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How's My Health Dashboard

Designing a Digital Platform to Monitor Health Status and Foster Trust Between Patients and Clinicians

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This report is one in a set of resources describing the development of a prototype for a new digital resource, **How's My Health Dashboard**, which would help patients and health care providers work together to achieve health goals that are important to patients. This project was conducted by United Hospital Fund and supported by a grant from the New York State Health Foundation.

This report includes findings from nine months of co-design work with patients and clinicians from a New York City primary care practice, interviews about their use of health information technology, the process of creating the content and design of the dashboard, user feedback about the prototype, and considerations of individual, organizational, and cultural factors that would facilitate its adoption.

Accompanying resources include an appendix on methods that provides details about the practice and patient participants, as well as the novel co-design approaches adopted given the unique context in which the project was conducted—namely from May to December 2020, amid unprecedented changes in health care delivery and significant societal health impacts experienced by patients and health care providers. Other resources include interview guides and the dashboard prototype; all may be found at the United Hospital Fund website.

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Executive Summary

Despite great advances in treating chronic illness in ambulatory settings, and the widespread adoption of the chronic care model, an evidence-based model for improving this care,[1] several barriers to implementation still limit this model's full impact on patient outcomes. Great progress has been made in approaches to patient self-management and in interdisciplinary team-based care innovations. Yet a major obstacle persists: a disconnect between the engaged patient and the prepared provider can hinder effective interactions. A team from United Hospital Fund's Quality Institute sought to better understand existing shortcomings in various aspects of the patient-provider partnership for chronic care—and ways of addressing them. The goal was to involve patients and primary care practitioners to explore together how a digital tool could address some of their challenges. A New York City primary care practice and its patients agreed to participate in this innovative co-design initiative. The practice was selected because of the population it serves—a diverse group of patients with high prevalence of diabetes. It also had a strong history of developing and adopting patient-centered practice transformation innovations. The practice had long endorsed the adoption of health information technology (HIT) and promoted use of digital patient portals and various apps with their patients.

In the first phase of the project, the team conducted a review of the literature to assess current knowledge on clinician-patient relationships in the context of chronic disease management. Four conditions were identified as necessary to build and cultivate an effective partnership.[2] The team then engaged 10 patients and practice staff in the co-design work by conducting a series of active listening interviews to cultivate trust and set the stage for the co-design collaboration. These conversations explored their common ground—their shared experience in co-managing diabetes. The interviews revealed several concerns in common related to successful communication, the discussion of priorities and values, agenda- and goal setting, visit efficiency, inclusion, and trust.

In the second phase of the project, the team conceived a shared digital tool that could help align priorities and goals, foster effective communication, improve visit efficiency, and contribute to the building of continuity and trust. A blueprint of the tool, *How's My Health Dashboard*, was developed in partnership with two health information technologists/designers. Patient and clinician feedback on the prototype was collected, and issues of workflow and feasibility of use were explored. Project staff investigated the requirements to create a working digital version of the dashboard, as well as the factors that would facilitate or hinder its adoption.

This report describes the development of the digital prototype, *How's My Health Dashboard*. Accompanying resources, including methods, interview guides, and the dashboard prototype, may be found at the United Hospital Fund website.

Support for This Work

Background: Current Knowledge on Clinician-Patient Relationships

Patients with chronic diseases live with their conditions for a significant portion of their lives. Their myriad interactions with the health care system may address clinical issues, such as symptom burden; complications from the condition; care coordination; post-hospital recovery; social determinants of health; and quality of life and function. Interactions also include transactional activities, such as arranging referrals, discussing cost of care, and billing issues. Primary care clinicians often serve as the central provider for this population because of the pivotal role they play in the prevention, treatment, and management of chronic diseases as well as their involvement in building relationships and continuity with both patients and communities.[3]

> "Complexity and length of visits have increased because of delays in care at the onset of the pandemic and patient reluctance to present to the clinic during pandemic. Also, an increase in mental health problems, particularly anxiety and depression."
>
> —Primary Care Collaborative. Quick COVID-19 Primary Care Survey. Series 24 Fielded December 11-15 2020.

Increasing demands on primary care have led to new challenges in patient-provider relationships. Primary care clinicians increasingly care for clinically and socially complex patients. They also work in a health care environment that is constantly shifting and unpredictable.[4] A recent study showed that close to half of clinicians' patients lived with two or more chronic conditions.[5][6] The health needs of this population are significant and contribute to the difficulty in finding and scheduling appointments, long wait times, and the potential for visits that are too short, all of which affect the quality of the provider-patient relationship.[7][8][9]

The COVID-19 pandemic has further exposed the fragile state of primary care. A recent survey indicates that over 90% of practices have "some form of personnel shortage" and nearly 50% report stress or exhaustion, which is reported to be worse 12 months into the pandemic than before.[10] In addition, over 60% of visits are more complex than before the pandemic, patients are experiencing growing mental health and social needs, and practices have seen an increase of 25% in patient volume despite a nearly 40% drop in in-person visits.[11] Perhaps most concerning is the current underinvestment in the nation's primary care infrastructure. A survey showed that in 2019, just before the pandemic, commercial

payers' spending for primary care was 4.67% of total national commercial health care spending, down from 4.88% in 2017.[12]

The pandemic has also shifted the way primary care is delivered, and the definition of what constitutes a "visit" has changed. Practices were forced to restructure and adjust rapidly to accommodate the new reality of virtual care, and respond to the COVID-19 crisis and the growing health needs of their patients. One year past the beginning of the crisis, there are still significant challenges to transforming and scaling care delivery sustainably. Telehealth is now integral to providing care to patients and includes a range of modalities—synchronous, asynchronous, and remote monitoring—which all allow patients and clinicians to interact virtually.[13] This shift has disrupted the typical clinician workflow: Pre-visit and post-visit planning that would typically occur in person may now need to accommodate televisits and be managed through email, text messages, telephone, and patient portals.

Innovations that facilitate and enhance interactions between patients and clinicians could make a significant impact on the resilience and levels of accomplishment perceived by the primary care workforce and on the health and well-being of their patients.[14] [15]

This project sought to co-design the prototype for a digital tool to support patients and clinicians working together toward health.

Dashboard Co-Design: Phase 1

Finding Common Ground in The Shared Experience of Patients and Clinicians Co-Managing Chronic Conditions

We partnered with the clinicians and patients from a New York City primary care practice and its patients who agreed to participate in this innovative co-design initiative (details about the practice, patients, and the context of the project can be found in the Methods Appendix). Although the project was conceived before the pandemic, the co-design work engaging patients and clinicians took place between May and December 2020, at the heart of the pandemic in the United States. This no doubt affected the perspectives that participants brought to their experience co-managing diabetes.

The practice was selected because of the population it serves: a diverse group of patients with high prevalence of diabetes. It also had a strong history of developing and adopting patient-centered practice transformation innovations. The practice had long endorsed the adoption of health information technology (HIT) and promoted use of digital portals and various apps with its patients. The goal was to involve patients and primary care practitioners to explore together the concept of a dashboard

and to co-design the prototype. Given that the "user" of the dashboard would be the "partnership," the partners would create the solution based on their shared experience. The team then engaged ten patients and practice staff in the co-design work by conducting a series of semi-structured, empathic inquiries to facilitate collaboration and foster trust. The interviews explored each of the conditions needed to build and cultivate a partnership (see inset box) and the well-documented pain points and sources of frustration in co-managing chronic conditions.[16] (Details on the interview process, and the interview guides themselves, may be found in the accompanying resources on UHF's website.)

> ### Conditions Needed to Build and Cultivate a Partnership
>
> - Knowledge of what is important to each partner.
> - Understanding and respect for each partner's values.
> - Shared goal-setting and decision-making.
> - Shared understanding and explicit agreement of the task to be accomplished and the role and expectation from each partner, for each visit and interaction and longer-term relationship.
>
> Source: Beach MC, Inui T, and Relationship-Centered Care Research Network. 2006. Relationship-Centered Care: A Constructive Reframing. *Journal of General Internal Medicine* 21 (Suppl 1): S3–S8. https://pubmed.ncbi.nlm.nih.gov/16405707/

The interviews provided face validity and relevant contextual details to the published evidence and knowledge about the challenges experienced by both clinicians and patients. We found that both patients and clinicians share very similar perspectives about barriers to their partnership (short duration of visits, multiple agenda items, desire to accomplish something together but recognizing that each visit can accomplish so much, and having a longer-term vision of how to achieve health). Yet how these barriers are experienced and how they affect the ability of the partners to work together in co-managing health may be different, and thus contribute to what appear to be competing agendas and priorities.
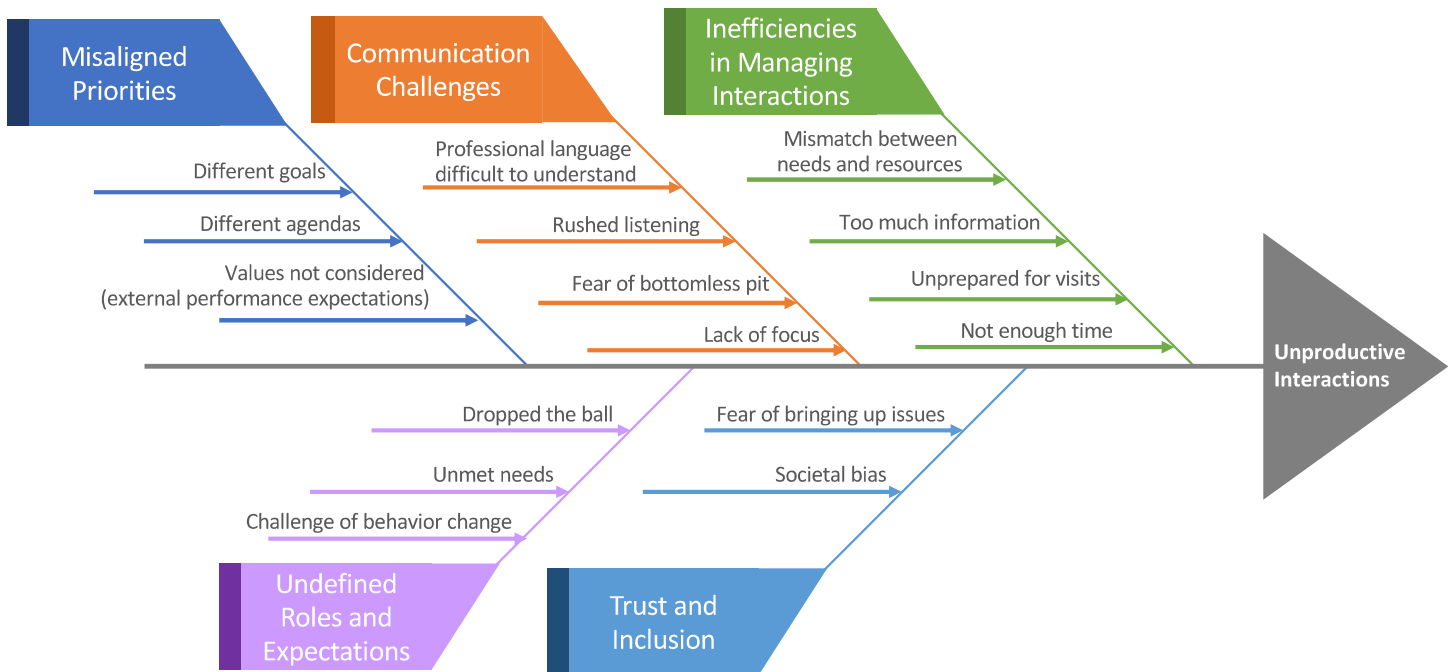
For example, patients and clinicians reported that they view trust as paramount to effective and caring interactions. Trust is essential, so both can be fully transparent and share any information freely without the fear of harming the partnership. Biases or stigmas related to individual characteristics, such as race, obesity, substance use, or mental health issues, can harm a patient's and clinician's trust in each other. A recent study highlighted the importance of the "mutually reinforcing nature of trust" between patients and primary care providers, as well as the value of listening, effective communication, and shared decision-making in building a trusting partnership.[17]

To synthesize the information shared during the interviews, and identify the common ground between patients and clinicians, we applied a process improvement method to visually display and organize barriers into five major categories.

These barriers include challenges to successful communication, alignment of priorities, agenda and goal-setting, explicit roles and expectations, inclusion and trust, and efficient interactions. The details below each category represent various ways that this barrier is experienced either by patients, clinicians, or both.

Given the reality of systemic limits affecting patients' and clinicians' interactions in the context of the complex nature of chronic disease management, the next phase of the co-design sought to develop an innovative solution in the form of a shared digital tool that could help align priorities and goals, foster effective communication, improve visit efficiency, and contribute to the building of continuity and trust.

Barriers Leading to Unproductive Interactions

Misaligned Priorities
- Different goals
- Different agendas
- Values not considered (external performance expectations)

Communication Challenges
- Professional language difficult to understand
- Rushed listening
- Fear of bottomless pit
- Lack of focus

Inefficiencies in Managing Interactions
- Mismatch between needs and resources
- Too much information
- Unprepared for visits
- Not enough time

Undefined Roles and Expectations
- Dropped the ball
- Unmet needs
- Challenge of behavior change

Trust and Inclusion
- Fear of bringing up issues
- Societal bias

Unproductive Interactions

Dashboard Co-Design Phase 2: A Digital Solution

Current Literature on Digital Platforms in Primary Care

Health information technologies have created numerous opportunities to facilitate communication between patients and clinicians, to support effective partnerships, and to improve chronic disease management.[18] [19] [20] Research suggests that portal use facilitates self-management and shared decision-making, prevents some medical errors, and has a beneficial impact on health outcomes.[21] [22] [23]

On the other hand, patients and clinicians alike struggle to develop the skills needed to maximize portal functionality and usage to achieve these outcomes. The demand for portal training, personal assistance, and technical support exceeds the available workforce capacity.

Studies have also found significant disparities in access and use of portals among disadvantaged populations, such as communities of color, people with low health literacy, those with chronic illnesses and disabilities, and the elderly.[24] [25] One of the main drivers of patient portal use is routine use of the portal by clinicians as way to communicate with patients. Yet clinicians have not endorsed patient portals with great enthusiasm, given concerns of disruption in workflow efficiency and the lack of reimbursement for care provided via the portal.[26] As a result, most providers lack explicit practice standards regarding patient engagement with portals, and there are no set expectations about how clinicians and patients should use them to interact (e.g., patients could be expected to report on symptom status after a change in medication; and clinicians might be expected to review patient-reported symptoms and respond with a recommended plan of action).[27] [28] [29]

Given the increasing accessibility of patient portals, a lot of attention has focused on enhancing their functionality to support the co-management of chronic disease. A group of clinicians and informaticists at Vanderbilt University recently published a study describing the development of a patient-facing diabetes dashboard integrated into a portal.[30] The co-created patient-facing interface designed with and for them is a novel feature that allows greater flexibility in the application of patient- centered principles to display and provide interpretations of clinical information generated by providers. Yet this tool falls short of two key functionalities that we explored with *How's My Health Dashboard*: a single, shared information platform that produces an identical view of information by both physicians and patients, and the display of health data that is generated by both patients *and* physicians.

OpenNotes—a transparency movement to make clinical encounter notes available to patients—is another example of an initiative that prioritizes clinicians' sharing of the electronic medical records with their patients. [31] [32] [33] Patients can review their notes

for accuracy and suggest revisions when the information is incorrect. OpenNotes has influenced how clinicians document visits in a positive way, but workflow challenges persist. Although patients can suggest modifications to their data, they cannot directly make those changes, given technological and legal/regulatory constraints. As a result, although OpenNotes facilitates the common sharing of information between clinicians and patients, patients review the information generated by providers but cannot directly contribute their own information into the record.[34] [35]

We also searched for relevant technological advancements in the realm of mobile apps. We identified numerous promising tools for medication management, patient education, self-monitoring, and self-management of chronic conditions.[36] Yet none of the apps reviewed sought to produce a dashboard that would include information input by both clinicians and patients and that would be shared in the course of co-management interactions.

In order to guide the development of the project's dashboard, we interviewed participants and collected their views about using health information technologies.

Interview Findings: Patients' and Clinicians' Experiences with Health Information Technology

Many of the findings from our review of the literature were confirmed by our patient and clinician interviews. We found wide variation in the breadth and depth of use, as well as in the ease and perceived value of various information technologies. And we uncovered the limitations that current HIT tools put in the way of the effective interactions required for co-management of chronic conditions.

Patients

All patients interviewed had used a portal to communicate with their practice and reported familiarity with several of its functionalities. Our interviews were meant to characterize user experience with the portal in order to guide the development of our proposed dashboard. Since effective interactions are a core concept of the *How's My Health Dashboard*, it was essential to explore how the platform could be integrated with existing patient- and clinician-facing technologies.

The portal was frequently used by patients for non-urgent, standard requests (e.g., medication refills, making appointments and accessing test results, trends and interpretations, and post-visit summaries), and for non-routine issues via secure messaging. Most patients found the portal to be a great addition to their care resources and a convenient tool for communicating with their practice.

However, user knowledge and favorable evaluation of the portal did not necessarily equate with user adoption. Patients emphasized that they still placed greater value on verbal communication, either in person or via phone. For example, patients described familiarity with the portal and said that having an easily accessible record of their

specific health issues, medication lists, and treatment plans was necessary—especially when care was complex and involved different clinicians. Yet they also believed that making informed decisions about care required in-person interactions to fully explore options, tradeoffs, and expected outcomes.

Patients commented that portal content seemed to be produced for other health care professionals and not tailored to them; this meant the use of somewhat complicated medical terminology and insufficient support for patients to interpret what was presented. Concerns were also raised about inclusion and the fact that some patients, particularly older ones, might lack access to smart phones, tablets, or computers. In addition, some regions of New York City still lack adequate broadband availability. These barriers limit the ability to connect easily to portals. Patients emphasized that a vision of health care equity must address these and broader, systemic barriers to access among disadvantaged groups.

Since the patients interviewed were all living with diabetes, apps for managing weight, diet, and glucose were important components of their care. They mentioned being more likely to adopt an app if their clinician recommended it—and, more importantly, if the clinician discussed the results with them. They appreciated when a member of the clinical team took time to discuss their data with them; this was most commonly the diabetic educator, dietician, or pharmacist. Most specifically, patients valued the ability to keep their clinicians informed of their results or to seek advice about particular issues related to their data. The apps that allow direct transfer of information to clinicians were more valued than those that didn't. Patients agreed that having to transcribe data and bring written records to their visit was a barrier to using the app.

Clinicians

Clinicians' experiences and opinions varied according to the specific technology and how it supported particular tasks required for the care of patients. Physicians are generally adept at using electronic medical record (EMR) systems and rely on them for most of their work, such as accessing patient data and documenting various aspects of patient care. They are also involved in recommending or "prescribing" various self-monitoring devices and apps to patients and in reviewing recorded or charted data to make clinical decisions. Clinicians unanimously agreed about one critical factor driving their decision to adopt HIT: that the various sources of a patient's information be integrated into a single location.

Unfortunately, in the current HIT context, clinicians have experienced the inefficiencies and frustrations of needing to pull up various tools to create the full picture from a patient's disparate information. This problem is a major cause of most failures in technology implementation and adoption.

Clinicians reported wasting energy and time on the task of consolidating data in a notably fragmented virtual information environment. This creates inefficiencies in preparing for and conducting visits, since they must piece together various sources of information to get the whole clinical picture. In such a system, interpreting trends is either time-consuming or impossible. The current challenge of clinicians using HIT is like trying to read a book whose chapters are located in different libraries and neither numbered nor indexed. The book could eventually be read, but the time required to assemble all the chapters and to figure out their order would be prohibitive. That's what clinicians are asked to do every day, under both time pressure and financial pressure.

Most existing platforms still consider patients and clinicians as individuals and not part of a whole unit or team in which each partner has specific roles and tasks. The information the health care system generates (e.g., physician notes, test results, consultations, and medication lists) is only shared partially—and what *is* shared is at the discretion of health care professionals. The information that patients generate (e.g., self-reporting of symptoms, goal achievement, outcomes from prescribed medications, data from apps) is shared, but, unless documented by clinicians in their EMR, is not integrated with other clinically and professionally derived information. Although it is patient-facing, portal content is generated by the health care system and conveys information in a way that is centered on that health care system.

This partitioning of information significantly limits the opportunity for clinicians and patients to effectively work together to address health problems. Clinicians wish they could access patient-reported information to facilitate effective visits, and patients wish they could more easily report what matters to them so that they can feel confident in management decisions they make. And if we examine the totality of information the partners can access to co-manage health, the balance is clearly on the side of health care-generated data, with huge gaps in patient-generated data.

Our interviews also revealed a significant barrier to using patient-generated data to co-manage chronic conditions. Patients reported technological problems accessing their information once it had been shared. Data remains embedded in a specific, secure message, and they cannot be indexed for future use or for identifying trends. This limitation was also reported by clinicians who were unable to integrate these data with other EMR data. In short, data that are required to co-manage and make decisions are segregated and not easily accessed by each partner for ease and consistency. This technological limitation needs to be addressed in order to achieve equal access and inclusion of health information.

The concept of a shared dashboard begins to address some of these shortcomings. We sought to explore how a digital platform might increase the patient contribution to generating data pertinent to the management of their health. This would contribute to improved interactions—and, eventually, to improved health.

Dashboard Co-Design Phase 3: Development

Developing Dashboard Content, Design Principles, and Use Cases

We reviewed published literature, conducted internet searches, and reached out to key experts to explore existing content and display features relevant to the goals of the dashboard.

First, we identified a set of design principles to guide content selection and display options. We then applied the criteria for effective health care interactions obtained from participant interviews to evaluate any proposed content or display options. The results are presented below; an additional table with more detail appears in Table 1 at the end of this report.

Design Principles and Criteria for Effective Interactions

Design

Information should be:
- Straightforward & unambiguous
- Clear-cut & actionable
- Well-founded, formally validated or in use with face validity
- Easy and quick to interpret
- Able to be flagged for common agenda-setting
- Complementary to current patient portal functionalities, not duplicative
- Accessible, integrated, and organized for ease of use

Effective Interaction Criteria

Content and display should facilitate:
- Trust and Inclusiveness
- Shared goals and priorities
- Visit efficiency
- Productive communication
- Clear roles and expectations
- Care continuity

Selecting Dashboard Content

The unique feature of this dashboard is content generated entirely by patients, which is meant to complement other data generated by the health care system, such as lab results, clinician diagnoses, medication lists. Our search was focused on finding existing content to guide patient reporting of their information. We found a number of examples that took the form of either open-ended narratives, qualitative answers to specific questions, or quantitative scores based on answers to standardized questionnaires. We then sought patient feedback on various options for reporting their health status as well as specific concerns that mattered to them. We explored the

face validity of questionnaires, patients' opinions regarding whether the wording of questions adequately communicated their health concerns, whether the questions were easy to understand and to answer, and whether patients would be willing to answer such questions ahead of a visit. Examples of narrative input templates were also tested by asking patients what information they would input if they were preparing for a visit. This allowed us to narrow down and select the content for the dashboard (see Table 1, *How's My Health Dashboard* sections).

Dashboard Display

Once the content was identified, the team's health information technologists created a draft dashboard prototype based on the design principles and the criteria for effective interactions we had mapped out.

Figure 1. How's My Health Dashboard Homepage
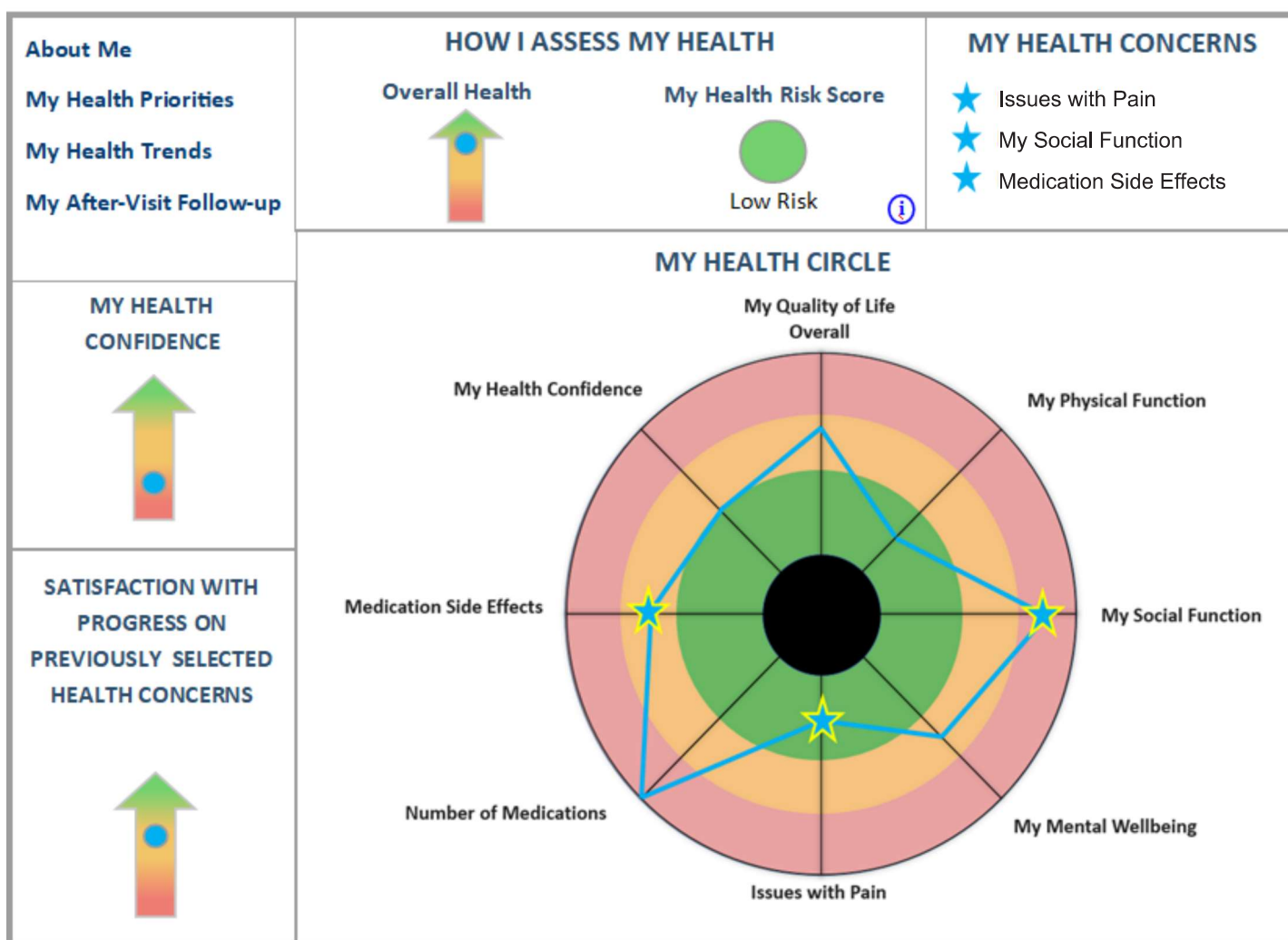
The dashboard home page is organized in sections with specific content that is displayed according to set design principles. More details about each section can be found in an accompanying appendix, *Prototype for How's My Health Dashboard.*

At the time of the visit, clinicians and patients share the dashboard landing page. The home page provides a snapshot of a patient's most recent health score, goals, and health circle, with links to navigate to other sections of the dashboard. A clinician can quickly visualize a patient's top three concerns, which are indicated by stars located in the appropriate sections of the health circle. The clinician is also informed about a patient's assessment of their overall health, as well as a score of a patient's risk of adverse events. The dashboard also displays a patient's confidence in managing their health and their degree of satisfaction with goals set in previous visits.

User Feedback on Dashboard Prototype

Once the first version of the dashboard prototype was developed, we sought feedback from clinicians and patients.

Content and Display

Patients said that they liked the overall content and display of the dashboard prototype and understood and appreciated the questions. They agreed that such information was not routinely asked of them, and that it would be important for their clinicians to know. As one patient put it, "These are the types of questions I would want to be asked." They said that if the type of information they input into the dashboard were discussed with their clinicians, they would feel more trust that their clinicians' recommendations would be tailored to their needs. "I know this is for me, Mr. R. with diabetes, not just any diabetic," one patient remarked. Despite their overall positive impression, they found some questions to be vague. For example, some did not understand what "social function" meant. Most did not care very much about comparing how they were doing to others and would rather be able to track their own health data over time.

> "This is good, I like it, and it gives you a format to follow to discuss with your doctor, and it keeps you from being scattered and pinpoints certain areas to address more than others… It's a good organizer for what I want to say to my doctor."

Patients also demonstrated a solid grasp of the display components of the dashboard, likening the red, yellow, and green color scales—as well as the line graphs, trends, and other infographics—to visuals they have seen in other settings; these included other health mobile apps and apps linked to medical devices. One patient referred to the "My Health Circle" section as "the eye" and said that it made it easy to understand what issues were the most concerning.

Benefits

Patients expressed that a tool such as the dashboard would be useful because it would help them to prepare in advance of their visits. They noted that the portal includes a post-visit summary they found particularly informative; the post-visit summary yielded information they did not remember being discussed during the visit and enabled them

to make a checklist for follow-up plans. Given this, they suggested, why not also include a pre-visit summary?

When considering the dashboard use for visit preparation, patients agreed that it would help them keep all the items they want to discuss with their clinicians in one place and would allow them to review this information over time. One patient stated: "This is good, I like it, and it gives you a format to follow to discuss with your doctor, and it keeps you from being scattered and pinpoints certain areas to address more than others… It's a good organizer for what I want to say to my doctor." All agreed that it would improve the efficiency of their visits and allow more time for productive communication and problem solving.

One patient summarized the dashboard's benefits: "It's not lengthy, it's clear-cut, to the point, easy to answer." Another said, "I can't wait to use it" and added that UHF could "use me for your pilot program."

More efficient visits also meant that patients felt the issues on their agendas, as well as those on their clinicians' agendas, could be explicitly stated at the beginning of the visit and jointly prioritized. "My physician may want to check my blood pressure, take blood for tests, and I may forget to say that I have questions about… Then I get home and I feel the visit was not really about my priorities but those of the clinician."

One patient summarized the dashboard's benefits: "It's not lengthy, it's clear-cut, to the point, easy to answer." Another said, "I can't wait to use it" and added that UHF could "use me for your pilot program." On the other hand, some patients expressed concerns about filling out the questionnaire before each visit. They felt the questions were a "lot to consider," would possibly be too time-consuming, and that not every interaction—like when they "just want a flu shot"—would necessitate this type of preparation. However, they acknowledged that they would use the dashboard for their annual wellness visits and would be willing to use it to prepare for other visits that involve more than simple transactions.

"My physician may want to check my blood pressure, take blood for tests, and I may forget to say that I have questions about… Then I get home and I feel the visit was not really about my priorities but those of the clinician."

The dashboard could help provide health care continuity—"a clear distinction of how things are going from one visit to the next"—according to one patient. A few thought that the tool might help relieve anxiety for patients with concerns that might be difficult to share in person. This came up when discussing issues around mental health and personal decision-making preferences: "For someone who doesn't always speak up or isn't able to, it might be even more helpful" to have a doctor know how the patient prefers to make decisions, so they don't come across as confrontational.

One of the patients' greatest concerns with using the dashboard was that it might disadvantage certain populations—especially the elderly, who might have less familiarity with technology, as well as limited access to affordable cellular coverage. However, one noted that "it may be more difficult for a senior aged person to navigate, but it's simpler than most things we all have to navigate." Some were concerned about the burden it might add to clinicians' already busy schedules. They worried that clinicians might not use the information in the dashboard due to lack of time. One patient noted that she would not want her proactive visit preparation efforts to be wasted. Another worried that her primary care clinician might pass the responsibility of reviewing the dashboard on to another staff member, and that there might be sensitive information she wouldn't want anyone except her primary clinician to see or discuss with her. Lastly, one patient shared a concern that flagging patient priorities in advance of a visit might lead to more referrals, an unintended consequence that would affect trust and continuity of care.

> "It may be more difficult for a senior aged person to navigate, but it's simpler than most things we all have to navigate."

Clinicians

Content and Display

Overall, clinicians were extremely positive about the dashboard concept and its design features. The narrative section, where patients describe the nature of each concern they selected for the visit, received the highest grade. They recommended that the word count be limited for efficiency purposes— "otherwise you may get a novel." Workflow efficiency was their top criterion for evaluating content and display. Clinicians looked for whether content and display would be easy to rapidly interpret and asked how long it would take to review the information before the visit. One remarked: "How long does it take the provider to go through this and screen it all, and how long is the range of time to review it in addition to everything else I have to look at?" They found the selected health concerns and the questions by which patients could self-assess these concerns to be clinically important and valuable. "This is not information we get readily, except if we ask about it at the time of the visit," one said. Another noted that having this information recorded by patients before a visit would be "incredibly helpful." On the other hand, clinicians were cautious about having patients identify three health concerns. "It may be best not to ask for a number because, if you do, people might search for a third concern that they otherwise wouldn't have," one said. The suggestion was to ask patients to report "up to three concerns," or ask them to rank their concerns so that clinicians could decide to address one at a visit and plan to address others at another time.

Clinicians expressed a variety of opinions about the visual representation of the dashboard content, some preferring narrative, others finding graphic representations easier to review. In response to their opinions about how they would use the dashboard with their patients, they pointed out that some terms would require further definition (e.g., "health overall" or "social function"). Some felt that certain graphs might be a bit "overwhelming" for patients and that the color coding might not be

intuitive. Concerns were also raised about patients who were not "tech savvy" and might not be able to utilize the dashboard effectively.

Benefits

All clinicians valued the dashboard's potential to set a shared agenda for a visit, thereby improving its efficiency. "There will always be a gap between the provider's goals and the patient's, but at least it'll capture three priorities to better negotiate the time spent on things with the patient," one said. Another remarked: "Patients frequently come in with numerous issues, and it's important to identify their most pressing concerns." Clinicians recognized that they create their own visit agendas prior to meeting patients—for example, reviewing HbA1c, test results, or making sure they meet measures for which they are accountable in value-based payment programs. And they also agreed that it is crucial to understand patients' agendas. "The dashboard information, plus the information I have in Epic, would paint a much better story about the patient," one observed. Another said, "I had a patient who was more focused on aspects relating to quality of life than improving clinical metrics, and I had to change my approach and communication style to work better with that patient."

Having key information beforehand can also lead to a more targeted visit. Clinicians made the following comments: one said "The worst scenario is when the visit ends, and the patient says to you, 'Oh, I have pain in my toe that is getting worse. What can I do?" and the other said, "That can derail the whole morning schedule, since I'll have to spend more time exploring this complaint. Had I known at the beginning, it would have been part of the visit conversation."

The clinicians had a lot of questions and ideas about workflow considerations. They wanted to know how the dashboard would integrate with the EMR they use; for example, would they be able to "drag" the dashboard information into the record for the clinical encounter. Not surprisingly, EMR integration was identified as highly desirable, if not a prerequisite, of efficient use of the dashboard and therefore its adoption into practice.

## From Prototype to Working Dashboard: What Will It Take?

At this point of the project, *How's My Health Dashboard* consists of a non-working prototype that was co-created with—and designed to support effective interactions between—patients and clinicians. User feedback confirmed its face validity and the willingness of patients and clinicians to try it in real time once a digital version is created. So, what will it take to realize the dashboard, test it in real time, and eventually foster its adoption into practice?

Drivers of Technology Adoption

In exploring the concept of the dashboard, we were keenly aware that navigating the path from concept to adoption would require addressing numerous factors that influence how innovations spread.

The adoption of any innovation does not happen automatically. Extensive research has demonstrated the conditions necessary for diffusion of new behaviors or new tools.[37] Despite well-recognized theoretical models, health care innovations have been generally resistant to adoption and spread.[38] Information technologies are no different, and studies have examined drivers of adoption by clinicians as well as patients. These include specific features of the technological innovation, such as relative advantage over existing technologies, degree to which it can be personalized, cost implications, trialability, end user perception and experience related to content and degree of fit with daily routines, and cultural (or social) and organizational factors. [39] [40]

Figure 2. Drivers of Innovation Adoption
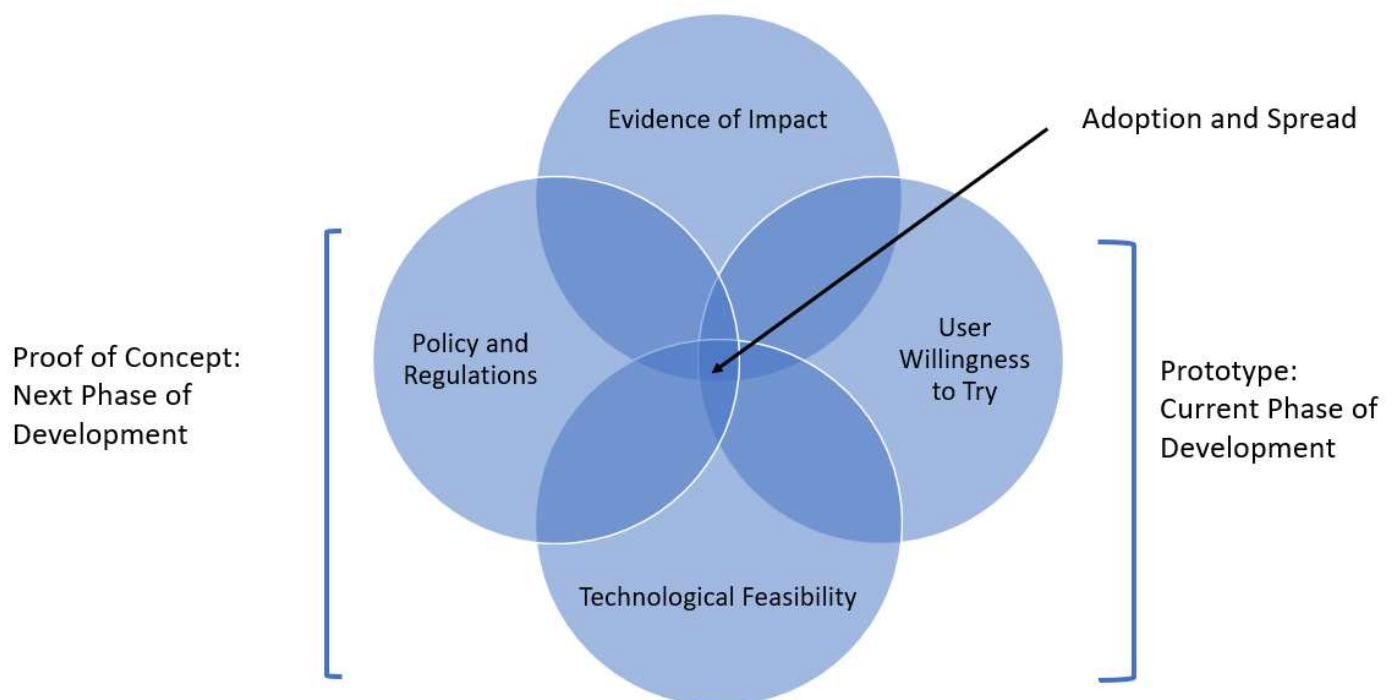
We explored what the next step might be to go from prototype to proof of concept. Key experts interviewed recommended prioritizing at least one use-case, based on what users would be willing to try once a digital tool with limited functionalities is created and can be tested. Various potential use-cases that pertain to moments when patients and clinicians typically interact were identified: before visits, during visits, and after visits—in either a planned or an unplanned way. These interactions could be supported by the dashboard. Both patients and clinicians strongly endorsed testing the dashboard to prepare for a planned visit and for an annual health review. The use of the dashboard to follow up after a visit or for unplanned communication was viewed favorably; yet both parties expressed concerns over the added complexity of realizing this type of functionality, which would require new explicit rules and workflows to appropriately manage less predictable interactions unless they can be standardized.

The Innovation: Integrating Clinician- and Patient-Reported Data

Even if the proof of concept is successful, significant technological, regulatory, and policy barriers will need to be addressed before the full, functioning dashboard model is realized. This project targeted a number of drivers of adoption; we confirmed that the content and design were viewed as conducive to user engagement and that patients and clinicians could imagine how the dashboard could be integrated into health care delivery. The prototype achieved face validity in terms of the convenience and degree of personalization it uniquely offers.

Next, we will need to develop a working prototype so that the dashboard can be tried, and users observed in real time. At that stage, the dashboard's relative advantage compared to the status quo, and the individual and social attitudes of users, would also need to be assessed to estimate its likely feasibility, pace, and degree of diffusion. This project was conducted with a primary care practice with a track record of innovation. Over the past five years, it has been involved in practice transformation efforts and was part of an initiative funded by the Peterson Center on Healthcare.[41] Applying quality improvement techniques, the practice successfully implemented a number of interventions and met the criteria to qualify as a high-performing primary care practice. But not all primary care practices may be ready to adopt such innovation.

Attitudes toward change and willingness to innovate, as well as familiarity with and knowledge of HIT, were the most relevant factors that affected the practice's willingness to participate in the development and testing of the *How's My Health Dashboard* concept. The emphasis on intrinsic motivation toward building effective relationships among staff and with patients were also key determinants. Perhaps most importantly, the practice had implemented and sustained new, team-based staffing arrangements and workflows that could support the introduction of a tool such as the dashboard: administrative and clinical leadership dyads; dedicated 1:1 staffing ratio (provider/care team relationship); and daily huddles and pre-visit preparation. The nature of staffing, the standardized workflows, and a culture of continuous quality improvement will affect successful adoption of an innovation such as *How's My Health Dashboard*.

Technical considerations include the level of complexity of the HIT and its compatibility with existing technologies in use by the practice and the health care system. Various options were explored to guide next steps in the development of the dashboard, and two major types emerged: first, an independent application that would allow patients and their clinicians to transmit information related to health management; and second, an add-on to the already existing portal. We searched for examples of similar technologies but did not identify any that enable clinicians and patients to share a longitudinal record of their interactions. Although medical records do belong to patients, they are also professional and legal documents. So far, only health care staff can input information directly into the EMR. Patient-recorded information can be shared with clinicians but may not be directly added into the

medical record. Health care staff must be the ones to input patient-reported data into the EMR, either interpreting or paraphrasing it, or adding it as is (as an attachment to a visit note). Because patient-reported data is not really part of the health care database, this makes it complicated if not impossible to innovate around shared information.

On the other hand, apps to accomplish the desired functionalities could be created and tested. The challenge here is that clinicians cited one condition which, if not satisfied, would make their willingness to try and test the dashboard "dead on arrival": needing to look for information outside the medical record. This condition significantly jeopardizes the willingness to adopt apps.

Patient portal integration of the dashboard content and display would be another option, given that portals are increasingly being adopted, offered, and used by patients. Yet we identified several technical barriers to this solution that we had not anticipated. Although patients can communicate directly with their clinicians via portals' secure messaging, this data remains attached to the message and does not get integrated into other health care-generated databases that populate the various sections of the portal. Patient questionnaires are not added to the medical record unless the clinician specifically saves it as a PDF attachment linked to a specific visit. This limits the ability to analyze data to compare trends in patient-reported health status, for example, or to allow clinicians to view the entire set of data about the patient, those stored in the health care system databases, and those provided by patients. In addition, the clinicians' view of patient information differs entirely from what patients view on the portal, which will affect how the information is interpreted and discussed. This perpetuates information asymmetry, which affects power dynamics and trust and undermines the partnership.

These technical challenges can be solved with policy, legal, and market-based interventions. If we are to achieve a degree of inclusiveness—and redress the imbalance between clinician and patient input into health co-management—the legal definition of a shared medical record should be reexamined. Patient portals have great potential, and there is much more that could be done to increase their functionality to allow patient input of relevant, health-related information. We could also propose a new concept: a much more comprehensive "shared medical record" where clinicians and patients could converge to co-manage health. Each partner would also keep their own record of information they use but that does not need to be shared.

An analogy may shed light on the current situation. If we examine the relationship between a person and a financial advisor, it is based first on client input of information, which is used to create a risk profile. Based on that, the advisor will then develop a shared document, allowing them to discuss investment strategies that take the risk profile data into consideration. We wouldn't fathom financial decisions being made without the input of the client and the advisor, and without them both discussing options while sharing a common document. But in health care, life-determining decisions are made without that shared document all the time; although

risk assessment may be conducted, it typically is not formally integrated into the decision-making process. If we can achieve co-management of a financial portfolio, we can surely achieve the same in health care.

This project substantiates that clinicians and patients are each invested in seeking to increase the quality of their interactions with one another. For clinicians, this means focusing on what is important to the patient and prioritizing their key concern during the visit. For patients, this means making sure they effectively share necessary information that enables clinicians to tailor recommendations to their unique life situation. This is the vision we should aspire to, and we should now focus on how we realize the dashboard concept.

Table 1. How's My Health Dashboard Sections

Dashboard Section	Design Principle	Effective Interaction Criteria	Content and Display
About Me	▪ Straightforward	▪ Care continuity ▪ Trust/ Inclusiveness	▪ Free narrative[42] ▪ Patient identifies and checks three health concerns
My Health Concerns	▪ Flag for common agenda setting ▪ Clear-cut and actionable ▪ Rapid interpretation	▪ Shared goals and priorities ▪ Visit efficiency ▪ Care continuity	▪ Validated questionnaires targeting eight health concerns that matter to patients[43,44] ▪ Score calculated based on patient answers
My Health Trends	▪ Rapid interpretation ▪ Straightforward	▪ Care continuity ▪ Shared goals and priorities	▪ Trendline of scores for each health concern ▪ Calculated automatically
My After-Visit Follow-up		▪ Care continuity ▪ Productive communication ▪ Clear roles and expectations	▪ Link to existing portal site for after visit summary
My Assessment of My Health	▪ Straightforward, unambiguous	▪ My Health Overall ▪ My Health Risk Score	▪ Questionnaire[45] ▪ Score calculated based on patient answers[46]
My Health Circle	▪ Flag for common agenda setting ▪ Rapid interpretation ▪ Clear-cut and actionable	▪ Productive communication ▪ Visit Efficiency ▪ Shared goals and priorities	▪ Questionnaires[47,48] ▪ Score calculated from patient answers ▪ Score translated into a color code ▪ Selected concerns flagged with a star
Satisfaction with Progress on Previously Selected Health Concerns	▪ Straightforward, unambiguous ▪ Rapid interpretation	▪ Care continuity ▪ Shared goals and priorities ▪ Visit efficiency	▪ Questionnaire[49] ▪ Score calculated based on patient answer
My Health Confidence	▪ Straightforward, unambiguous ▪ Rapid interpretation	▪ Productive communication ▪ Trust ▪ Visit efficiency	▪ Questionnaire[50] ▪ Score calculated based on patient answer

Acknowledgments and Project Team

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The name of the dashboard, "How's My Health," was inspired by and gives a wink to the work of John Wasson, MD, and the resources he created to support the interactions of clinicians and patients (https://howsyourhealth.org). John is a special colleague whose passion for what matters to patients has influenced health care leaders and researchers in the United States and abroad.

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Over the course of this project, we interviewed numerous research experts and other stakeholders whose work is focused on co-production, patient engagement, quality measures and other information needs of patients with diabetes, chronic conditions, health technology, and user adoption. We extend our thanks to them.

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