

# Digital Drivers in a Learning Health System: Considerations for Research Innovation



COMMENTARY

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## ABSTRACT

*Research innovation has the potential to speed progress towards seamless services, empowered patients, and safer care, including by guiding and bolstering new directions in digital health. Coordinated approaches to gain consensus on strategic directions and priorities would help to maximize the value of research innovation investments and minimize the risk of overlaps and gaps. Deep and active stakeholder engagement can facilitate co-creation and accelerate use of digital health to improve care, not just at the time of initial implementation but also on an ongoing basis. Likewise, we need research and innovation related to complementary policy, practice, and other enablers of progress, not only the technology itself. There are also opportunities to adapt the research enterprise so as to more effectively generate and apply knowledge related to fast-paced and complex interventions.*

Ensuring that Canada's health system works effectively for every Canadian and is sustainable for future generations means persistently improving the patient experience, stepping up access to care, raising quality, driving out inefficiencies and waste and focusing on

social determinants of health. This may mean abandoning some status quo positions and making difficult choices. Continual innovation is needed. Progress depends on nurturing conditions for change, then scaling and spreading promising approaches.

There is no single silver bullet solution, but the most promising ideas have the potential to simultaneously rein in costs while improving access, quality and patient experience. In the lead article of this issue of *Healthcare Papers*, Tamblyn et al. (2016) suggest that key elements required for health system transformation include “financing and funding approaches that will either drive or create barriers to innovation, the creation of

a new breed of scientists that can collaborate with health system stakeholders and the co-creation and use of eHealth technologies that can improve the quality and efficiency of care.”

This article focuses on the latter. It explores four key considerations that influence how and how well we can foster and leverage research innovation to enable progress toward better health and healthcare using digital solutions.

### **Digital Health: Where We Are Today**

Hospitals were among the first organizations in Canada to implement internal health information systems, although only a minority initially included electronic patient records (Jha et al. 2008). Physician offices began to automate in the 1990s – in most cases, initially to support electronic billing and administrative functions, with some also using electronic medical records instead of paper charts. Meeting administrative and operational needs at the point of care was also one of the drivers for the early introduction of health information technology into pharmacies.

In 2001, Canada’s First Ministers recognized the need to invest in electronic health record systems to drive clinical value and leverage the power of information to improve health and healthcare. The intent was not to develop a single massive structure but rather to connect a “network of networks,” building on a number of initiatives that were already in place or under development.

Since then, use of digital health has grown tremendously. Digitization of lab test results, medications and other core elements of the shared electronic health record was 91% complete as of 2015 (Canada Health Infoway 2015). Likewise, three in four family physicians now use electronic medical records, a rate that has tripled since 2006 (Osborn et al. 2015), and use of telehealth for clinician–patient consultations has grown by more than 180% since 2010. International comparative studies show that Canada leads globally in use of telehealth and electronic sharing of information, such as diagnostic imaging. However, in spite of recent growth, we are not at the top of international league tables in the use of point-of-care solutions in primary care or patient online solutions (OECD 2015).

Independent studies estimate that investments in digital imaging, drug information systems, telehealth and electronic medical records have led to access, productivity and quality benefits valued at \$13 billion since 2007 (Canada Health Infoway 2015). These types of results led provincial/territorial ministers of health to declare electronic health records to be “one of the most transformational innovations in healthcare in a generation” (Canadian Intergovernmental Conference Secretariat 2014).

While much has been accomplished, adoption gaps remain at some points of care, there is uneven connectedness to shared information and the maturity of solutions and their use varies across the country. Much more remains to be done to fully harness the potential. Progress has been – and will be – woven by cultural, political, structural and policy stepping stones, as much as by new technologies themselves. Research innovation has the potential to be most effective when it is embedded in and responsive to this complex environment.

### **Coordinated Approach to Identify and Address New and Important Questions**

In their article, Tamblyn et al. (2016) suggest that for health services and policy research to drive system transformation, “we will need to create alignment and synergy among health services research funders, researchers and end-users.” This is definitely the case for digital health. Alignment among the types of organizations captured in the lead article’s scan of research funders is clearly important, just as the Advisory Panel on Healthcare Innovation (2015) called for a “whole-of-government” approach to accelerate value from innovation.

In addition, there are wider opportunities to seek and promote alignment, including engaging patient/citizen and clinical organizations, healthcare providers, non-governmental organizations, private sector companies and industry associations, economic development agencies and more. Many of these stakeholders are also making significant investments in digital health research, development and innovation. For example, more than two in five of Canada’s domestic health information communications and technology companies predict that their research and development investments will increase over the next three years, while a further 35% expect no change and 21% are unsure (Information and Communications Technology Council 2015).

While this environment is complex, experience shows that consensus on strategic directions and priorities can be achieved. For example, a process of engaging stakeholders around key benefits and evaluation priorities for digital health, with the guidance of an advisory panel, led to the creation of a Benefits Evaluation Framework (Lau et al. 2007) and supporting indicator sets. These resources, and subsequent updates and extensions, have guided evaluation of many digital health investments in Canada since 2006, enabling easier synthesis of findings and collective learning.

### **Listen, Learn and Adapt: Co-Creation and Use of Digital Technologies to Improve Care**

Deep and active engagement is also needed within specific digital health initiatives. Highly usable, readily adoptable solutions that integrate well with workflow are more likely with strong co-design and iterative approaches (Pan-Canadian Change Management Network 2013). This principle is applicable whether end-users are clinicians or patients/citizens. For instance, the primacy of the public interest and strong user engagement was built into Nova Scotia’s trial of personal health records and patient online services. Adoption was strong and participants report that the digital solutions empowered them to play a more active role in managing their own health (Stylus Consulting 2014).

Thus, research and innovation efforts must address how best to engage end-users in system design and deployment, how to optimize the use of digital solutions in different contexts and how to scale and spread those that are most promising. There are rich opportunities to leverage and learn from natural experiments based on experiences from across the country and around the world.

These opportunities also extend well beyond initial development and implementation. A number of studies from Canada and elsewhere have documented rising benefits as use of digital health matures (e.g., Leung et al. 2013; PwC 2013). This may occur for a variety of reasons, including clinicians gaining experience with the use of the solutions, changing workflows or new applications of existing solutions/new analytics on existing data that add further value. As a result, there is also strong utility in research and innovation that identifies potential additional sources of value or how to shorten the time and effort to achieve greater value.

### **Research Innovation and Enablers of Change Beyond Technology**

The uptake and use of digital health solutions mirrors the progress of other large-scale changes in the health system. To harness the transformative potential as vigorously in practice as in theory, a solid understanding of facilitators and barriers to progress is required. For example, new clinical workflows, processes and practices may be needed; healthcare providers and their clients/patients may interact in new ways; policy and regulatory changes may be required; and cultural shifts may prompt improved results. This, too, is an area where innovative research can deliver value.

Tamblyn et al. (2016) note that Canada's main research funders have not invested large sums in research on change management and scaling up innovation in recent years, but others have addressed this area. As a result, key dimensions important for transformation – governance and leadership, communications, training and education, workflow analysis and integration, stakeholder engagement and monitoring and evaluation – are well documented (Pan-Canadian Change Management Network 2013). Nevertheless, further research and innovative approaches to these and other broader enablers of change promise to complement a focus on the technologies themselves.

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### **From Research Innovation to Innovating and Adapting the Research Enterprise**

Just as digital health is transforming the health sector, so too is it creating new possibilities for research and innovation. Perhaps the most obvious way that this is occurring is in the growing range of data available. In a digital

world, there is more data than ever before, from streams of data generated by continuous monitoring and wearable technology to possibilities for population-wide disease surveillance from analysis of social data.

This offers rich potential for research innovation that improves health and health-care, but innovation will be required to harness the possibilities in a timely, privacy-sensitive way. Currently, access to health-related data, their use and the capacity to generate and apply knowledge from them is uneven across Canada and around the world (Expert Panel on Timely Access to Health and Social Data for Health Research and Health System Innovation 2015). Addressing current gaps and issues offers opportunities to accelerate progress.

In addition, the opportunities that digital health offers go beyond knowledge generation. For instance, the potential for narrowing the gap between what we know and what we do is significant. There is growing evidence that clinical decision support can improve outcomes, but there is still much to learn about its effective design and deployment (Bright et al. 2012). Likewise, with smarter electronic systems, studies show that primary care clinics can identify patients who may benefit from proactive outreach for preventive or follow-up care, such as screening for diabetes complications or cancer, 30 times faster than clinics with paper records (Leaver et al. 2013).

In order to fully realize these types of transformative opportunities, the research enterprise will also need to adapt. As Tamblyn et al. (2016) point out, new methods for rapid scientific investigation that use point-of-care patient experience, digital health and social data are needed. For example, Lau et al. (2013) argue that electronic medical records should be evaluated as complex interventions. Likewise,

the challenges of navigating ideas through testing to widespread adoption and diffusion have been well documented (Advisory Panel on Healthcare Innovation 2015; Ontario Health Innovation Council 2014). Other examples include:

- Adapting research funding mechanisms to better support rapid innovation cycles, the need for broad engagement, opportunities for embedding knowledge into practice and the possibility of quickly scaling successful innovations;
- Exploring new approaches to research publication and knowledge synthesis that better respond to the importance of sharing and incorporating the latest evidence in rapidly developing fields; and
- Capacity building, not just within the research enterprise but also among end-users, policymakers, research ethics boards, research and innovation funders, technology developers and others who play important roles in the process.

*“Research innovation has the potential to guide and bolster bold new directions ...”*

### Conclusion

Modern healthcare relies on teams, from the patient and family to an increasingly complex mix of healthcare providers. Effective communication among these teams is essential, but in a ‘system’ that has historically operated in silos, information sharing, even among the immediate circle of care, isn’t assured (Osborn et al. 2015).

Seamless services, empowered patients and smarter care are among the potential benefits that effective use of digital health

can deliver, accelerating the transformation of healthcare. Research innovation has the potential to guide and bolster bold new directions with a focus on patients, access to care, quality and value for money. Opportunities to accelerate progress include:

- Coordinated approaches to gain consensus on strategic directions and priorities so as to maximize the value of investments in research innovation and minimize the risk of overlaps and gaps;
- Deep and active stakeholder engagement to facilitate co-creation and use of digital health to improve care, not just at the time of initial implementation but also on an ongoing basis to identify potential additional sources of value or how to shorten the time and effort required to achieve greater value;
- A focus on research and innovation related to complementary policy, practice and other enablers of progress, not just the technology per se; and
- Adapting the research enterprise – including, but not limited to, capacity building, funding, methods, knowledge exchange and approaches to scale and spread of innovation – in order to effectively generate and apply knowledge related to dynamic, fast-paced and complex interventions with the potential to enable health system transformation.

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