

Leadership Guidance on
Critical Success Factors for a Digital Consumer Health Strategy

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Dedication

This project is dedicated to my children Spencer, Sydney, and Samantha for whom I work so hard to help improve the sustainability of the health care system and to my life partner, Cathy, without whose positivity and support, none of this would have been achievable. You are all so awesome!

Key Messages

This paper argues for a truly consumer-oriented health system. It outlines the importance of achieving meaningful and sustained engagement for all stages of life and all health states.

The proposed digital consumer health strategy approach holds the promise of addressing the Quadruple Aim (Bodenheimer & Sinsky, 2014). If properly designed, improvements in client experience, cost, and health outcomes are achievable. Optimizing clinician readiness is the critical fourth Aim.

The implications are far-reaching: policy gaps, procurement strategies, funding models and issues concerned with medico-legal liability and perceived loss of clinician control must be carefully considered to create the right conditions to support optimal outcomes.

The guidance recommends a digital consumer health strategy approach designed to

1. maintain and enhance the trust paradigm between client and provider,
2. address the four client archetypes and their dynamic nature,
3. focus on change management,
4. use a Collective Impact approach,
5. build community digital capacity for sustainability,
6. employ outcomes-based procurement strategies for vendor risk-sharing, and
7. be grounded in rigorous, multi-dimensional evaluation.

Executive Summary

The logic model - or theory of change - on which this paper is predicated, surmises that enabling client/provider access to the right information, at the right time, can influence their decision-making, facilitate behaviour change and improve health outcomes. This framework has been borne out in the literature and the project's experience.

The guidance recommends addressing the dynamic nature of the four identified client archetypes, using a relationship-based design approach, applied with a “social determinants of health” perspective. For ongoing sustainment, a community-based train-the-trainer strategy, based on a Collective Impact approach, is recommended. This long-term, stakeholder-based method to systemic change is considered to be one of the most effective methodologies for maintaining client, community and provider sense of ownership.

A risk-sharing approach with vendors, based on procurement strategies focused on measurable outputs and outcomes, will incent optimal value realization. The methodology described represents a multi-faceted approach to optimizing the impact of a consumer health strategy. Critical success factors include:

1. Maintaining/enhancing the relational trust paradigm between client and provider(s).
 - Seeking a solution based on a client relationship management (CRM) design foundation that can document non-clinical, empathic and social interactions for relationship continuity (HIMSS & Personal Connected Health Alliance, 2017).
 - Incorporating health coaching into the health service delivery model to foster on-going engagement as client interest shifts.

2. Design considerations that address the four client archetypes and the dynamic nature of clients that move through the various archetypes and the related motivations.
3. Focusing on change management and sustainability.
 - Addressing the clinician-client power differential and equalization potential of a consumer health strategy.
 - Measuring provider and client perspectives through a robust evaluation framework based on the Quadruple Aim.
4. Using a Collective Impact approach to enhance long-term adoption.
 - Fostering partnerships with funders, community groups, vendors, researchers and multi-sectoral stakeholders such as educational institutions and municipalities.
5. Incorporating longer-term strategies for community-based digital capacity building.
 - Enabling sustainable, community-based, peer-to-peer training.
 - Supporting person- and family-centred enablement.
6. Using outcomes-based procurement strategies.
 - Risk-sharing with the solution provider that incents the vendor to achieve key process/output/outcome clinical and administrative measures.
 - Incorporating a robust evaluation framework to assess the extent to which the dimensions of the Quadruple Aim have been addressed by the initiative.

The leadership considerations herein are reinforced by the LEADS in a Caring Environment Framework by addressing the dimensions of Engage Others, Achieve Results,

Develop Coalitions and Systems Transformation (LEADS Canada & Canadian College of Health Leaders, 2017). Leaders planning a digital consumer health strategy improve the potential to achieve their objectives by incorporating these considerations.

Context

This Fellowship project entails the development of a digital consumer health strategy for the members of the Association of Ontario Health Centres (AOHC). The project was based on the Ontario health care system and is aligned with the province's Patients First: Action Plan for Health Care priority. In response, it has been proposed that primary health care must become the foundation of the health system (Young & Nesbitt, 2017) and that the service delivery approach must be optimally client- and community-centred. The findings are presented in a manner that promotes applicability for a consumer health strategy in any jurisdiction or health service sector.

The project demonstrated that applying specific technology strategies, that engage people proactively and meaningfully in their health management, can fundamentally transform the health system experience, and significantly improve outcomes.

Organizational Background

The AOHC represents 100+ comprehensive primary health care organizations which include Community Health Centres (CHCs), Aboriginal Health Access Centres (AHACs), Nurse Practitioner-Led Clinics (NPLCs) and Community-governed Family Health Teams (CFHTs). All members have adopted a common Model of Health and Wellbeing (MHWB) and Health Equity Charter (Association of Ontario Health Centres, 2015).

The primary service focus of AOHC members is on the 22% of Ontario's population who face barriers to equitable health (Patychuk, 2012). Jurisdictions such as Sweden are leveraging

consumer health solutions to specifically reduce/remove barriers to good health and have begun to measure outcomes using a health equity lens (Hellberg & Johansson, 2016). This requires the ability to capture ‘know me’ information such as insights related to the influences of a client’s social determinants of health. Gathering a more holistic picture of the client can contribute to better care (Canada Health Infoway, 2016). According to the World Health Organization, the social determinants of health identify the characteristics that people are born, grow, live, work and age in. Such determinants of health outcomes information generated over a person’s lifetime indicate that 60% of data is exogenous determinants of health factors, 30% is genetic determinants and only 10% of data is medical determinants (McGover, Miller, & Hughes-Cromwick, 2014). Given the relative volume of data on the social influences of health, there is a clear need for consumer health solutions to help address non-medical determinants of health and encourage disease prevention and health promotion (McGinnis, Williams-Russo, & Knickman, 2002). This can be achieved by employing health coaching as part of the service delivery model.

Ontario’s CHCs have realized strong outcomes given the complexity of clients served, and how a focus on prevention and well-being results in better health outcomes; which according to ICES, includes a 20% lower than expected ER use (Glazier, Hutchinson, & Kopp, 2015).

These health service providers (HSPs) address a client’s overall health and well-being which involves an approach to primary care that includes addressing a client’s determinants of health factors. The influence of social isolation on health is well documented (Marmot, 2005). This research has shown that social isolation can be more influential on health than poverty.

The term “client” is used to describe any person that engages as a meaningful member of their healthcare team. “Person”, “citizen”, “consumer”, “patient” are roughly equivalent terms for the purposes of this paper. The primary differentiator is that the personal power balance

between a client and provider is considered to be more equitable than traditionally associated with a provider-patient relationship; which can historically be described as more one-way – from the provider – and passive – on the part of the patient.

The term “provider(s)” describes health service professionals in the individual, team-based and organizational contexts. In Ontario, members of the AOHC employ all clinical staff. There is no fee-for-service billing which allows for more time to be spent with complex clients.

The project was closely aligned with Ontario’s Patients First: Action Plan for Health Care (Ontario Ministry of Health and Long-Term Care, 2016) the member-approved Strategic Plan (Association of Ontario Health Centres, 2015) and its supporting Information Management Strategy including a consumer health priority (Association of Ontario Health Centres, 2015).

“The blockbuster drug of the century – [is] an engaged patient” (Kish, 2012). Today’s health system, however, minimally addresses this even though the Wagner Model for Chronic Disease Management argued two decades ago, that an informed and activated patient, who was meaningfully involved in self-management, significantly improved their health outcomes (Wagner, 1998). Although meaningful client activation and a prepared care team underpin this model, Wagner’s approach preserved the provider-centric paradigm (The MacColl Institute, 2017). The required policy, accountability, and funding frameworks were not in place to sustain the approach.

A comprehensive policy framework to support digital communities is critical and requires municipalities and community-based organizations to partner with HSPs to build capacity. As reported in the UK, approximately 6B £ of savings in 12 months were attributable to cost-avoidance by community digital capacity building (The Good Things Foundation, 2016).

Technological innovation has been well associated with the practice of healthcare delivery (The Medical Futurist, 2018). At its core, healthcare is based on a strong trust relationship between a provider and a person in need of such services. The focus of technological investment should focus on enhancing interactions between providers and the clients they serve (The Medical Futurist, 2018).

The focus of technology investment has traditionally been lopsided on the provider side of the business proposition (Canadian Patient Safety Institute, 2017). This has often served to further widen the knowledge/power imbalance between providers and patients. Recent research and technology developments are demonstrating that effectively enabling the consumer can prevent avoidable care costs as well as improve health service efficiency and effectiveness (TELUS Health, 2016). Enabling technology enhances client activation and self-management by influencing decision-making that promotes positive behaviour changes resulting in measurable improvements in outcomes (Ball, 2010).

The Consumer Health-‘e’ Strategy contemplates the application of technologies that span the continuum of personal experience. A critical success factor of any consumer health solution is effective relationships between providers and clients. ‘Digital humanism’, a term coined by Gartner in 2014, acknowledged the need to prevent the loss of relational elements as a result of technology use. A primary objective must be to enhance meaningful relationships and interactions between providers and clients (Aczel-Boivie, 2014).

This is poignantly articulated by Dr. Adrienne Boissy, Chief Experience Officer at the Cleveland Clinic (Boissy & Gilligan, Communication the Cleveland Clinic Way: How To Drive a Relationship-Centred Strategy for Superior Patient Experience, 2016). She stresses the need to

design consumer health solutions for empathic and social needs (Boissy, Patient Engagement: What's Technology Got To Do With It?, 2017).

By focusing on enhancing client-provider relationships first and technology second, a digital consumer health strategy can produce significantly improved outcomes when evaluated through the Institute of Healthcare Improvement's Triple Aim (Berwick, Nolan, & Whittington, 2008). In fact, a critical success factor for leadership consideration is incorporated into the latest variant of this approach – the Quadruple Aim – which takes into account the impact such changes have on providers (Manchanda, 2014). Clinicians must work differently with clients and in ways that are sometimes described as a loss of control; especially if personal health information (PHI) is made available to the client without being reviewed first by the provider. If not managed effectively, this creates the potential for panic calls from clients and providers who may not be ready to respond.

A Collective Impact approach can enable sustainable change in the cost, effectiveness, value, and satisfaction realized with modern day health services by both clients and providers (Tamarack Institute, 2017). Such an approach can mitigate the high potential risk of technology failure and sub-optimal value realization (Or, Tao, & Wang, 2017).

Based on the growing trends of consumerism, social media, consumer health knowledge and technology access, the opportunity exists to fundamentally improve the sustainability of the health system. A growing body of research is confirming this impact. By focusing technology investments on the enhancement of the trust relationship between consumers, their informal caregivers and the providers that make up the person's circle of care (Information Privacy Commissioner of Ontario, 2015), improvements in cost, outcomes and satisfaction can be

realized and measured (Warnar & McConnachie, Myhealthlinked: Project Review and Benefits Evaluation Final Report, 2016).

As a result of the literature review, requirements gathering and the experience of multiple pilot projects, a formalized digital consumer health strategy was developed. It became apparent that specific technologies that engage people proactively and meaningfully in their health management can fundamentally transform the healthcare system experience and improve outcomes. Critical success factors for leadership consideration are identified.

Approach / Methodology

The project confirmed both internal and external stakeholder alignment. Canada Health Infoway, Ontario's Patient's First Action plan and associated Digital Health Strategy informed a five-year strategic plan that included a supporting Information Management Strategy (IMS). IMSv2 includes a Consumer Health-'e' Strategy priority that received over 90% endorsement by the Executive Director Network; a group of 84 executive leaders.

Multiple case studies were analyzed to highlight critical success factors required for an effective digital consumer health strategy. Three commercial consumer health solutions were pilot tested and lessons learned generated. An international literature review was completed.

The project involved urban, rural, and indigenous settings within AOHC members. One pilot was a tethered personal health record (PHR) and two were stand-alone consumer health solutions that required electronic medical record (EMR) integration. A fourth solution demonstrated EMR integration using the approved Ontario interoperability standard known as Fast Healthcare Interoperability Resources (FHIR). This standard was approved in 2017 by the eHealth Ontario Business and Technical Committee on which the author and the vendor

community participates. Such interoperability address the inherent limitations of tethered PHRs that typically rely on source data coming only from the provider's EMR.

A project funded by the Erie St. Clair Local Health Integration Network (ESC LHIN) based on a client-centred health and wellness collaboration platform, that included Chatham-Kent Community Health Centre (C-KCHC), further informed strategy alignment with LHIN and ministry priorities. This case study helped identify additional critical success factors for meaningful client engagement and activation as well as the proposed evaluation framework.

A Consumer Health Solution Request for Information (RFI) was issued to gain insights into the “art of the possible”. The RFI helped identify the current commercial capabilities and gaps that exist in the market. The responses were summarized into four categories of consumer health solutions. These were then presented back to the Executive Leadership Network for confirmation of strategic direction.

Involvement with the first MaRS Discovery District Innovation Co-Design Competition further refined and prioritized the requirements that informed the Consumer Health-‘e’ Strategy (MaRS Discovery District Co-Design Competition, 2016). The MaRS initiative assisted with developing an innovative procurement approach that engaged the vendors in risk-sharing and emphasized procuring for outcomes rather than merely products (Wise, 2017).

The proposed capabilities and design features were reviewed and validated by internal leadership forums as well as two external leadership conferences using live polling feedback (Burns, Technological Innovation in Health Care Delivery Panel: Consumer Health-'e' Strategy, 2017) (Burns, The Future of Digital Health in Ontario, 2017).

Lastly, engagement with Canada Health Infoway (CHI) resulted in the development of a funding proposal for a consumer health solution. The proposal demonstrated strong alignment to CHI's Person-Centred Care and Access to Health Services priorities.

The project's insights have informed the digital Consumer Health-'e' Strategy. The strategy is substantially more about measuring the impact on the nature of meaningful relationships between clients and providers, change management strategies and, ultimately, on improvement in the goals of the Quadruple Aim.

Leadership Considerations – Critical Success Factors (CSFs)

Project findings, and the literature review, identified critical success factors for an effective consumer health strategy. The Client Archetypes and the Consumer Health Hierarchy of Needs models were developed by the author to optimize client adoption and activation.

Client Archetypes

Most consumer health solutions have been designed for a static client profile and usually with a 'one size fits all' approach (Greenspun, Thomas, Scott, & Betts, 2015). Solutions must, however, be able to address a broad spectrum of client health and motivational states. The project identified that the following client archetypes comprise the majority of profiles to be addressed by such solutions. Assessment of health and motivation must be considered from both the client and provider perspectives to promote effective collaboration. The intent is to use a consumer health solution to engage clients that can address their health status and motivation.

Table 1. Client Archetypes – Considerations for Consumer Health Solutions

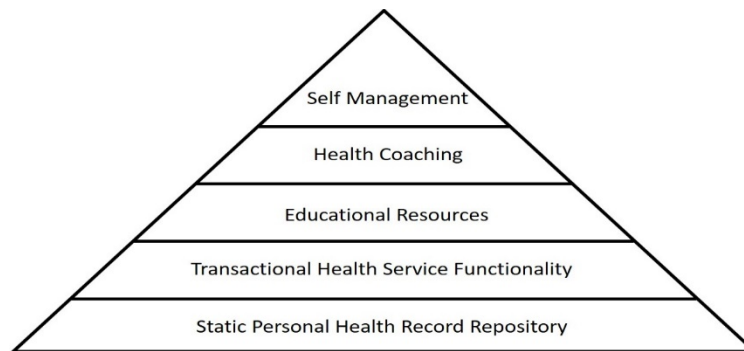
Client Motivation Status	Client Health Status	
	Healthy	Unhealthy
Motivated	Healthy/Motivated	Unhealthy/Motivated
Unmotivated	Healthy/Unmotivated	Unhealthy/Unmotivated

Dynamic Archetype Status

Digital consumer health solutions must be able to address client shifts from one archetype to another. Ideally, clients will move from being unmotivated to being motivated and from an unhealthy to a healthy state as depicted in Table 1. In reality, clients actively move through these archetypes and back again at any time. This is why the ‘one size fits all’ paradigm cannot optimize utilization for all archetypes. Solutions that are designed to address the dynamic nature of health status and motivation will be the most effective at achieving the best health outcomes in the long-term. Digital consumer health solutions must be a supplement to – and not a replacement for - face-to-face interactions; the basis of the provider-client trust relationship. Further elaboration of these concepts can be found in Appendix 1.

Adaptation of Maslow’s Hierarchy of Needs

As described in Maslow’s Hierarchy of Needs, people seek to meet basic needs first and then move to higher order needs (Maslow, 1943). In digital consumer health terms, this can translate into design considerations that address the broad domains outlined below.

Figure 1: Consumer Health Hierarchy of Needs

- Self-Management – includes easy to interpret analytics (e.g. green status = good) and promotes knowledge, confidence, and independence. This domain includes integration with social media platforms that promote social network supports.
- Health Coaching – expert, unbiased risky behaviour-reducing advisor for promoting self-management capabilities. This role enhances the social aspects of the platform and assists with health system navigation and responds to basic questions. Such interactions are seamlessly documented in the EMR.
- Educational Resources – pre-validated condition-specific educational content that can be monitored for review by clients and seamlessly documented in the provider’s EMR.
- Transactional Health Service Functionality – provides capabilities such as secure communications, appointment self-scheduling, medication refill requests, self-check-in, wait-time status, on-demand education, etc.
- Personal Health Record Repository – collects, organizes and displays PHR data that is specific to the reviewer’s needs through context filtering or date range.

The lower levels of Figure 1 represent the basic information and transactional aspects of healthcare services. The upper levels represent digitally-enabled social constructs that are

considered vital to an effective consumer health strategy. These hold the greatest potential for influencing client behaviour change, sustained engagement and, ultimately, health improvement.

Customer relationship management (CRM) platforms are designed to address relational needs. CRM solutions have been well-proven in the marketing and sales sectors in solutions such as SalesForce.com. Such design considerations are now showing up in some consumer health solutions (Arnold, 2017). This approach creates knowledge continuity and fosters confidence in the relationship between the client and provider(s). From an evaluation framework perspective, the goal is to influence decision-making by the individual being supported that translates into behaviour change measurable by improved health outcomes.

Methodology for Adoption

The approach is designed to activate clients, reduce costs, optimize adoption and shift some of the risks through procurement based on measurable outcomes. More vendors are willing and able to enter into contracts that are constructed around paying for outcomes instead of products. This has been one of the priority mandates of the Office of the Chief Health Innovation Strategist (Office of the Chief Health Innovation Strategist, 2017). A well-designed contract that articulates readily measured outcomes can shift some of the risks of a consumer health solution away from the HSP and onto the vendor.

A consumer health solution must be effectively planned with clinical teams as it will directly impact their workflow (Archer, Gagnon, Payne-Gagnon, Shen, & Wiljer, 2015). Strong leadership direction, a commitment by clinicians to adjust their workflow and use the solution effectively with their clients, as well as the necessary training and support, must be well-established. Once a consumer health solution is made available, it will not be easy to take it away

from clients. Managing expectations is critical as disillusioned or unengaged staff and clients can have significant implications for HSPs including staff turnover, client frustration and even loss of clients. In the US, a one-star quality rating improvement by patients can increase revenues by 5-9% (Reputation.com Inc., 2017); in Ontario's context – improving access.

Engaging clients and the community, early and often, are important first steps with consumer health as is the need to develop community-based digital capacity building (Shaw, Wong, Griffin, Robertson, & Bhatia, 2017). By partnering with community groups, the opportunity to learn how to use the consumer health solution can be done cost-effectively as demonstrated in the United Kingdom's National Health Service (NHS). A formal communication strategy is vital to reaching the public and client population to inform and manage expectations during start-up. Leaders must ensure clinicians are ready for clients to use the consumer health solution before any client-targeted advertising is launched.

Vendors are in a good position to achieve optimal adoption and gather utilization metrics. It is recommended that a motivated population be the initial target group for early implementation. Chronic disease cohorts have well-established clinical outcomes and are more likely to use a consumer health solution. Populations with diabetes, congestive heart failure, chronic obstructive pulmonary disease and non-acute mental health illness are responsive to using digital consumer health solutions (Picton, Urowitz, Wiljer, & Cafazzo, 2016).

Supporting materials need to be available in easy to understand terms and in languages of choice for clients; especially given Canada's population diversity. Self-service for password resets, online tutorials and access to help desk technicians 24/7 are critical support aspects for any consumer health solution to support meaningful client engagement (Longwoods, 2016). Vendors often have mature support desk services established so HSPs can focus on their core

business. Clients are likely, however, to use such support services outside of regular business hours. As health is a 24/7 proposition, support for a consumer health solution must also be available 24/7. Managing client expectation about provider access during off-hours is critical.

User-Friendly Analytics

As PHR and EMR data holdings grow, it becomes challenging to interpret the data mass effectively. Presenting large datasets in visual ways can facilitate trend analysis and decision-making. The value and need for such consumer health capabilities were confirmed through the project by client focus groups, clinical staff, and leaders. The intention is to use analytical tools to provide insights which influence decision-making that leads to behaviour change and ultimately improved health outcomes. For the busy provider, trying to sift through more than what they need may result in missed insights or resistance to adoption. Ability to filter and sort the data for a particular perspective is a powerful function. The solution should be flexible enough to display only the information that is relevant to the specific viewer.

Client perspective. User-friendly analytics can assist with basic interpretation. Using colour coding or pattern overlays for numeric results, (e.g. green=good, yellow=caution, red=requires follow-up) can assist with decision-making. A key adoption consideration is to manage expectations with clients about such analytics. HSPs should begin with establishing client consent to use the solution. This is the opportunity to manage expectations and potential reactions to what is accessible. Clients need to understand that they can always contact their provider(s) if they see something they do not understand or are concerned about. The common practice today is that significant abnormal diagnostic results usually prompt a call to the client – which will continue to happen. This workflow may be facilitated through a consumer health solution - if preferred over phone calls. Providing clients both options will help with adoption.

Health professionals are well-trained to assess multiple factors in disease management. A lab result that is out of the normal range, and therefore tagged as a red status, may not be a concern based on the provider's analysis. Clients that have access to PHR data must be coached about not getting overly worried about results until they can discuss them with their provider(s). A consumer health solution must be able to evoke decision-making by both clients and providers. Some solutions allow for suppressing data sharing if, in the provider's professional opinion, it may do more harm than good. This is not uncommon in some aspects of psychiatry and counselling services when releasing such detail to a client may do more harm than good.

A leadership consideration is the timing of when the consumer health solution will receive data through the provider's EMR – at the same time or only after the provider publishes it to the solution following review. Some clinicians report feeling a loss of credibility and control if the content is delivered to clients before they have time to review it.

In Ontario, the availability of provincial datasets and potential integration with consumer health solutions is resulting in clients seeing results before clinicians do. This perceived loss of control for the provider creates the imperative of managing client expectations of information they see in the consumer health solution. It may take the provider a few days to review the result and, with immediate access by clients, it may create expectations for clinicians to have reviewed it more quickly than they are able.

The ability for clients to access lab results online has been enabled by both LifeLabs and Gamma DynaCare community laboratories in Ontario. The potential for client panic calls exists today but if properly factored into the introduction of the consumer health solution, it often nets out positively when those expectations are effectively managed as part of the adoption phase. The physician-lead of one of the piloted consumer health solutions reported that his team

actively managed client expectations. He also reported that in three years of use, he had not received one panic call due to abnormal lab results being shared with clients. In fact, clients reported relief at getting the result sooner, rather than later, and not having to wait to hear from their provider; all the while worrying what the result might be.

Consumer Health Solution Functional Requirements

The list of requirements below summarizes the lessons learned from the various pilots and projects that were undertaken as well as some important considerations used in the process of selecting a consumer health solution.

Workflow integration. This was identified as a key requirement by providers to reduce workflow disruption and avoid duplication of data input. Client context-sharing and single sign-on are critical technical aspects for providers. Similarly, such capabilities already exist for consumers in applications such as Facebook and Google and for providers with ONE ID, eHealth Ontario's single sign-on service (eHealth Ontario, 2017). Similar capabilities exist in other provincial jurisdictions as well (Alberta Health Services, 2016).

Bi-directional data-sharing. Providers must be able to easily publish data or documents into the PHR, as well as be able to download discrete data from the solution, into their EMR.

Integrated EMR documentation. When clients use recommended educational resources in the consumer health solution, a chart note should automatically be generated to provide a record for the provider(s). One of the solutions piloted recorded audio and visual annotations in the education material that was reviewed in the office with the client saving documentation time.

Multilingual support. With Canada's diverse cultural and linguistic makeup, having the option to switch into a client's preferred language improves comprehension and use.

Cloud-based performance. Having the solution optimized and available over the Internet enables mobile and remote access. Providers avoid the cost and complexity of managing infrastructure and vendors can provide massively scalable solutions much more cost-effectively. Given Canada's geography, such solutions must be able to perform well over limited bandwidth and low quality of service and recover from brief interruptions in connectivity.

Hybrid pointer/repository. Some solutions do not copy data into the consumer health solution, rather, they use pointers to known data sources and display it when the application is opened. This prevents stale or out-of-date data being resident in the consumer health solution and enhances its scalability given it only stores what is entered by clients themselves or through their personal digital devices. The solution must be able to indicate success or failure of data requests from existing sources.

Privacy and security. Considering the growing importance of privacy and the need to strengthen the compliance framework (e.g. certification, fines, reporting requirements, etc.), it is important for the consumer health solution to instill confidence in clients and providers by demonstrating its ability to securely protect PHI. Today, such records are considerably more valuable than credit card records on the Dark Web (Yao, 2017).

Given today's rapid rate of technology evolution, data security cannot be guaranteed. Individuals to nation-states using sophisticated techniques have caused breaches in even the largest organizations (e.g. Equifax, Sony, eBay, Yahoo, JP Morgan Chase, etc.) (Armerding, 2017). The ability to prevent, detect, minimize impact and recover from security threats is best achieved by companies that can invest in the appropriate skills and tools. The public will only trust consumer health solutions that have a good reputation. The public also assumes that these solutions are using best practices for security and privacy (Longwoods eLetters, 2017). A breach

could result in loss of trust by clients and providers and ultimately discontinued use of the solution. This can be an area of vendor risk-sharing. Certifications, regular 3rd party security audits, and incident reporting metrics can be incorporated into a well-structured contract to provide confidence and trust in the vendor's ability to protect its solution and data holdings. Given the rise of robotics, artificial intelligence and 3D printing in healthcare, this is also an area for government regulation and oversight to ensure the best interests of the public are effectively maintained (Standing Committee on Social Affairs, Science and Technology, 2017).

Training

Consumer health solutions must be intuitive, easy to understand and fit into both a clinician's workflow and a client's lifestyle. To address different learning styles, training methods must utilize best practices in adult learning techniques. Peer-based, volunteer-led training has been used effectively in the NHS where there is a priority to build digital capacity at the community level in a sustainable way (The Good Things Foundation, 2016).

Device-Agnostic

The solution must be able to run on any device: laptops, desktops and mobile devices in the most common operating systems (e.g. Windows, Android, iOS, and Linux). From the client perspective, affordability and access are critical. Clients should not be expected to pay for use of a consumer health solution and access should be readily available on any device they have. For clients without access to a smartphone or computer, community access through public libraries, schools, community centres or at the provider's office is an important consideration. This is why a community-based digital health strategy was developed in the Netherlands (The Council for

Public Health and Health Care (RVZ), 2015). Both the Netherlands and the UK have adopted Collective Impact approaches to sustainable community-based digital capacity building.

Activity and Bio-Tracker Integration

Consumer grade fitness trackers and digital monitors and meters must be able to easily and seamlessly upload data into the consumer health solution. The data must then be presented in an easy to interpret and flexible manner when viewed. Commercial solutions are available that support the standards-based integration of activity and bio-trackers into consumer health solutions (Validic, Inc, 2017). These 3rd party solutions provide the development and quality assurance testing required for reliable integration. Clients that cannot afford such devices must be able to manually enter data to achieve similar insights.

Features Preferred by Clients

Following a number of client workshops and focus groups, the following features have been identified by clients as necessary for them to use a consumer health solution.

E-booking. Enabling clients to schedule appointments online.

E-visit. Enabling secure video-conferencing and after-hours service can improve access. Most smartphones and tablets support real-time streaming video which allows for such visits to occur. The challenge is to offer an easily accessible and integrated capability to offset requests to use consumer-grade applications such as email, Skype or Facetime that may not provide the necessary quality of service or security. Ontario's Telemedicine Network provides secure, high-quality video-conferencing capabilities (Ontario Telemedicine Network, 2017).

With secure video options becoming publicly available, the current growth of virtual medical services presents a potential risk. Similar to walk-in clinic convenience, electronic access to providers has value. Access to a complete medical record, however, is not often available to ad hoc providers. Client-controlled access can mitigate some of this. Consumer health solutions have to be user-friendly and efficient for both providers and clients with minimal training required.

E-refill. Prescription renewal request completed online. This has also been identified by clients as a requirement especially for chronic disease management where a face-to-face appointment with a provider to re-evaluate the need for the medication is not always necessary.

E-view. Clients, and those to whom they provide access, can review the data. The ability to review results online in an easy to understand way can be achieved by using colour to indicate result status; green (e.g. good), yellow (e.g. caution), red (e.g. may require review). Clients interviewed also indicated value in getting access as soon as the result was available instead of having to wait for the next appointment. Providers need to be able to filter content for the view that meets their professional needs efficiently.

E-communication. Allowing clients and informal care providers (e.g. family members) to communicate with the client's healthcare team and each other via secure messaging. Regulatory colleges advise against using insecure communication especially if it includes PHI.

E-referral. Allows the client to do self-referrals and share their PHI with providers. In Ontario, the Ministry of Health and Long-Term Care is leading the development of e-consult and e-referral capabilities as part of the provincial Digital Health Strategy (Ontario Ministry of

Health and Long-Term Care, 2016). The consumer health solution must be able to integrate with such provincial digital assets and will likely use the FHIR data interoperability standard.

Client-driven care team. Clients can add/remove provider access to the consumer health solution; putting more control in the hands of clients.

Integration with social communities. Integrating with applications that support communities of interest can also drive enhanced use of a consumer health solution. Single sign-on that integrates with Facebook, Google, Patients Like Me, etc. can make accessing a consumer health solution seamless and more likely to be used.

Other Consumer Health Solution Considerations

Surveys. The solution will allow providers to create, update, and share surveys that can gauge client experience, knowledge and inform care planning.

E-check-in. Allows clients to check wait times and confirm their arrival at the provider's location in a way similar to online flight check-in.

Shared assessments. Clients and providers can collaborate on completing assessments in the solution. Integrating standard clinical assessment tools allows for a record to be retained by the client in the consumer health solution as well as by the clinician via their EMR.

Population health analytics. The data within the consumer health solution should be able to generate de-identified population health analytics and inform researchers and policymakers on clinical best practice adherence and client outcomes. Such functionality provides a diverse stakeholder group with value and helps promote sustainability. This capability – use of PHI for secondary use – must honour privacy regulations.

Artificial intelligence (AI) and machine learning. These emerging technologies can track and assess client health trends and suggest next steps. This can be especially valuable for clinicians monitoring client well-being. If there are indications of loneliness, sadness, self-harm thoughts, consistently high blood sugar, etc., they can be notified and respond accordingly.

Evaluation Framework

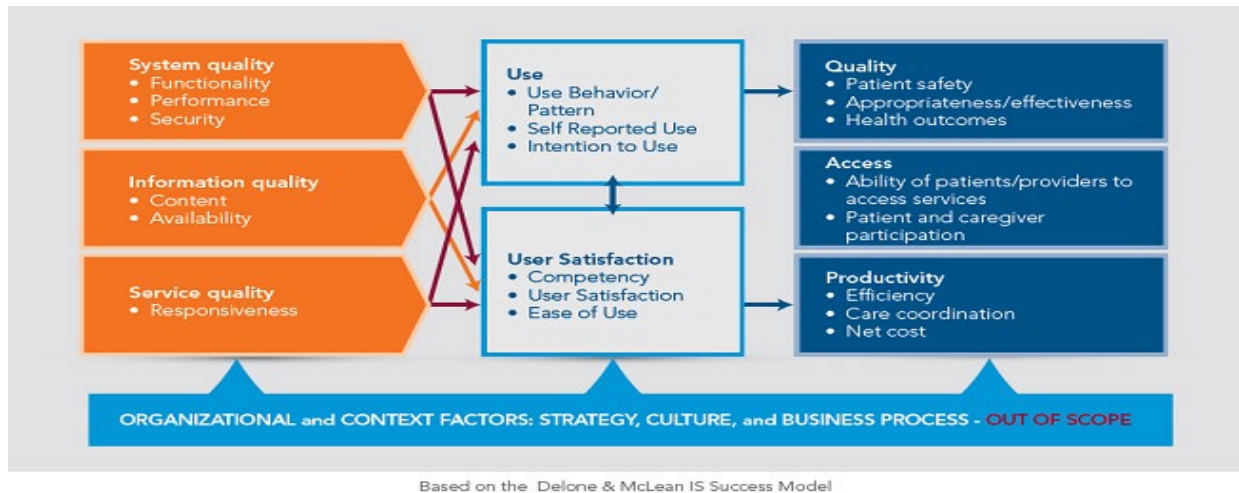
Digital consumer health solutions can benefit from an Evaluation Framework based on the Quadruple Aim (Bodenheimer & Sinsky, 2014). It will promote a client-driven perspective when planning, implementing and evaluating the multi-faceted approach that is required for these solutions to be successful.

According to the Institute for Healthcare Improvement (Berwick, Nolan, & Whittington, 2008), new designs and products must be developed to simultaneously pursue three dimensions:

- improving the patient experience of care (including quality and satisfaction),
- improving the health of populations, and
- reducing the per capita cost of healthcare.

The fourth aim reflects the need to address providers who are increasingly suffering from burnout and overload. Consumer health solutions must optimize clinical workflow and enhance efficiency and effectiveness; aspects that can be readily measured.

Infoway has designed a standardized evaluation framework and indicators for eHealth solutions (Canada Health Infoway Benefits Evaluation Toolkit, 2017). Coupled with the Quadruple Aim as an evaluation framework, the impact of a consumer health solution can be measured and the results used as vendor performance indicators in a risk-sharing contract.

Figure 2: Canada Health Infoway Benefits Evaluation Framework

The Benefits Evaluation (BE) toolkit helps leaders understand the impact of investments, best practices and how to improve digital health tools to improve care. Alone, it is insufficient to evaluate what is important to clients. Along with the Quadruple Aim, these approaches can help ensure success.

Similar Benefit Evaluations have been conducted for Nova Scotia's PHR Demonstration Project (Department of Health and Wellness, Ministry of Health, Nova Scotia, 2014), Alberta's Personal Health Portal and the Barrie and Area Family Health Team PHR project (Barrie and Area Family Health Team, MyHealthLinked Project Review and Benefits Evaluation Final Report, 2016). These and other similar consumer health solution BE reports are available on CHI's website.

Below is a representative set of evaluation indicators that address both the Quadruple Aim and the Infoway Benefits Evaluation Framework. Process, output and outcome indicators are necessary for a comprehensive vendor risk-sharing contract. Such outcome indicators may

require additional data linkage to determine cost impacts on other parts of the health system such as reduced ER utilization. ICES conducts such data linkages and evaluations in Ontario.

Leaders need to identify measures that reflect their specific circumstances and requirements.

Table 2. Digital Consumer Health Program Evaluation Sample Measures

Inputs	→	Process/Activities	→	Outputs	→	Outcomes/Impact
Clients/family Providers readiness		# of clients/informal carers/providers recruited to participate		# clients/informal carers/providers trained		Reduced HbA1c levels for people with Diabetes
Training resources available in needed languages in accessible language		Help Desk function set up Collective Impact stakeholder engagement		# of Help Desk calls closed # of organizations committed to supporting digital Consumer Health Program		Lower cost for Diabetes care Improved provider efficiency and effectiveness
Solution access points available				Client/informal carer Satisfaction in Consumer Health Program		Client confidence in self-management

Conclusion/Lessons Learned

This project and the literature review have demonstrated that health improvements can be realized through the well-designed implementation of digital consumer health solutions that address the archetypes and motivations of both clients and providers.

Taking a Quadruple Aim perspective will provide a long-term evaluation framework that can be used in conjunction with a Collective Impact approach to enhance adoption and use. Community-based digital capacity building can help address social aspects of health as well as enable cost-effective support. By organizing HSPs as well as other stakeholders such as

community groups, funders, municipalities and the research community, the value proposition for digital consumer health solutions is improved.

As population health funding policy becomes more mature and health data becomes more accessible, health service delivery costs can be reduced, and outcomes improved, by deploying a digital consumer health program. Decision-makers are advised that a long-term roadmap must be established to ensure the culture change in health service delivery models does not lose momentum. Early engagement of funders, clinicians, communities, clients, and other stakeholders in the planning will support long-term adoption and success.

Voters will influence government as these capabilities become expectations of an effective health care system. Funders and health care system decision-makers must provide a supportive policy framework that allows for the effective use of consumer health solutions. In a zero-sum spending environment, consumer health solutions must reduce the overall cost of healthcare as financing such solutions will have to come from other parts of the system. Consumer health solutions are one of the emerging new technologies no different than a PET or MRI scanner. These expensive technologies have proven their diagnostic utility when appropriately used. Consumer health solutions are beginning to show similar value and when optimally designed and implemented, they will help contribute to a sustainable health system.

The evidence has shown that a truly person- and community-centred health care system presents the best opportunity to improve health while reducing costs. Incorporating this paper's findings into a digital consumer health strategy will help lay the foundation for success; informing healthcare policy and solution design considerations which will enable high-impact, cost-effective, and optimal client health outcomes.

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Appendix 1: Client Archetypes

Healthy/Motivated Archetype

Adults, young and old, can fall into this profile (Table 1). These individuals are diet-conscious, exercise regularly and may use tracker technology, such as Fitbits, digital scales, and smartphone applications, to document progress (Pare, et al., 2017). The key for this group is to enable them to succeed through provider recognition, data trend analysis, positive feedback loops and enabling e-communication with communities of interest (e.g. an exercise group, friends, etc.) to foster continued use and reinforce positive behaviours.

Healthy/Unmotivated Archetype

Young adults in their teens and early 20's, often fall into this category. They typically do not have any major health concerns and do not feel they need to do much, specifically, for their health. This client profile responds to social media integration and incentives to prompt them to engage. The goal is to shift them into being motivated and participating in prevention activities and healthy behaviours (e.g. healthy eating, exercise, reduced risky behaviours, etc.).

Unhealthy/Motivated Archetype

This archetype describes people with chronic diseases such as diabetes, congestive heart failure, chronic obstructive pulmonary disease, obesity, profound allergies, and food sensitivities. They may struggle with their health but are motivated to improve their quality of life. This part of the population is quite large and consumes a significant amount of healthcare services. Education, lab result tracking, key physiological indicator trends, social media integration (Patients Like Me, Facebook interest groups, etc.), activity tracker integration (e.g. Fitbits)

Appendix 1: Client Archetypes (cont'd.)

coupled with user-friendly analytics are foundational consumer health solution design considerations for this archetype.

Unhealthy/Unmotivated Archetype

Clearly, the most difficult client type to reach, this group may suffer from social isolation, poverty, homelessness, mental health issues and/or addictions. Outreach workers are often very familiar with this population and find they must go to where the clients are to provide service. A consumer health solution must have the mobility to follow the client and be an influence wherever and whenever the client is ready to use it.

Incentive systems based on simple goals with ample encouragement and non-intrusive bio-feedback performance can help prompt awareness, interest, and motivation. The role of a formally trained health coach can often assist with healthcare service navigation, care continuity and positive decision-making. For clients with addictions, harm reduction efforts can be facilitated through a consumer health solution. Maintaining non-judgemental social connection with this type of client is key to the health coaching approach for this archetype.

Clients suffering from mental health illness are often socially isolated as well. Consumer health capabilities that remove time and geography, and improve social connections, can be very effective at supporting improved health outcomes for this population (Griffiths, 2017). The cost of chronic loneliness in the UK based on avoidable visits to the Emergency Department, general practice and other urgent clinic services is estimated at 12,000£/person (Fulton & Jupp, 2015).

Appendix 1: Client Archetypes (cont'd.)

Motivation

The term motivation is generalized to include intrinsic and extrinsic influences. Beliefs, fears, and values can influence decisions and behaviours. Likewise, poverty, lack of transportation, and cultural influences can also influence a person's behaviours. Considering the social determinants of health can help identify potential extrinsic influences.

Dynamic Archetype Status

Human Factors design thinking helps address both the dynamic nature of client motivation and the provider's need for efficiency and effectiveness. For clients, a CRM approach to digital consumer health solutions promotes continuity and relationship building that can help the care team adjust their approach with the client. Such approaches can span the continuum of health promotion to harm reduction strategies. The intent is to remove geography and time from the ability to interact with clients and meet them where they are in terms of their health and motivation. A CRM design can help identify trends and can also inform providers on cyclical patterns that may occur over time.

Appendix 2: Adaptation of Maslow's Hierarchy of Needs

Personal Health Record

The limited uptake of PHR repositories such as Google Health or Microsoft's HealthVault were due in part to the lack of acknowledgment of the other levels of the functionality in the consumer health design model (Figure 1). These solutions were primarily designed for 'Healthy/Motivated' users and did not address the other three archetypes effectively nor the implications of someone moving through the various archetypes. Capturing personal health information, and making it accessible in an easy to read manner, is foundational but not adequate. PHR information goes stale quickly, and without trend analytics, user-friendly data visualizations and the ability to filter and search for information of interest, the PHR data holding has limited value.

Engineered for Client Experience and Clinician Workflow

A consumer health solution must include functionality that removes the challenges of time and geography from accessing health service providers.

Such capability allows clients to

- receive notifications of new results and updates,
- integrate with activity and bio-trackers for easy data consolidation (e.g. Fitbits, glucose monitors, digital scales, etc.),
- access lab results, diagnostic tests, and vitals (with easy to understand interpretation),
- schedule and change appointments,
- request medication refills, and
- communicate with the health service providers in their circle of care.

Appendix 2: Adaptation of Maslow's Hierarchy of Needs (cont'd.)

These transactional features, that automate the mundane workflows of interacting with today's health service provider, can remove time and geographic barriers to access and decision-making, and improve outcomes. These features, to varying degrees, can incent engagement of all four client archetypes although they hold the most value for clients that require frequent interactions with their provider(s). Client engagement and activation are important outcomes of a consumer health solution as they are closely correlated with health improvements (Malovec, 2017).

Educational Resources

“Give a man a fish and feed him for a day. Teach him how to fish and you feed him for a lifetime”. Anne Isabella Thackeray Ritchie is most often credited for this paradigm as a means for enabling self-sufficiency (Quote Investigator, 2015). Empowering clients with applicable knowledge is one of the strongest behaviour modifiers.

‘Dr. Google’ has become a well-established challenge for many providers. The growing use of online health resources indicates the need for such information being made readily accessible by clients motivated to understand their conditions better. The ability to access provider-validated educational materials, record client use in the health chart, and to enable the use of these resources in teachable moments, are critical to helping clients make better decisions about their conditions and their management of same. Informed clients take ownership of their health more readily. Effective management by clients will result in better than average outcomes. It is important to inform clients of the usual progression of their condition to help them determine if their efforts are having a positive influence. For conditions that are chronic and deteriorating, employing user-friendly analytics to demonstrate that a client's results are above

Appendix 2: Adaptation of Maslow's Hierarchy of Needs (cont'd.)

average can be motivational to incite continued efforts; even if it means a deterioration of health such as may be the case for chronic disease management.

Health Coaching

The top two levels of the pyramid model reflect the humanistic aspects and potential of an effective consumer health solution. A relatively new role in western medicine, health coaches use relationship management techniques to help clients succeed with their self-care efforts without being perceived as an authority.

Nursing, social work or allied health professionals such as dietitians serve as health coaches. The role includes an emphasis on empathic listening and motivational techniques that help empower clients to understand and improve their health.

A first in North America, York University (York University, 2017) has designed a post-clinical degree Health Coaching certificate to help providers with

- technology-assisted health coaching: using an evidence-based approach, using the latest technology/applications to assist clients, families, and clinical teams optimize outcomes,
- relationship-based and [person]-centered communication as a key to behaviour change,
- coaching for chronic disease and mental health,
- grounded in behaviour change methods and tools, and
- gain buy-in with the clinical team, the client, and family to support health goals.

This approach was used successfully as part of a Connected Health and Wellness pilot project with Black Creek Community Health Centre and a cohort of their clients with Type II

Appendix 2: Adaptation of Maslow's Hierarchy of Needs (cont'd.)

Diabetes. The results showed a significant improvement in HbA1c management in clients that used the collaboration platform in conjunction with health coaching over traditional best practice (Wayne, Perez, Kaplan, & Ritvo, 2015). Similar results were reported in India where the use of text messaging and smartphones achieved positive engagement of patients with type II diabetes (Muralidharan, Ranjani, Anjana, Allender, & Mohan, 2017).

Health coaching represents a fundamental shift in the clinician-client power differential; something that must be carefully thought through (Nosta, 2015) (Delbanco, et al., 2001) (Philpott, 2017). By working through a technology-enabled approach to collaboration, clinicians are empowering and motivating clients to be meaningful members of their own care teams. This improves client self-confidence, their own knowledge and their trust in their care teams. Like any sports coach, earning the confidence and respect of the athletes can translate into improved performance. For some providers, this is a very different way of conducting their clinical practice.

Once educated about their condition and management options, client-based decision-making is correlated with behaviour change and better outcomes. Where clients may not be motivated to take ownership of decision-making, other incentives and approaches can be used to encourage engagement. Mental health, addictions, and terminal illnesses are often correlated to unmotivated populations. Consequently, the consumer health solution must include functionality that includes social media capabilities that enables communication between family, friends, and communities of interest (Cordos, Bolboaca, & Drugan, 2017). There is strong evidence to show that incorporating family and friends in use of a consumer health solution can have a strong positive influence on client activation (Thacott, 2017). These social elements are those higher-

Appendix 2: Adaptation of Maslow's Hierarchy of Needs (cont'd.)

order aspects of the Consumer Health Hierarchy of Needs model and those that are showing the most important influences on health outcomes.

The latest research is clearly showing that social isolation is a greater contributor to poor health than poverty (Griffiths, 2017) and is correlated with earlier mortality (Holt-Lunstad, Smith, Baker, Harris, & Stephenson, 2015) (Cornwell & Waite, 2009). Consumer health solutions can provide communication linkages and facilitate a sense of social inclusion.

Incentives and gamification can also foster client engagement. The province of Ontario recently announced a partnership with Carrot Rewards to incent and reward healthy behaviours (Cross, 2017). Carrot Rewards tracks users' steps and offers quizzes and tips on topics including healthy living and has about 200,000 active users in Ontario. Integrating such incentive systems can help monetize the platform to eliminate the cost for clients and providers. Leaders will need to be diligent in pursuing such approaches to avoid undue influence or inappropriate sponsors but the value of customized offers that address a client's needs holds significant potential. As reduced health care system utilization benefits the health system funders, supportive policy may be required to regulate this approach to mitigate the potential for inappropriate influence.

Engineering game design into a consumer health solution can create the sense of achievement, entertainment, and competitiveness. This approach can influence users to visit the application more frequently than they otherwise would and may entice some to try it. By allowing the user to connect with social networks, they can challenge or cheer friends towards new goals. This design has been well used by Fitbit.

Appendix 2: Adaptation of Maslow's Hierarchy of Needs (cont'd.)

This explosion of data becomes a potentially rich source of insight into client behaviours. Governments, policy-makers, researchers, health service providers, clients, families and the private sector now have a valuable stake in making such a consumer health solution work. Using a Collective Impact approach (Tamarack Institute, 2017) will help ensure alignment of incentives with a common goal of improved population health.

Of course, appropriate privacy, security and audit considerations need to be fundamentally designed into the solution. Blockchain, machine learning, and artificial intelligence are emerging technologies that are being leveraged to enhance security as well as the use of consumer health solutions (Hafner, 2017). Clients must be confident that their personal health information will be used in their best interests (Vezyridis & Timmons, 2015). In fact, to enable services anywhere, solution mobility is critical (Ackerman, 2017). Clients must have the ability to provide access to family, or other providers, from anywhere and on any device: nothing about me without me.

Ethically monetizing such a platform provides both valuable personalized information for users and can provide a sustainable means to support and evolve the consumer health solution (Glover, 2005) (Wise, 2017).