness prior to implementation and continued to follow providers post-implementation. Dissemination and implementation efforts can help bridge the gap between how patient-facing eHealth tools can be implemented into routine clinical practice within primary and specialty care settings. Through incorporating patient, caregiver, and organizational partner perspectives, we were able to tailor implementation strategies based on barriers and enablers, using evidence-based behaviour change frameworks. To support implementation, continuous dissemination, development of offline resources, and environmental supports were effective strategies. Iterative feedback allowed us to further refine or innovate strategies, including adaptations to the intervention itself. For example, a webpage dedicated to resources was developed to house printable materials, videos, and resources in one location for all website users.

The role of health care providers in supporting patients in self-managing their CKD cannot be underestimated. Traditional models of the provider-patient relationship and how education is provided must be revisited. Patients are feeling more empowered and more inclined to be involved in their health and health decision making [46]. Health care providers have had to adapt to not being an intermediary (i.e., all knowing of information and passing it on) but taking on a role of an apomediary (i.e., directing the patient to high-quality information and services) [47]. *My Kidneys My Health* provides a solution that supports information sharing during a clinical encounter and can be tailored to each patient, potentially impacting the provider-patient relationship [48].

Strengths and Limitations

Strengths of this study include the rigorous application of implementation frameworks and theories pre-implementation through to evaluation. However, there are some limitations to consider. Recruitment of health care providers, specifically in primary care, was affected due to the impacts of COVID-19 and the changing landscape of health care in Alberta, which posed challenges to staffing and burden of care. This resulted in a small number of participants in Step 1, a pool that we recruited from for Step 3. Therefore, we recruited participants in Step 3 who did not participate in the Step 1, but who did engage in implementation activities and could provide insights to their implementation experience.

Additionally, the evaluation could not directly correlate effectiveness of implementation strategies to website user data from Google Analytics, given the complexity of this intervention and the limitations on Google Analytics tracking metrics. Unique QR codes were used where possible; however, these data alone do not provide a full picture of the impact of our dissemination strategies. Additionally, concurrent dissemination activities beyond this study may have brought website users to this study as well, that we cannot specifically identify. Finally, effectiveness was not within the scope of this evaluation component of the study.

Conclusions

Our study demonstrates that there is a need and readiness to implement a patient-facing, tailored tool to support self-management for patients experiencing early-stage CKD. Early understanding of factors to tailor implementation strategies can support successful adoption and sustainability by health care providers. Across primary care and nephrology clinics, participants believed *My Kidneys My Health* can support patient education and impact patient empowerment. To ensure sustainability of this intervention, we continue to strategically disseminate to audiences within the primary and specialty care settings, support organizations to embed *My Kidneys My Health* into existing practices and improve accessibility of the website by enhancing and adapt not only implementation strategies, but the website content as well.

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The authors thank the patient partners and stakeholders who are integral in the success of this study, as well as the participants from across Alberta.

Conflicts of Interest

None declared.

Data Availability

Data from this study are not publicly available as participants did not consent to share the data outside of the research team.

Abbreviations

AACTT: Action, Actor, Context, Target, Time;
APEASE: Acceptability, Practicability, Effectiveness, Affordability, Side effects, and Equity;
Can-SOLVE CKD: Canadians Seeking Solutions and Innovations to Overcome Chronic Kidney Disease;
CFIR: Consolidated Framework for Implementation Research;
CKD: chronic kidney disease;
COM-B: Capability Opportunity Motivation Behaviour System Framework ;
COREQ: Consolidated Criteria for Reporting Qualitative Research;
eHealth: electronic health;
PCP: primary care providers;
RE-AIM: Reach, Effectiveness, Adoption, Implementation, and Maintenance;
TDF: Theoretical Domains Framework

Figures

Tables

Multimedia Appendices

Multimedia Appendix 1. Evaluation Logic Model
Multimedia Appendix 2. Step 1 Interview Guide
Multimedia Appendix 3. Step 3 Interview Guide

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Supplementary Files

Multimedia Appendixes

Logic Model.
URL: http://asset.jmir.pub/assets/7a1a24ec00983f70966715ecd5248a2c.docx

Step 1 Interview Guide.
URL: http://asset.jmir.pub/assets/0d9f8451687e937adcd3e2b0ed0b6819.docx

Step 3 Interview Guide.
URL: http://asset.jmir.pub/assets/4cd0ef17f95e660234e8d2b41427972e.docx