

Contents lists available at ScienceDirect

PEC Innovation



journal homepage: www.elsevier.com/locate/pecinn

Dissemination, adaptation, and uptake of patient-facing materials to improve care coordination in primary care

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ABSTRACT

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ARTICLE INFO

Patient-facing materials

Educational materials

Care coordination

Keywords:

Brochure

Pamphlet

Handout

Leaflet

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Objective: We sought to improve patients' experience of care coordination by promoting the uptake of patientfacing tools with evidence of sustained use in Veterans Affairs (VA) primary care clinics. We disseminated tools, adapted and improved tools in response to feedback, and tracked real-world uptake. *Methods:* We conducted outreach to leadership and frontline providers at local, regional, and national levels. We collaborated with frontline providers and veteran patients using human-centered design approaches to guide tool adaptation. We assessed dissemination and real-world uptake through website analytics and QR code tracking. *Results:* Tools included paper pamphlets that explained care processes, provided contact information, and answered frequently asked questions. Feedback resulted in use of larger fonts; pictures and colors; less dense text;

answered frequently asked questions, recentack resulted in use of larger fonds, pictures and colors, less dense fext; and QR codes. Discussions led to development of new tools addressing current challenges coordinating care with VA-paid community providers. We observed substantial uptake (>2000 tool page views, >3000 QR code accesses).

Conclusion: Simple patient-facing tools are valuable to patients and frontline providers as evidenced by voluntary uptake despite competing demands.

Innovation: Tools with evidence of sustained uptake were adapted to address current challenges with navigating care and care coordination among VA and non-VA providers. QR codes enabled tracking of real-world uptake.

1. Introduction

Understanding how and when to seek different kinds of health care is a challenge for many patients. Deciding on the appropriate level of care and its urgency – a portal message, or a trip to the emergency department? – is difficult without clinical training [1]. Navigating the system to contact and see the right provider can be challenging [2,3]. Terminology used by health systems, such as differences between prescription refills and renewals, can be perplexing [4]. Ensuring that necessary care is covered by insurance can also be a source of stress and aggravation [5].

Veterans who receive care through the U.S. Department of Veterans Affairs (VA), which runs the largest integrated health system in the U.S., often encounter issues obtaining needed care or locating important health information [6,7]. VA primary care clinics experience a high

volume of walk-ins (patients arriving in-person without a prior appointment) [8] as a workaround for navigation and coordination challenges. Often, these visits are for concerns that could have been handled via non-face-to-face approaches, such as over telephone or VA's online patient portal (MyHealtheVet) [9]. Difficulties in navigating and coordinating VA care have also emerged under the MISSION Act [10], which has made it easier for veterans to obtain VA-paid care from community providers. The Act's implementation has made it complicated to communicate what kinds of care are covered under what circumstances [11], among other challenges [12,13].

Care coordination is "...the deliberate organization of patient care activities between two or more participants (including the patient) involved in a patient's care... often managed by the exchange of information among participants responsible for different aspects of care" [14]. VA coordinates primary care in three contexts: within VA primary

https://doi.org/10.1016/j.pecinn.2025.100386

Received 16 May 2024; Received in revised form 11 February 2025; Accepted 28 February 2025 Available online 2 March 2025



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care, between VA primary care and other VA settings (e.g., specialty care), and between VA and non-VA community care or contracted providers. Numerous approaches have been studied for improving care coordination, one of which is "providing support for patients, including education" [15].

Patient-facing educational materials (leaflets, brochures, pamphlets, or handouts) are commonly used interventions to address problems in care navigation and care coordination. Because of similarities in VA primary care clinics across the nation, there is potential "economy of scale" associated with developing effective patient-facing tools that can be implemented with minimal local customization. Effective patient-facing materials can improve patients' knowledge and care experiences [16], though whether such materials ever end up in the hands of patients depends on many factors [17].

Our team has promoted adoption of care coordination tools to support VA patients through several initiatives, including the Coordination Toolkit and Coaching (CTAC) project. CTAC aimed to improve care coordination through dissemination of an online toolkit to 12 VA primary care clinics across the U.S. [18,19]; sites were randomized to have access to the toolkit alone or access to the toolkit plus coaching, and were allowed to choose which (if any) tools from the toolkit to implement. The most popular tools from CTAC were patient education materials.

Tools that help veterans navigate VA care could improve care experience while improving workflows for providers and reducing burnout. We initially aimed to disseminate and promote uptake of patient-facing care coordination tools that had evidence of successful use in a research project in the real world, and we ended up adapting these tools in an iterative process to maximize their utility to end-users. We also wanted to understand the effectiveness of our efforts, but as this was not a trial, we needed to measure uptake through metrics without a formal data collection effort from end-users. This manuscript describes our efforts and lessons learned in the process of translating research into impact by disseminating, adapting, and tracking uptake of five tools (three pre-existing tools and two newly created tools) in VA primary care clinics nationwide.

2. Methods

2.1. Research ethics

This work was determined to be research not involving human subjects by the VA Greater Los Angeles Institutional Review Board on August 26, 2021 (study number 1226661). This effort was a Research to Impact Veterans [RIVR] project, whose aims are to increase the reach of research to improve patient care and demonstrate impact by disseminating effective interventions [20,21].

2.2. Study setting

This study took place in the VA, which provides health care services to 9 million veterans annually. VA's 1380 health care facilities, including 170 medical centers and 1193 outpatient clinics, are organized into 18 regional networks (Veterans Integrated Service Networks [VISNs]).

2.3. Tools

Our initial focus was disseminating the most popular and widely used tools in the CTAC toolkit [19,22]. "Widely used" was defined as being in continuous use by at least two geographically distinct VA primary care sites. Tools initially meeting this criterion were the Clinic Information tool, Medication tool, and Save a Trip tool. These preexisting tools share a similar format: 1- to 2-page 8.5"x11" paper handouts with space to customize local phone numbers and locations. Later, we created two new tools (Care in the Community tool and Urgent Care tool). Table 1 further describes the tools, and tools are available in the Supplement.

2.4. Guiding frameworks

Dissemination and uptake were guided by the Diffusion of Innovations theory [23]. This theory posits that attributes of innovations make them more or less likely to be adopted and implemented, including relative advantage, compatibility, complexity, trialability, observability, and reinvention. The tools we disseminated were selected because of their evidence of sustained use, which we attribute to these characteristics. For example, these tools were compatible with care processes and resources (including using software available on all VA computers and standard printers/paper). We also followed the Diffusion of Innovations theory to maximize effectiveness of dissemination strategies. We were thoughtful about accounting for potential adopters' needs, employed tailored strategies for different groups, crafted our messages with frontline providers and patients in mind, used appropriate communication channels, and incorporated monitoring [23].

Although our original aim was tool dissemination, dissemination is not a one-way interaction; many individuals had ideas for improvements to improve tool usability and feasibility. Thus, we ended up adapting several tools in an iterative process as we were disseminating them. This process was guided by human-centered design approaches [10,24]. The human-centered design process consists of iterative cycles of empathizing with end-users, defining the problem to be solved, ideating solutions, prototyping solutions, and testing solutions. We considered endusers of the tools to be veteran patients and their family members or caregivers, as well as VA frontline staff. Empathizing with end-users involved discussing the shortcomings of existing tools, and defining the problem involved discussing current challenges for care coordination. Ideating, prototyping, and testing solutions involved redesigning, iterating, and piloting new versions of existing tools and attempting to address current challenges with new tools.

2.5. Dissemination

We disseminated the tools through outreach efforts to VA leaders and frontline providers in line with best practices for external change agents. We developed a standard presentation on the tools and then adapted this presentation to different venues and audiences. We employed dissemination approaches at the local, regional, and national level using both purposive and snowball approaches (we identified an initial list of leaders and reached out to individuals who were recommended by anyone else we contacted). We sent outreach messages to primary care integrated clinical community leaders in all 18 VISNs and offered to present the tools at VISN-level primary care-related meetings. We also conducted targeted email outreach with individuals who had completed the VA's Geriatric Scholars Program, a professional development program to develop skills in geriatric care and quality improvement [25]. At later stages, we pursued dissemination efforts to national audiences and offices, including the VA Primary Care newsletter, the annual VA Shark Tank competition [26,27], and a VA Health Systems Research Cyberseminar. We also sought out a permanent "home" for the tools to be easily found and accessed in the future.

2.6. Adaptation

Patient-facing materials benefit from iterative processes of testing and refinement to be most useful to end-users (veteran patients and their family members or caregivers, as well as VA frontline staff) [28,29]. To be useful, the tools needed to provide information that was valuable and understandable to both groups. Since VA frontline staff would be responsible for customizing the tools for their local facility, making paper copies available, and handing them out to patients, it was also a priority to make tools as easy to implement as possible.

Table 1

Primary care coordination tool descriptions, source, versions, and sites with confirmed use.

Tool Name	Description	Source	Versions Available	VA Clinics Using Tool*
Pre-Existing Tools (id Save a Trip tool	lentified or developed in CTAC, and/or adapted in RIVR project) Resource for patients that explains and illustrates the difference between routine, non-urgent, and urgent medical situations. The tool explains what actions to take in the case of each of these situations and provides relevant contact information	Original created by frontline provider, adapted in RIVR project	 One-sheet (original) Tri-fold Half-sheet 	 Viera (FL) Sugar Land (TX) Oceanside (CA) Sorrento Valley (CA) Santa Maria (CA)
Clinic information tool	Customizable resource for clinics to create their own brochure of important contact information for patients	Created by frontline provider	• Tri-fold	 Santa Maria (CA) Sorrento Valley (CA)
Medication tool	Customizable resource for clinics to provide prescription refill and renewal information to patients	Adapted from Clinic information tool by frontline provider	• Tri-fold	 Boston (MA) Mission Valley (CA)
New Tools (newly created during RIVR project)				
Care in the Community tool	Resource for patients that explains the process of receiving community care and important policies and contact information	Created by RIVR team	 Tri-fold for OptumServe regions Tri-fold for TriWest regions 	 Sugar Land (TX) Santa Maria (CA) San Luis Obispo (CA)
Urgent Care tool	Resource for patients that explains how to determine whether urgent care is appropriate, how to obtain urgent care in the community using VA urgent care benefits, and important policies and contact information	Created by RIVR team	 Tri-fold for OptumServe regions Tri-fold for TriWest regions 	 Sugar Land (TX) Santa Maria (CA) San Luis Obispo (CA)

Abbreviations: CTAC, Coordination Toolkit and Coaching project; RIVR, Research to Impact for VeteRans project.

Clinics where we can confirm use are listed, but other VA clinics may be using them as well.

Based on the human-centered design approaches noted earlier, we first sought to understand the varied needs and tool "use cases" of patients and clinic staff through outreach and engagement with frontline staff. Questions asked during dissemination efforts revealed concerns about the usability and feasibility of existing tools, which led us to conduct 13 semi-structured interviews with frontline providers in VA primary care clinics nationally who were using or considering using the tools. These interviews covered how the tools were used in practice, how tools were most and least helpful, and implementation considerations. To hone our adaptation efforts to meet the needs of VA patients, we met with the VA Greater Los Angeles Veteran Engagement Team, a standing advisory group of VA patients who provide input on research.

Existing tool formats inspired adaptation into two new tools responding to current needs. Coordinating VA-paid care received from providers outside VA is an increasingly urgent need [8,11,30]. Seeing opportunities to adapt existing tools to help with these challenges, we built upon the tri-fold format of the most popular tools for two new tools, the Care in the Community tool and the Urgent Care tool (described in Table 1). We met with local VA Care in the Community leadership to identify care coordination needs and iteratively refined tools with national VA leadership and frontline providers before and after piloting the tools in practice. The pilot efforts involved working closely with front-line providers from several regions across the United States who had indicated interest in care coordination tools in response to our dissemination efforts.

2.7. Uptake

We pursued several routes to measure real-world, voluntary uptake of the tools resulting from dissemination efforts. Uptake of the Clinic Information tool, Medication tool, and some versions of the Save a Trip tool was tracked through views and downloads on our internal VA SharePoint site. Website hits indicated that a VA employee viewed or downloaded a tool. Similarly, we tracked number of visitors to and views of the VA Diffusion Marketplace site. Visitors, views, and downloads are only indicators of possible uptake, however, as individuals may have only viewed but not implemented the tools. In contrast, we were able to measure uptake for the tools that we adapted or created (half-sheet and tri-fold versions of the Save a Trip tool, and the Care in the Community and Urgent Care tools), which use QR codes to refer patients to online information. QR codes enable deidentified tracking when anyone accesses the codes, which mostly happens in the context of real-world use.

3. Results

3.1. Dissemination

Initially, we pursued dissemination at the regional network (VISN) level. Our dissemination efforts reached numerous VA facilities and individuals nationally (Fig. 1). Six of 18 VISN leaders contacted (VISNs 10, 15, 16, 17, 19, and 22) invited us to present on a monthly VISN primary care meeting; these meetings are attended by primary care leadership of every facility in the VISN. In addition, at least one VISN leader opted to disseminate the tools via email instead of on a call. In an additional VISN (23), we presented on the Registered Nurse Care Manager call and the Ambulatory Care/Patient-Aligned Care Team (PACT) Governance meeting. Collectively, VISN meetings had a total of 220 attendees. On each call, we asked attendees if they were interested in learning more, and if so, to indicate that interest by putting their email addresses in the chat. We periodically followed up with 24 clinical leaders and frontline providers who did so to offer updated versions and opportunities to pilot the tools. In addition, five primary care clinicians who completed the Geriatric Scholars Program followed up for more information on the



Fig. 1. VA Facilities Reached by Dissemination Activities (N = 26). Facilities include VA care sites with a variety of sizes and patient populations served, and included representatives from VA national headquarters, regional Primary Care Integrated Clinical Communities, and individual providers serving patients at VA medical centers and community-based outpatient clinics.

tools.

At later stages, we presented on national calls with Veterans Health Education Coordinators [31], the Primary Care Analytics Team [32], and the End User Governance Group (part of the governance structure of the Office of Primary Care); we also conferred with national partners in the Office of Integrated Veteran Care [33] and the National Center for Health Promotion and Disease Prevention [31]. The VA Primary Care newsletter feature resulted in 57 tool requests via email (4.6 % of newsletter recipients). The Save a Trip tool advanced to the VA Shark Tank semi-finals [26,27]. An unknown number of people attended our

public online Cyberseminar [34,35]. To create a permanent home for the tools that would be more easily found than our internal VA Share-Point site, we also added all five tools to the VA Diffusion Marketplace website (viewable within VA firewall only) [36].

Dissemination often enabled opportunities for discussion of the tools and suggestions for adaptations. Some frontline staff we spoke with were enthusiastic about the potential utility of the tools and became our collaborators in refining them, while others expressed strong opinions that they would not meet patients' needs. VA leaders we met with had different philosophies about the flexibility presented by the tools. One national leader was enthusiastic about the grassroots, local solution the tools presented, noting how it complemented the nationally applicable tools that VA headquarters offers. Conversely, a leader at one VA facility raised concerns that allowing for customization created opportunities for insertion of incorrect, incomplete, or out-of-date information.

3.2. Adaptation

From feedback received in our initial dissemination process and in the semi-structured interviews with frontline providers using or considering using the tools, it became clear that adaptation of the Save a Trip tool would be beneficial for uptake, due to the small font and the large amount of information presented. We revised the tool through iterative rounds of feedback and implementation with end-users (Fig. 2), starting with the feedback that fonts were too small, there were too many words, and there was too much extraneous information. First, we redesigned the tool with a tri-fold format (like the Clinic Information tool and Medication tool) and included the most used non-face-to-face care options. We developed several prototypes that varied graphical elements (e.g., color coding versus icons) and ways of seeking further information (e.g., QR codes versus shortened links).



Fig. 2. Evolution of the Save a Trip Tool. The origins of the original Save a Trip tool are murky, but it was part of the Coordination Toolkit and Coaching project (CTAC) toolkit and taken up by several sites starting in 2017. As of 2021, multiple sites sustained use of the tool. Sites adapted the tool to their needs but continued to add information such that readability concerns emerged. Our team adapted the tool with health literacy in mind, creating two versions, one with shortened links and color coding (which we preferred) and one with QR codes and colorful icons. The veteran focus group strongly preferred the latter. As we disseminated this version to other sites, it emerged that some sites still preferred the one-sheet versions due to not wanting to spend time folding pamphlets. A VA Community-Based Outpatient Clinic (CBOC) created a half-sheet version that addressed this concern, changing the design of the front to align with national VA style rules and removing some of the icons in favor of more text. They noted that veterans gravitated towards the tri-fold version when both were displayed side by side, which led us to develop a half-sheet version with some of the same visual elements as the tri-fold.

We met with the Greater Los Angeles Veteran Engagement Team virtually in March 2022. The four veterans present provided opinions and feedback on three versions of the Save a Trip tri-fold brochure. This meeting resulted in a surprising change in direction; veterans strongly preferred tools with the icons' literal representation of information over designs with only color coding. This feedback informed the pictureheavy, cartoony look of the Care in the Community tool and the Urgent Care tool (see Supplement). Materials produced by VA headquarters with similar information generally lack pictures and other visual elements veterans seem to prefer.

Through the interviews and discussions with sites who were implementing the tools, we learned about clever ways local sites adapted the tools. One site kept its Save a Trip tool updated by having newly hired nurses contact every phone number and website listed to ensure that contact information was current; this also helped new nurses become familiar with options for referring patients to other parts of VA. The halfsheet Save a Trip tool was initially developed by a site that preferred this format to a full sheet or tri-fold brochure, reducing paper usage as well as time and effort spent folding. This site told us that patients seemed to prefer the graphical elements on our version, which motivated us to make a half-sheet version of the Save a Trip tool that preserved those elements.

Balancing end-user and leadership concerns was challenging given the hierarchical structure of VA. Discussions with leadership indicated that the tools served important informational needs, but there was concern about fidelity. By design, the tools had elements that were to be locally customized (e.g., local phone numbers). This need for customization increases the risks for inaccuracies being introduced, either through information becoming outdated or through errors - we learned of one situation where an incorrect phone number was inserted, which was frustrating for both patients and staff. There were also specific concerns regarding the Care in the Community and Urgent Care tools; as the processes referenced in the tools are quickly evolving, the tools could become outdated quickly. Others were concerned that the tools would inadvertently increase care coordination and budgetary challenges by promoting use of non-VA care. Ultimately, we tended to favor ease of use by frontline clinicians, flexibility to adapt content to local needs, and including rapidly evolving information on program benefits and processes, even if they may change. These choices may have diminished leadership support for the tools.

3.3. Uptake



Figs. 3 and 4 show tool uptake in terms of SharePoint site visitors/ views and QR code accesses, respectively. While many people engaged

with our dissemination activities, we could only confirm uptake at a small number of sites. Barriers to uptake reported in interviews included limited availability of staff time or motivation to devote to tool customization (required to make the tool locally useful) and resource constraints affecting sites' ability to print or fold them (e.g., lack of a color printer onsite). Sites that had an immediate need for tools (e.g., one site lost a primary care provider and needed materials to help patients access non-face-to-face care) were especially motivated to use them. We have also observed 190 total page views from 94 unique visitors on our VA Diffusion Marketplace site.

Using QR codes as a means of tracking was not our original intention; we initially added QR codes to make it easier to access long URLs for important VA care information, and only later realized their potential for tracking. Although we present aggregated results of QR code accesses for each tool, the tools have several QR codes on them that refer to different resources. Tracking the different codes on each tool also helped us understand which resources patients were most interested in. QR codes are not perfect measures of uptake, as smartphone use and access varies by important sociodemographic characteristics.

4. Discussion and conclusion

4.1. Discussion

In this project, we disseminated, adapted, and measured uptake for patient-facing tools to improve care coordination in VA primary care. We carried out dissemination activities at local, regional, and national levels; engaged in a human-centered design process to adapt the tools to the needs of patients and clinicians; and used innovative approaches to track uptake. Our efforts resulted in sustained use of the tools under some circumstances but not others, reflecting the nature of a large health care organization as a complex adaptive system [48].

Creating effective patient education materials may be important to help patients as they navigate healthcare systems and coordinate their care, but the work is often treated by the health care system as a collateral or side activity for staff. Thus, even for simple tools like these, turning dissemination of innovations into adoption requires significant engagement and effort to be prioritized among other, more urgent demands on the time of frontline staff. While our dissemination efforts reached hundreds of VA employees and patients, they were also small relative to the scope of an organization with hundreds of thousands of employees serving millions of veterans.

Adapting interventions requires effort, and this neglected labor is crucial for successful spread of innovations [41]. Our intentions for adapting the tools addressed multiple goals of improving likelihood of

Fig. 3. Primary Care Coordination Tool SharePoint Site Visitors and Views, from inception to November 2024. Totals include visitors and views/downloads for the RIVR tools homepage and each tool's page. Timing of visits to the SharePoint site was correlated with dissemination activities.



Fig. 4. Primary Care Coordination Tool Total QR Code Accesses, November 2022 to November 2024. Totals include accesses of all QR codes (each tool has 4–6 different QR codes) on each of two versions of each tool (Save a Trip tool tri-fold and half-sheet versions; Care in the Community tool TriWest and Optum versions, Urgent Care tool TriWest and Optum versions). These numbers likely undercount the true number of accesses because we had to change QR codes and analytics services several times during dissemination, so older versions we can no longer track may also still be in use.

adoption, fidelity, and sustainability [45], but the actual changes we made were relatively minor in the context of possible adaptations, and can mostly be considered tailoring/tweaking/refining [46,47].

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Our efforts yielded idiosyncratic uptake. Many efforts to disseminate did not result in uptake, but at other times, the tools seemed to address an urgent concern or need and were taken up immediately and enthusiastically. Our experience convincingly validated previous work finding that spread of innovations, even simple ones, is difficult [38] and rare [39,40]. The tools were all seemingly simple patient educational materials, but implementing their use in the clinic is actually complex [42]. Clinic staff must undertake significant initial effort to customize the tools with local information, and then develop an ongoing routine to monitor changes, update tools with new information, print them, hand them out to patients, and train new employees on their use [43]. Given the energy and effort required, it is notable that usage, which is not mandated by VA, is sustained at all. Therefore, we think perceived value and feasibility are high [44].

4.2. Innovation

This project innovated through the iterative processes of dissemination, adaptation, and uptake used to develop tools that VA primary care teams continue to use with no external incentive or mandate. We learned from primary care teams' voluntary adoption of the Clinic Information, Medication, and Save a Trip tools - specifically, which attributes of tools made their use enduring - and then applied this learning to develop new tools addressing current issues facing VA. While the MISSION Act was designed to facilitate veterans' access to urgent care and more convenient and timely care from community providers, in practice, there are numerous steps that patients must follow to ensure that they are not financially responsible for this care. We endeavored to create tools for providers, especially those with many patients eligible for community care, to communicate this information clearly and quickly. As evidenced by the continued and potentially increasing usage of these tools (measured by QR codes), these tools address important needs.

This project was also innovative in how we measured uptake. QR codes represent an easy and practical way for creators of patient-facing materials to track use in the real world. Measuring spread of innovations is tremendously difficult outside the context of a formal evaluation or study. This method can be used by others aiming to track the real-world reach of their contributions outside the context of a formal data collection effort.

4.3. Conclusion

Other teams endeavoring to create and disseminate patient-facing materials within VA should know that even well-resourced, multipronged strategies may only reach a small proportion of the intended audience, and the reach of these efforts is difficult to measure. Paradoxically, because of how our tools deviate from style rules of official VA materials – in ways that tend to work better for patients [37] – we were unable to use externally-facing, official, and centralized venues for dissemination. If top-down dissemination from national offices is not an option (and it was not in our case), the impact of dissemination approaches at scale is likely to be limited.

Many prior studies have considered the readability, design, and effectiveness of patient educational materials [16,49,50]. Most studies focus on readability or literacy level of text information, with little consideration of other pictorial and visual elements, or even the format (tri-fold versus half-sheet versus full sheet), which we found were very important to end-users. We were unable to find prior work focusing on implementing the use of such materials or modes of dissemination. Such studies may exist, but are poorly indexed in databases, as there are many terms used to describe such materials (e.g., brochures, pamphlets, leaflets, educational materials).

Of note, paper patient education materials may become less salient over time, as people increasingly seek information online and more care is delivered virtually, providing fewer opportunities to hand out materials. There is increasing interest in using patient portals, QR codes [52], and/or video instead of or in addition to such materials [51-54]. The five tools described would require a redesign to be disseminated this way, as they are not optimized for viewing on a screen. Nonetheless, the need to help patients navigate and coordinate care remains, and methods used to make physical materials meet the needs of end-users may apply to other information delivery modes. Future efforts can build upon the knowledge and strategies developed to center the needs of patients and frontline providers.

Disclaimer

The views expressed are those of the authors and do not necessarily reflect the position or policy of the Department of Veterans Affairs or the United States Government.

CRediT authorship contribution statement

Claire E. O'Hanlon: Writing – original draft, Visualization, Methodology, Investigation, Conceptualization. Jenny M. Barnard: Writing – review & editing, Visualization, Project administration, Formal analysis, Conceptualization. Danielle E. Rose: Writing – review & editing, Supervision, Conceptualization. Susan E. Stockdale: Writing – review & editing, Supervision, Conceptualization. Evelyn T. Chang: Writing – review & editing, Supervision, Conceptualization. Elizabeth M. Yano: Writing – review & editing, Supervision, Conceptualization. David A. Ganz: Writing – original draft, Supervision, Resources, Project administration, Funding acquisition, Formal analysis, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

This work was supported by a Research to Impact Veterans Award from VA Health Systems Research (RVR 19-473) with additional support from VA's Care Coordination QUERI Program (QUE 15-276). Dr. Yano's time was funded by a VA HSR Senior Research Career Scientist Award (RCS 05-195).

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.pecinn.2025.100386.

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