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Commentary

Consolidated Principles for Equitable and Inclusive Digital Health and Virtual Care Co-Design

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ABSTRACT

Digital health and virtual care (DH/VC) interventions have been rapidly transforming healthcare systems, offering enormous potential to bridge gaps in healthcare access and deliver person-centred interventions to equity-deserving populations. Working in partnership with patients, caregivers and communities to meaningfully integrate lived experience perspectives into DH/VC interventions can help ensure that diverse needs are met. In this commentary, we propose a consolidated set of principles for co-designing equity-informed DH/VC interventions. We also identify how these principles can be leveraged through resources and opportunities of
Excellence Canada and others.

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INTRODUCTION

Digital health and virtual care (DH/VC) interventions have the potential to revolutionize the Canadian healthcare system by offering a more tailo
the diverse and evolving health and social care needs of individuals (Abernethy et al. 2022; Murray et al. 2016). Despite the promise of DH/VC in
protect against the risk that these interventions could perpetuate healthcare disparities for underserved populations (Brewer et al. 2020). Equity
which often experience barriers to accessing culturally safe and equitable care, are frequently left behind in the design and development of DH/'
2021; Shaw et al. 2021). This reduces the chance that such innovations will respond to the needs and preferences of the communities they are me
principles and approaches from the patient-centred care literature may help address these shortcomings (Sayani et al. 2022).

Patient-centred care is an approach to the planning, delivery and evaluation of healthcare that is grounded in mutually beneficial partnerships ar
healthcare providers to make sure that healthcare services meet patients' unique needs (Kitson et al. 2013; Montague et al. 2017). These partners
to patient engagement and patient partnership, where patients, their families and communities are actively involved in the planning, developmer
(Bird et al. 2020; Gallivan et al. 2012).

Co-design approaches and principles

Co-design has emerged in the DH/VC literature as one solution for developing more patient-centred DH/VC interventions, with special attention
with equity-deserving populations (Papoutsi et al. 2021). Co-design can be understood as a collaborative process of co-creating a product or se
intended to benefit from that product or service (Weaver 2018). Co-design supports those receiving care to share their unique expertise, which
by members of the healthcare workforce who assumed that they knew what patients needed and wanted. A broader understanding of co-desig
notion of engagement-capable environments that recognize the value, wisdom and lived experience of patients and care partners (HEC 2023a).
support and are supported by engagement-capable environments can help create and sustain a culture of patient- and family-centred care.

Despite the promise of co-design, many co-design projects and studies do not appear to engage a diverse range of patients and care partners (
omission risks promoting a type of patient-centred care that has a narrow definition of "patient." In 2016, a large systematic review was conduct
and processes used to co-design digital health interventions (Eyles et al. 2016). Most studies included in this review failed to adequately report d
information on their co-design partners. Eyles et al. (2016) concluded that despite the alignment of co-design methodology with minority and In
no study in their review reported co-design principles for engaging equity-deserving groups, leading them to recommend that this be a key area

Since Eyles et al.'s (2016) systematic review, there has been considerable advancement in the development of frameworks and principles that can be used to guide equity-informed DH/VC co-design (Brewer et al. 2020; Chauhan et al. 2021; Kuluski et al. 2019; Noorbergen et al. 2021; Sayani et al. 2021; Tremblay et al. 2020). While this shift is encouraging, recommendations from these frameworks sit across a diverse set of literatures exploring patient engagement, digital equity and technology design. Reviewing, comparing and consolidating the recommendations from across these literatures can help provide a holistic framework for equity-informed co-design for DH/VC interventions. Box 1 presents a vignette of a story where a DH/VC project would benefit from a clear, equity-informed co-design process.

Box 1. A vignette: The need for an equity-informed DH/VC co-design process

After the COVID-19 pandemic, Marta's primary care clinic has been advertising that they plan to offer more virtual care options for patients and their families. Marta is optimistic about virtual care; however, she wants to ensure that the new virtual care options will be accessible to her and her family. She is particularly concerned about her aging parents whom she cares for at home, as well as getting care for her two children when they need it. Her parents only speak Spanish, and she often attends their appointments to translate. This is challenging as she and her spouse manage shift work and the care of their school-aged children. **However, even with a tight budget and scheduling limitations, Marta finds the prospect of virtual care promising as it is expensive to get to the clinic and it can save them time. Marta has a lot of ideas on how this could work for her and her family, but she is not sure how she can share her thoughts. How can she let her care team know about her ideas, concerns, and possible solutions?** **The primary care clinic team is also excited at the new prospect of virtual care for their patients but wants to be sure that they can still deliver high-quality care. They want to work with their technology vendor to see how they can adapt the new virtual care solution to meet the needs of the clinic and their patients. Both the clinic and the vendor are unsure how best to capture the needs of the different patients who visit the clinic and represent a culturally diverse community. They worry about their patients, similar to Marta and her parents, who may have trouble accessing care on the new virtual care platform. Will the technology be able to meet all these different needs? How can they be sure that no one is left behind?**
DH = digital health; VC = virtual care.

AIMS AND OBJECTIVES

This commentary offers consolidated best-practice principles to guide equity-informed DH/VC co-design to partner more effectively with people with lived experience, including those from equity-deserving groups. These consolidated principles can be used by designers, researchers, innovators and people in the health workforce during the planning, development, delivery and evaluation of DH/VC interventions to ensure that DH/VC interventions reflect the needs and preferences of the people they are meant to serve.

Consolidation of principles for equitable and inclusive DH/VC co-design

In this section, we present a set of principles for co-designing equity-informed DH/VC interventions that meaningfully integrate lived-experience perspectives of patients, caregivers and communities, with a particular focus on engaging those from equity-deserving groups. To consolidate these principles, we use two co-design frameworks – one developed by Bird et al. (2021) and the other by Voorheis et al. (2023) – which organize co-design into distinct phases, including pre-design, co-design and post-design (Table 1). These two co-design frameworks are newer contributions to the literature that outline how DH/VC technologies can be co-designed with an emphasis on patient engagement principles.

Table 1. Co-design frameworks: A summary

Author (year)	Title	Co-design process framework components
Bird et al. (2021)	**A generative co-design framework for healthcare innovation: Development and application of an end-user engagement framework**	1. Pre-design • Contextual inquiry (observational fieldwork and informational interviews) • Preparation and training (participant and facilitator selection, preparatory materials and technology tests) 2. Co-design • Framing the issue (lived experiences and what must change) • Generative design (expressed needs, challenges, experiences and future state planning) • Sharing ideas (presentations of generative design work and appreciative inquiry) 3. Post-design • Data analysis (transcription, organizing and coding) • Requirements' translation (action items)
Voorheis et al. (2023)	**Maximizing the value of patient and public involvement in the digital health co-design process: A qualitative descriptive study with design leaders and patient-public partners**	1. Preparation and planning • Recruit diverse co-design partners • Select multiple co-design methods • Reconsider co-design starting points • Create a co-design communication plan 2. Product and implementation design • Product design (co-design the user experiences, behavioural supports and in-person interventions) • Implementation design (co-design how users will perceive a need, seek the solution, reach the solutions and adopt the solution) 3. Adaptation and improvement • Co-design equity-based data collection and evaluation • Co-design how the solution will be tailored • Co-design a sustainability plan

While these co-design frameworks offer a helpful starting point, they do not explicitly capture perspectives from equity-deserving groups with lived experiences (including First Nations, Inuit and Métis people and communities) and do not suggest specific principles for equity-informed patient engagement. Therefore, using these frameworks as a backbone, we overlay principles from published research that discuss equity-informed approaches for healthcare innovation design (Table 2). Specifically, we will use best-practice principles developed by Sayani et al. (2021) and Kuluski et al. (2019) (from the equity-informed patient and caregiver engagement literature), by Chauhan et al. (2021) (from the equity-informed co-design literature), by Brewer et al. (2020) and Noorbergen et al. (2021) (from the equity-informed digital health literature) and, finally, by Tremblay et al. (2020) (from literature on engaging Indigenous patient partners in patient-oriented research). These papers were purposively sampled because they are leading papers in their field, written by authors who have intimate experience with equity-informed DH/VC co-design.

Table 2. Considerations from published articles to support meaningful engagement and partnership to inform equitable and inclusive DH/VC co-design

Author (year)	Title	Considerations to promote equitable DH/VC co-design as shared by the article authors
Sayani et al. (2021)	**Building equitable patient partnerships during the COVID-19 pandemic: Challenges and key considerations for research and policy**	Build inclusive and diverse patient partnerships • Use an equity-oriented approach to engagement • Co-build sustainable safe spaces for engagement • Consider issues of accessibility • Build capacity one relationship at a time • Do no harm

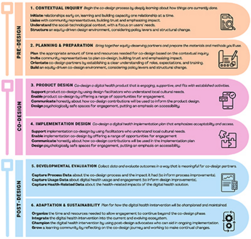
Kuluski et al. (2019)	Twelve principles to support caregiver engagement in health care systems and health research	Policies and structures • Use policy levers, incentives and tools to support engagement • Make structural changes Culture and mindset • Face fears; do not wait for perfection • Use formal approaches to identify and engage partners • Define what quality engagement means • Avoid tokenism by including more than the “usual suspects” • Address language and power issues by creating comfortable spaces to open up Procedures • Engage early during the problem identification stage • Listen and act on what you hear; be honest about actions • Meaningfully measure; do not just survey people and focus on capturing stories • Create a learning community by establishing learning competencies for all stakeholders
Chauhan et al. (2021)	Optimising co-design with ethnic minority consumers	Ensure that diverse, seldom-heard groups are invited • Liaise with community representatives and support groups • Employ peer-led community engagement Meet partner needs and allocate resources • Use multilingual fieldworkers • Arrange financial remuneration • Identify technical, access and support needs • Schedule around cultural and religious practices Enable a diversity of contributions • Co-develop terms of reference • Co-develop workshop design, content and scheduling • Contribute to the evaluation of the co-design process
Brewer et al. (2020)	Back to the future: Achieving health equity through health informatics and digital health	Design and implement digital health for marginalized communities • Increase recruitment and retention of diverse populations throughout the research and development process • Leverage established leaders and trusted social networks to understand communities • Understand the social context of potential users, including social determinants of health and health inequalities • Integrate community engagement into user-centred design practices • Understand community partner technology infrastructure to support capacity building • Plan the appropriate amount of time and recourses for community engagement for intervention development and sustainability
Noorbergen et al. (2021)	Using co-design in mobile health system development: A qualitative study with experts in co-design and mobile health system development	Address the challenges in co-designing digital health systems • Understand participant vulnerabilities and diversity • Plan for assessing health behaviour change • Identify and involve co-design facilitators that have an authentic, empathetic understanding of the context • Plan for immersion into the mobile health ecosystem by identifying key partners and processes • Identify and involve post-design advocates who can aid in implementation, evaluation and championing • Use health-specific evaluation criteria to understand impacts on the health system and end users • Analyze usage data to understand impact
Tremblay et al. (2020)	Engaging Indigenous patient partners in patient-oriented research: Lessons from a one-year initiative	Build meaningful partnerships with Indigenous patient partners • Initiation of a partnership (meet people in their community and build on existing relationships with local organizations and key community members) • Interest development (build trusting relationships and emphasize potential impacts for patients and communities) • Capacity building (establish a clear understanding of the patient partner’s role and provide orientation and support skill development) • Involvement in research (offer diverse opportunities for engagement, be accessible and flexible in all aspects of involvement and value patient involvement in and contributions to the project)

DH = digital health; VC = virtual care.

(This table is also available online here.)

Figure 1 presents and consolidates the best-practice principles from the above works, offering a new contribution to the field as the Principles for Equitable and Inclusive Digital Health Co-Design framework. This novel framework emphasizes equity-informed principles for engaging those with lived experience in each phase of the DH/VC co-design process. By connecting equity-informed principles to the co-design process, this framework offers actionable steps that can be followed, making this a practical and applicable tool for innovators, researchers and designers seeking to do equity-informed co-design work.

Figure 1. The Principles for Equitable and Inclusive Digital Health Co-Design framework



PRE-DESIGN

1. CONTEXTUAL INQUIRY *Begin the co-design process by deeply learning about how things are currently done.*

Initiate relationships early on, learning and building capacity one relationship at a time.
Liaise with community representatives, building trust and emphasizing impact.
Understand the social-technological context, with a focus on users' needs.
Structure an equity-driven design environment, considering policy levers and structural change.

2. PLANNING & PREPARATION *Bring together equity-deserving partners and prepare the materials and methods you'll use.*

Plan the appropriate amount of time and resources needed for co-design based on the contextual inquiry.
Invite community representatives to plan co-design, building trust and emphasizing impact.
Orientate co-design partners by establishing a clear understanding of roles, expectations, and training.
Build an equity-driven co-design environment, considering policy levers and structural change.

CO-DESIGN

3. PRODUCT DESIGN *Co-design a digital health product that is engaging, supportive, and fits with established activities.*

Support product co-design by using design facilitators who understand local cultural needs.
Enable product co-design by offering a range of opportunities for engagement.
Communicate honestly about how co-design contributions will be used to inform the product design.
Design psychologically safe spaces for engagement, putting an emphasis on accessibility.

4. IMPLEMENTATION DESIGN *Co-design a digital health implementation plan that emphasizes acceptability and access.*

Support implementation co-design by using facilitators who understand local cultural needs.
Enable implementation co-design by offering a range of opportunities for engagement
Communicate honestly about how co-design contributions will be used in the implementation plan
Design psychologically safe spaces for engagement, putting an emphasis on accessibility.

POST-DESIGN

5. DEVELOPMENTAL EVALUATION *Collect data and evaluate outcomes in a way that is meaningful for co-design partners.*

Capture Process Data about the co-design process and the impact it had (to inform process improvements).
Capture Usage Data about digital health usage and engagement (to inform design improvements).
Capture Health-Related Data about the health-related impacts of the digital health solution.

6. ADAPTATION & SUSTAINABILITY *Plan for how the digital health intervention will be championed and maintained.*

Organize the time and resources needed to allow engagement to continue beyond the co-design phase.
Integrate the digital health intervention into the current and evolving ecosystem.
Champion the digital health intervention by using post-design advocates who can aid in ongoing implementation.
Grow a learning community by reflecting on the co-design journey and working to make continual changes.

A more detailed version of the figure is available online here.

DISCUSSION

Using Bird et al.'s (2021) and Voorheis et al.'s (2023) co-design process frameworks as a starting point, this commentary demonstrates how best-practice principles related to equity-informed engagement and design can be applied throughout multiple phases of the DH/VC co-design process. Breaking down best-practice principles into different phases of the DH/VC co-design process offers a pragmatic way for designers, researchers, innovators and people in the health workforce to operationalize these concepts alongside patient and caregiver partners.

A noteworthy finding from consolidating best-practice principles for equity-informed DH/VC co-design is that there is an imbalance of principles across the different phases of co-design. For instance, most principles focus on pre-design, offering advice on how to build trusting relationships and prepare for co-design (Brewer et al. 2020; Chauhan et al. 2021; Kuluski et al. 2019; Noorbergen et al. 2021; Sayani et al. 2021; Tremblay et al. 2020). Relatively fewer principles focus on the actual co-design process and post-design needs. This is an important finding because DH/VC design teams may benefit from more equity-informed co-design principles that focus on design, implementation and sustainability. As such, we see this as an important gap that needs to be addressed in future works. Box 2 presents a new vignette of how Marta and her family could be engaged, leveraging the consolidated principles suggested in this commentary.

Box 2. A new vignette: An equity-informed DH/VC co-design process

Marta's clinic team and vendor partner have decided to engage with patients in co-design work before rolling out their new virtual care solution. Given the clinic's diverse patient population, they adopt the Principles for Equitable and Inclusive Digital Health Co-Design framework to guide their approach.

During the pre-design phase, the clinic team and vendor partner begin the co-design process by discussing the project with trusted local community leaders, mapping out the populations they serve and devising a strategy to engage and seek input from individuals in these diverse communities (principle: liaise with local community representatives and leverage trusted networks). During their community consultations, the clinic staff learn that they need to reach out to diverse communities in unique ways. As such, Marta is called on her phone by her church community leader who knows when Marta is typically available and not working (principle: invite seldom-heard participants, leveraging peers who understand the context). During the phone call, Marta learns that the clinic would like to hear her thoughts and opinions about the virtual care platform, and they offer her several different ways to share her views in a psychologically safe way (principle: build psychologically safe spaces and opportunities for engagement). She is also informed of what to expect and that the clinic will offer her childcare, reimbursement for transportation and compensation for her time to participate (principle: orientate participants to what is expected of them and how they will be supported).

During the co-design phase, the clinic staff hires a co-design facilitator with patient experience from within the community (principle: support engagement by using peer-led facilitators). During the co-design sessions, Marta feels heard and understood as the co-design facilitator clarifies how their feedback will be used to tailor the virtual care solution (principle: communicate with patients about how their contributions will make a difference). Marta notices that other patients opted to join the co-design sessions over video or phone and some provided written feedback in letters or e-mails (principle: enable engagement by offering a range of ways to contribute). Experienced designers and scientists work together to integrate the co-design feedback into a user-friendly virtual care platform that will give patients and caregivers a healthcare experience that aligns with their desires (principle: design using user-centred methods).

In the post-design phase, the clinic staff call Marta to give her a chance to offer feedback about how she felt about the co-design process (principle: capture process data about the co-design process). After the virtual care platform runs for six months, they reach back out to Marta to ask how she is finding the new virtual care platform (principle: capture usage data about DH/VC usability). Marta decides that she wants to send her feedback in an e-mail as she has been very busy at work (principle: enable engagement by offering a range of ways for contribution). In her e-mail, she is able to share her thoughts on how they can improve the scheduling system for virtual care that will better meet her shift needs and how they can make it easier for her to help her parents on their virtual visits. A peer leader from the community responds to her e-mail, thanking Marta, and she later sees how the clinic made those new adjustments (principle: champion the improvement of the solution by involving post-design advocates). Marta feels much more comfortable with the new virtual care offering at her clinic, and the clinicians have been hearing from patients that they are receiving care in the way that suits them. The clinic plans to use a similar co-design process to develop future innovations (principle: grow by reflecting on key learnings and use these learnings moving forward)

DH = digital health; VC = virtual care.

Overall, the consolidation of best-practice principles for equitable and inclusive DH/VC co-design presented in this paper offers a way for the DH/VC field to ensure that future design practices will adequately account for the needs of equity-deserving groups.

Healthcare Excellence Canada resources and educational opportunities

In addition to the principles discussed above, resources and educational opportunities from Healthcare Excellence Canada (HEC) can help DH/VC design teams understand, co-create and adopt best practices to ensure that solutions capture issues that matter most for those with lived experience, including equity-deserving people and communities. Launched in 2021, HEC brings together the Canadian Patient Safety Institute and the Canadian Foundation for Healthcare Improvement. HEC is an independent, not-for-profit charity funded primarily by Health Canada. Through collaboration and meaningful partnerships with people across the country, HEC finds and spreads innovations, builds capabilities and catalyzes policy change to help shape a future where everyone in Canada has safe and high-quality healthcare.

Listed below are several relevant HEC resources for equity-informed DH/VC co-design:

- *How to Successfully Engage Patients and Families: 10 Lessons Learned from Patient and Family Advisors* is a resource that outlines 10 insights about what worked to help patient and family advisors co-design solutions with quality improvement teams (HEC 2023c).
- *Engagement-Capable Environments* is a tool that outlines characteristics of healthcare organizations that support the purposeful engagement of people with lived experience with healthcare teams and leaders to make healthcare improvements (HEC 2023a). The tool contains a self-assessment that can guide healthcare organizations to support purposeful and meaningful engagement at an organizational level.
- *Report of the Diversity in Patient Engagement Learning Exchange Event* profiles strategies that six organizations used to engage and partner with diverse patient perspectives to drive healthcare improvement efforts (HEC 2023d).

- *Clinician Change Virtual Care Toolkit* (HEC) and Canada Health Infoway 2022) is a tool created based on learnings from the Virtual Care Together program (HEC 2023e). The toolkit includes considerations and example questions to guide partnerships with patients to co-design virtual care solutions.
- *Equity, Diversity and Inclusion Virtual Learning Exchange* provides access to seven webinars aimed at building capacity to be equitable and inclusive in healthcare improvement efforts (HEC 2023b). The recordings emphasize engaging with a broad diversity of people with lived experience of the health system and how to identify and apply approaches for including those who have traditionally been excluded from patient engagement because of systemic barriers.
- *Developing Relationships on a Shared Path to Reconciliation: The Core of Health Transformation and Safe Care for Indigenous People* shares guidance to foster respectful relationships with First Nations, Inuit and/or Métis partners to foster open dialogue, collaboration and system transformation by centring Indigenous voices and worldviews (Maar et al. 2022). A related resource includes *A Journey We Walk Together: Strengthening Indigenous Cultural Competency in Health Organizations*, a primer for health organizations to build and enhance Indigenous cultural competency (HEC 2020).

Additional resources that might be relevant to DH/VC design teams are listed as follows:

- *Patient-Oriented Research Curriculum in Child Health* is a series of free online modules to help build understanding and skill to lead patient-oriented research in child health, including foundations for patient engagement (PORCCH n.d.).
- *Patient-Oriented Research Training and Learning – Primary Health Care* provides information on how to register for a series of four free online modules to build skills to conduct patient-oriented primary healthcare research (Terry n.d.).
- *Learning Together: The Use of Simulation to Enhance and Enable Authentic and Meaningful Research Partnerships* is a simulation-based educational program designed to support patients, families and all members of the research community to authentically and meaningfully partner with one another in the research process. It also includes guidance on how to find and partner with family partners to establish research objectives, review results and translate knowledge from research (Parker et al. 2022).

CONCLUSION

In conclusion, consider the following to co-design equity-informed DH/VC interventions with patients, caregivers and communities:

- Use equity-based co-design principles throughout the entire DH/VC development process, including during pre-design, co-design and post-design.
- DH/VC pre-design work helps participants (i.e., patients, caregivers and communities – as well as researchers, innovators, designers – and people in the health workforce) prepare for co-design. This preparation will support in building trust, providing orientation materials and offering a variety of ways for participants to give input, ask questions and meaningfully collaborate.
- Employ strategies to ensure diversity in the voices of people with lived experience and the communities that the DH/VC intervention is meant to serve. Through co-design work, aim to ensure that the DH/VC product and implementation reflects what matters most to the people who stand to benefit.
- Continue to engage with patients, caregivers, communities and people in the healthcare workforce after the DH/VC solution is implemented, which will help ensure that the intervention is meaningfully evaluated, adapted and sustained.

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