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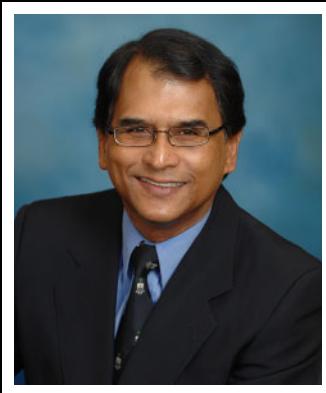
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A Message from the Guest Editor



D. David Persaud, PhD, is a Professor in the School of Health Administration at Dalhousie University.

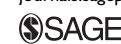
This edition of *Healthcare Management Forum* is dedicated to innovations in healthcare. Inertia in the midst of continuously changing healthcare environments is not an option. Therefore, all entities must innovate and change to adapt and flourish in the face of relentless environmental change and disruption. This edition of the journal contains ten Canadian innovation initiatives and practices that can be utilized nation-wide to drive innovation, change, and adaptation.

Noseworthy describes Learning Health Systems (LHSs) across Canada that are at the forefront of clinical innovation. These systems are based on a framework composed of three phases exemplified by healthcare research, knowledge, transfer, and integrated knowledge transfer to achieve high performance, innovation, and change. A learning community such as a clinical or research network can act as an enabler to enhance and sustain change. The author describes three promising Canadian examples of LHSs and clinical innovation: Strategic Clinical Networks in Alberta, the Rural Co-ordination Centre of British Columbia, and the Translating Research in Eldercare research initiative.

Bearnes et al. describe an innovation strategy at The Ottawa Hospital that is used to guide the adoption, implementation, and utilization of virtual care innovations aimed at achieving the system, organizational, and individual-level improvements promoted by the quadruple aim concept. The case example they describe can be utilized by health leaders and providers who are considering the implementation of virtual care within their organizations.

Coderre-Ball and her co-authors describe the development of an innovation procurement clinical framework. It is an Innovative Procurement Strategy (IPS) that is premised on value-based healthcare, where value is measured as a function of delivering high-quality patient outcomes while being cognizant of the cost of delivering those outcomes. Therefore, value-based procurement applies value-based

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principals to procurement decisions. The authors interviewed experts with experience in innovative procurement and used thematic analysis that allowed them to identify the factors that form the basis of the innovative procurement clinical framework they developed. This framework can be used by any healthcare organization looking for a way to develop an IPS based on value-based healthcare.

Joseph et al. describe an innovation called Health City. It is a non-profit corporation headquartered in Edmonton that is mandated to drive economic development and transformation of the health sector through innovation. Although Health City is based in Edmonton, it has a national scope through partnerships with industry, government, and philanthropic organizations. It describes itself as an innovative “living lab” that executes projects that demonstrate increased patient access and efficient use of resources with the goal of driving better health outcomes. The authors describe how this is done to eliminate barriers to execution.

Lapaine writes about the experience at Bluewater Health in pursuing healthcare’s quadruple aim. Bluewater Health has emphasized the importance of improving the experience of all employees including clinical staff so as to improve the achievement of the other three aims of quadruple aim. He describes the application of system leadership strategies to improve system performance in terms of costs and quality. A step-by-step process and practical recommendations are outlined that have resulted in increased employee engagement and trust in leadership with the attendant achievement of quadruple aim goals.

Cady believes that system optimization leadership strategies such as innovation, collaboration, and data-driven decision-making can affect system and organizational improvement and performance in terms of both financial and quality performance perspectives. Cady uses simulation and gameplay to assess learning systems’ optimization strategies. A set of recommendations for leadership practice and future

research are presented with the aim of helping optimize whole systems and not solely their parts.

Koch and her co-authors have conducted a study with a specific emphasis on the factors relevant for producing innovative health technologies for adults. They did this within the context of a Canadian technology and aging research network focused on aging and technology. The AGE-WELL (Aging Gracefully across Environments using technology to support Wellness Engagement and Long Life) NCE (Networks of Centres of Excellence) is focused on technology and aging to improve independence and health outcomes and reduce caregiver burden, while stimulating growth in the aging sector. A multiple case study design using the Accelerating Diffusion of Proven Technologies (ADOPT) theoretical model was used to examine factors that facilitate or constrain innovative technologies being developed within the AGE-WELL NCE. Findings illustrated the complexities of the innovation processes, as well as the challenges in developing a business case and the benefits of a collaborative network.

Keddy and her co-authors describe the development and use of a new assessment instrument, the Team Assessment of Self-Management Support protocol. It is designed to assess and improve the self-management and support that is provided to patients with chronic conditions by multidisciplinary teams. This assessment tool is being used by primary healthcare teams, managers, and decision makers in Nova Scotia to assess self-management support offered to patients with chronic health conditions. The authors first describe how the instrument is utilized and then provide two examples that demonstrate its efficacy in informing quality improvements and reforms to chronic disease self-management support in the province.

Kennedy and her co-authors describe a province-wide healthy eating policy initiative of the Nova Scotia Health Authority. It is intended to set the standard by being a benchmark for healthy eating and creating a food environment supportive of health. The authors discuss the policy and its use of nutritional and cultural benchmarking around healthy eating practices. In addition, they discuss the policy's role as a benchmark to be used within the quality improvement and health promotion contexts with the ultimate goal of propelling system-wide structural and behaviour change in support of healthy eating in Nova Scotia.

Persaud and Murphy explicate the use of the ELIAS (Enhancing Learning, Innovation, Adaptation, and Sustainability) framework in driving innovation and change in healthcare. The ELIAS framework is a dynamic capability based on organizational learning mechanisms that integrate action learning, shared reflection, and continuous improvement with the aim of increasing a healthcare entity's absorptive capacity for learning and innovation as well as its readiness for change. The authors underscore the importance of continuous learning and its function as a precursor to innovation. In addition, the presence of a culture that acts as an enabler of learning and innovation is emphasized. This is followed by a description of the domains of the ELIAS framework, and three case studies are presented that reinforce the utility of the framework for driving innovation, change, and adaptation within continuously evolving healthcare environments.

Thanks to all of the contributors!



Innovation in the Canadian health system

Tom Noseworthy, MD¹ 

Abstract

The essence of human ingenuity is creation and novel ideas that result in collective and desired impact. Indeed, innovation is foundational to life in a changing world. In no situation today is this more relevant than in health systems, whether they be challenged to maintain population health, threatened by impending disasters, or expected to respond to the ever-expansive demand and inexorable course of those with chronic diseases. This article discusses health system innovation and its trajectory. It focuses on clinical innovation as a means of achieving high-level performance within a learning health system model. Examples of innovation in Canada are used to illustrate successful approaches worthy of broader consideration and pan-Canadian attention.

Introduction

The essence of human ingenuity is creation and novel ideas that result in collective and desired impact. Indeed, innovation is foundational to life in a changing world. In no situation today is this more relevant than in health systems, whether they be challenged to maintain population health, threatened by impending disasters, or expected to respond to the ever-expansive demand and inexorable course of those with chronic diseases.

This article discusses health system innovation and its trajectory. It focuses on clinical innovation as a means of achieving high-level performance within a Learning Health System (LHS) model. Examples of innovation in Canada are used to illustrate successful approaches worthy of broader consideration and pan-Canadian attention.

What is innovation?

Few terms in health and healthcare seem to be used more frequently or differently than “innovation,” a word that suffers from semantic satiation. There are countless definitions and wide-ranging uses of the term. This article offers a simple working definition, with inputs from many sources:

Health system innovation is the phenomenon of developing and/or delivering new or improved health technologies, products, services, policies, or practices.

While the emphasis may be on the new, innovation includes what does exist in terms of novel and improved approaches or new ways of thinking about long-standing problems, with consequential change in policy and/or practice. Distinguishing between technical and non-technical innovation is useful for focusing this discussion.

Technologic innovation in healthcare involves a new invention, technology, or product or a technology-enabled approach or intervention. Some of these innovations have been transformative, such as the introduction of laparoscopic surgery or phacoemulsification in cataract removal.

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Non-technologic innovation relates to a novel practice, service, or way of doing or thinking about things that derive a preferred result, such as prone positioning of critically ill patients with hypoxic respiratory failure in order to improve oxygenation. For the most part, this article deals with non-technologic innovation and, specifically, clinical innovation designed to achieve high performance.

The trajectory of innovation to implementation

Whether an innovation is technical or non-technical, it has to have a start and finish. The ‘starts’ happen with an idea and champion. To have relevance or impact, it must be implemented. The trajectory from idea to completed implementation can be long and tortuous, with well-recognized gaps between scholarly research and uptake by the health system or market. Eventually, and after varying periods of use, the lifecycle of a technologic innovation reaches a point at which it wanes in value or popularity, there is something better to replace it, and disinvestment and obsolescence ensues.¹

This trajectory may be further disrupted by the reality that appropriate diffusion of technology does not always follow an orderly or predictable course, wherein the right innovation takes place at the right time and is used in the right way for the right purpose. Some innovations diffuse too rapidly yet are of unproven or limited value, such as widespread vitamin D screening. Other potentially beneficial innovations may be slow to achieve uptake or effective use, such as earlier commencement of palliative care in non-cancer patients.

Enabling the trajectory

It is recognized that there are steps and a trajectory for diffusion of technologic innovation, as described in models of innovation

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and technology adoption.² In many countries, this has prompted the emergence of structures and processes meant to support and catalyse this technology transfer and trajectory, such as innovation strategies, springboards, accelerators, pipelines, corridors, and hubs; with or without clearly defined goals and actionable outcomes; and with variable degrees of reported success and impact.

On the non-technologic side of innovation, particularly clinical innovation, there is similar emergence of models, structures, and processes. These are similarly meant to inform, support, and catalyse this knowledge transfer and trajectory through practice and policy change aimed at achieving high performance.

Learning health systems to achieve high performance

In this past decade, the LHS model has emerged to offer guidance in achieving high-level system performance. Distinctive structures, processes, and outcomes of LHSs combine with the aim of optimizing health system performance and delivering greater value.^{3,4} High performance is usually judged in relation to measures of achieving the Quadruple Aim of better health, improved healthcare outcomes, and greater value for money, with engaged and fulfilled care providers.⁵ Notable international examples of systems that accomplish this include Intermountain Health and Birmingham East Primary Care Trust.^{6,7}

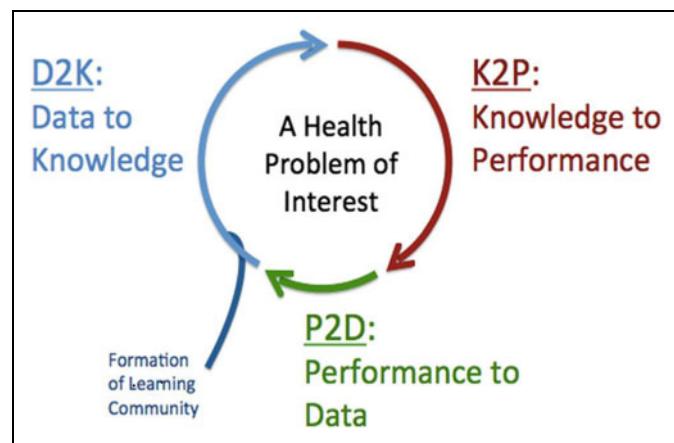
Learning Health Systems are constructs in which “science, informatics, incentives, and culture are aligned for continuous improvement and innovation, with best practices seamlessly embedded in the delivery process and new knowledge captured as an integral by-product of the delivery experience.”⁴ This suggests a highly dynamic and iterative approach to the issue, in which each act of care liberates data. From this, continuous and iterative improvement is informed and results, with measurement driving management and management changing and influencing what is measured and how it is used.

Learning Health Systems require vision, leadership, and infrastructure to flourish. Such systems are organized to learn at every level of scale, from a single clinician’s practice to a hospital unit or an entire provincial system. They require structure and essential building blocks including:

- robust, comprehensive, and accessible data;
- standardized approaches to measurement, including tools for sharing results and key outcomes;
- supports for behaviour and culture change;
- collaborative networks to address priority topics; and
- stakeholder involvement to achieve effective top-down, bottom-up decision-making and to establish and maintain trust and appropriate ethical underpinnings.

The LHS Framework as promulgated by Charles Friedman portrays a model with an identified intent or issue at its core and with phases to address or achieve it arranged around that

core—data to knowledge (D2K), knowledge to performance (K2P), performance to data (P2D), and so on.⁸



Framework for a LHS: Adapted from Charles Friedman et al.^{5,7}

A major component of the D2K phase is health and healthcare research, while K2P has formed the basis for the expansive field of knowledge transfer, and P2D continues to evolve into integrated knowledge translation, in which there is a highly iterative relationship between practice performance and the data generated by it. The formation of a learning community, such as a clinical or research network, may occur or be created at any stage in this cycle and act as an enabling vehicle to engender and sustain change.

Clinical innovation in LHSs

The handling of the COVID-19 pandemic in 2020 by governments, public health agencies, other officials, providers, researchers, and countless others is an outstanding example of LHS development and approaches in Canada. Measurement has been central to pandemic management provincially and nationally. Management has influenced what has been measured and how it has been used (P2D). Moreover, knowledge gaps have been identified and, in some cases, filled, and there has been a flurry of new research and funding support to stimulate it (D2K). As knowledge has advanced, it has changed public health direction and messaging, as has been the case with asymptomatic transmission and how it has influenced both practices and communications (K2P). What we do know has translated into robust information dissemination and advice, which has been better and more organized in some provinces than others, but Canada-wide, it has been a live demonstration of LHSs in action. Continuous learning from this experience will have indelible effects on Canada. It has acted as a nation-wide preparation to more broadly and deeply drive and improve our health systems through the LHS model.

Even before the pandemic, many favourable features of LHSs were becoming more apparent in Canada, such as the commencement of CIHR’s Canadian Data Platform and several provincial examples discussed later. Moreover, in this past decade in Canada, in alignment with and informed by the

LHS model, two phenomena appear to be developing simultaneously, patient engagement and clinical networks. Where these have been harmonized, interesting results are emerging. Both seek to implement evidence-informed, patient-centred innovation designed to maintain health, to fill care needs and gaps, and to achieve best value throughout the patient's health trajectory.

Patient engagement has been enabled and advanced in this past 5 years by the "Strategy for Patient-Oriented Research" led and funded by the Canadian Institutes for Health Research. This work is supported by matched funding from each province. Simultaneously, clinical networks comprised of physician and non-physician clinicians, patients, and researchers have been forming. Many have been using the LHS model to drive change, with early findings that they are able to achieve the Quadruple Aim at scale.⁹ Momentum has been enabled by continuing health system integration into fewer regions or single provincial delivery systems.

Promising Canadian examples of LHSs and clinical innovation

Of the current and varied examples across this country, the following are selected and differing LHSs in Western Canada. These are chosen because of their common characteristics as seen in the LHS model. Each is a clinical or research network with demonstrably strong leadership, meaningful patient engagement, and systematic approaches to change and improvement, with each informed by continuous measurement and iterative processes for change.

- Strategic Clinical Networks in Alberta

A maturing and comprehensive example of LHSs in Canada is the Strategic Clinical Networks (SCNs) in Alberta. In June 2012, Alberta Health Services introduced SCNs as engines of innovation to work at provincial scale.¹⁰ The SCNs are collaborative clinical teams. Each has a provincial and strategic mandate, with defined goals of achieving best outcomes, getting greatest value for money, and engaging clinicians and patients in all aspects of the work. The SCNs are led by clinicians and physicians; involve patients, community partners, researchers, and policy-makers; are driven by demonstrable clinical needs, based on measurement and best evidence; and supported by research expertise, infrastructure, quality improvement, and analytic resources. In short, SCNs are about improving the outcomes and value of the health system in Alberta at scale.

There are now 16 operational SCNs in Alberta at various stages of maturity, with each focusing on demonstrable populations or clinical healthcare issues. Recent publications have shown how the SCNs are advancing the LHS model in Alberta and leveraging the advantage of a single healthcare delivery system that was the first to be established in Canada in 2008.¹¹

A comprehensive analysis of the SCNs' collective impact and return on investment showed a direct cost savings of

\$15.2 M and reduction in bed days of 43,000, for a total saving of \$42.3 M from the first nine signature projects carried out, with a reported 2:1 return on investment.

- The Rural Coordination Centre of British Columbia

The Rural Coordination Centre of British Columbia (RCCbc) is a provincial, rural, and physician-led clinical network. It includes physicians, patients, and other members of the primary healthcare team.¹² Its intended purpose is improving the health and healthcare of rural patients and their communities. This network started in 2005 to advance interprofessional and collaborative practice. It has strong and committed leadership, measurement and research support, and a core oversight body (governance). This network has shaped rural health system innovation and change. It has done so in a socially accountable manner, with a focus on health equity and narrowing the gaps in care in rural and remote British Columbia (BC). The Network is data-driven and depends on knowledge synthesis and the wisdom of the learning community to choose priorities for change.

As an innovative approach to maximizing the advantages of digital infrastructure, information, and communications technologies, and prompted by COVID-19 pandemic in early 2020, RCCbc supported and championed the implementation of a provincial virtual care platform and a shared electronic medical record to enable virtual access to care and services. This included novel care and exchange, such as with the First Nations Doctor of the Day, and creation of a provincial virtual emergency room.

These programs occurred through an unyielding commitment to partnerships. They used a rapid cycle innovation and acceleration approach in testing and iterating the options and subsequent selection of a best fit. Implementation occurred in 2 weeks from finalization of a funding agreement to activation of accounts for over half of the rural physicians in BC (as of May 2020). The platform is driven from a clinical interface, with utilization across BC and adoption by multiple agencies.

- Translating Research in Elder Care

Canada is in demonstrable need of a major and positive transformation in how we think about and care for older adults and their families and the experience of nursing homes. This has been made starkly apparent from the COVID-19 pandemic. Learning Health Systems in nursing homes have been developing and have been enabled and informed by Translating Research in Elder Care (TREC). Operating since 2007, this is the only large-scale, multi-disciplinary research network working longitudinally in the residential long-term care (nursing home) sector in Canada. The TREC has completed studies and clinical trials that have made immense contributions to how health authorities and nursing homes can translate and implement innovation and improvement.

This network has long-term and notably strong scientific leadership. It receives international expert advice and has a core

multi-disciplinary and multi-provincial/state membership, with an oversight body that influences course and direction (governance). It is grounded in strong metrics, data acquisition, standardization, and analytics. It has made novel discoveries across the long-term care sector related to symptom burden at the end of life, reducing burnout among frontline workers, documenting increased complexity among residents, uncovering the extent of social isolation and the associated care challenges among adults with no friends or family, documenting the severe under-detection of health issues, developing a system-level composite indicator of quality, and establishing the importance of the care unit in nursing homes.^{13,14}

Considerations for health leaders

What are the implications for those responsible for the outcomes of health systems? Why address issues and challenges through the LHS approach? As Henry Ford said, “if you always do what you always did, you will always get what you have always got.” Hence, if the current practice is not getting the results one seeks, this is the time and the argument for new and innovative ways of thinking about issues and doing things differently to achieve improved outcomes and value for resources used. This is unachievable without central involvement of clinicians. Moreover, in consideration of everything we have learned in these past years, the patient voice and that of their family/friend caregivers must be fully integrated into decision-making.

Innovations may be implemented if the essential components of the LHS model are assembled. This requires the common characteristics of strong and sustained leadership, clear vision and goals, a core team with team-based approaches to decision-making, a backbone of supports, and a continuing and iterative process of change based on input from measurement and evidence. Health system managers and leaders can enable such an environment for learning if they encourage top-down, bottom-up decision-making to flourish. This requires a culture of co-operation and collaboration, wherein there is an expectation to achieve alignment between the executive/senior leadership, clinical leaders and practitioners, and patient voices around common goals, measurement, and management of the measures. While there is no single recipe for achieving success in the trajectory of innovation to implementation, there must be a clear line of sight and a navigable plan between the innovation and achieving one or more goals of the Quadruple Aim.

Paths forward

Innovation in health is alive and well in Canada. At no point has this ever been more important. This is an ideal opportunity to learn about innovations coming from others, near and far. While there is no single solution for structure or process, the examples demonstrate the features and components of LHSs in Western Canada. Each has had collective impact at scale.

The components for LHSs are present in many parts of Canada. The successful assembly of these components in some places demonstrates that system-level change of this sort can and should be taking place across and throughout Canada.

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Virtual care and the pursuit of the quadruple aim: A case example

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Abstract

Many healthcare organizations have adopted the quadruple aim to create system-level improvements for delivering enhanced experience and outcomes to patients, healthier populations, reduced per-capita costs, and better provider experiences. With a maturing health technology sector, virtual care is gradually being adopted in Canada and proving to be a viable tactic for achieving the quadruple aim. Despite increased acceptance of virtual innovations and their related benefits to patients and providers, implementation of virtual care can be challenging in a Canadian healthcare system. The Ottawa Hospital developed an innovation strategy to guide the adoption and maturity of virtual care as a means of supporting the pursuit of the quadruple aim and achievement of the organization's mission and vision. A case example presenting the strategy and recommendations for health leaders and providers considering implementation of virtual care is discussed.

Introduction

The adoption of technology in sectors such as banks, airports, grocery, and retail stores has led many Canadian consumers to prefer and expect digital service options. The healthcare sector, however, has not kept pace with this cultural transformation, leading Ontario's Ministry of Health (MOH) to announce the "Digital First for Health" strategy in 2019.¹ The strategy aims to expand digital healthcare services across the province, providing patients with more digital choices for their care, such as virtual care, on-line appointment booking, and electronic access to health records, thereby empowering patients to better manage their health. It also seeks to support frontline providers to communicate and share information with their patients and other providers through technology, and to enable health systems to manage themselves and improve performance through data integration and predictive analytics. This strategy sets new expectations and creates a road map for healthcare organizations and the newly created Ontario Health Teams to implement virtual care. While seemingly ambitious, the direction for virtual care has been supported with guidelines and standards by several key stakeholder groups, including the Ontario Medical Association, the Ontario Hospital Association, College of Nurses of Ontario, and Accreditation Canada.²⁻⁵

Definition

Virtual care occurs when patients obtain advice and support to optimize health and/or to manage acute or chronic medical condition(s), without a healthcare practitioner being physically present. Examples include on-line automated tools that provide medical advice, interactions with providers over telephone or video-based encounters, and real-time remote monitoring capability.

Recent factors for virtual care adoption

In recent years, there have been several contributing factors leading to the adoption of virtual care solutions. Most recently, the healthcare system has experienced tremendous pressure to innovate care delivery models as a result of the COVID-19 pandemic. The adoption of virtual care solutions in the Canadian healthcare system has accelerated at an unprecedented rate, in order to maintain access to services and provide continuity of care for those we serve. Prior to the pandemic, healthcare organizations were faced with a need to do more with the same or fewer resources due to budget constraints and an insatiable demand on services. At The Ottawa Hospital (TOH) for example, there are 1.3 million outpatient visits annually and volumes have continued to increase an average of 2% to 3% per year over the past five years, with limited additional operational funding or physical space. Additionally, given the widespread public use of technologies in recent years, patients and providers have expressed a willingness to adopt virtual care. Ontario's MOH reports two-thirds of Canadians are interested in communicating with healthcare providers through virtual means.¹ Finally, several hospitals have recently adopted enabling technologies such as state of the art Electronic Medical Record (EMR) systems and third-party monitoring capabilities, creating a new foundation for innovation of patient-centred virtual care solutions.

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Table 1. Benefits and challenges of virtual care to patients, providers, and organizations

Group impacted	Benefits	Challenges
Patients	<ul style="list-style-type: none"> Increased access to care by eliminating barriers such as transportation or organizing time off work to attend appointments Better quality care and prevention of additional visits Efficient referral to specialist care Reduced visits to hospital settings 	<ul style="list-style-type: none"> Need to develop trust in virtual care innovations Concerns that providers may overlook certain aspects when providing care virtually May lack access to the technology devices or internet services required
Providers	<ul style="list-style-type: none"> Streamlined access to secure health information Reduced no show rates for clinic appointments, supporting improved productivity for providers⁶⁻⁸ Improved work-life balance by enabling flexibility with scheduling and working in unconventional locations 	<ul style="list-style-type: none"> Commitment to high-quality care requires trust in virtual innovations before adopting into practice Reimbursement models for providers have not yet fully matured in jurisdictions across the country Failure to integrate virtual care technologies into EMR creates additional workflow Adoption depends on openness and proficiency with information technology Budgeting for upfront investment costs Managing change when providers have varying degrees of technological dexterity and commitment
Organizations/system	<ul style="list-style-type: none"> Fewer in person outpatient visits and decreased in patient length of stay Secondary quality indicators such as reduced infection rates in hospital, and lower per-capita costs 	

Abbreviation: EMR, electronic medical record.

Benefits and challenges

Based on literature review and corporate-level experience to date at TOH, virtual care presents many potential benefits to patients, the healthcare system and providers, and yet also encounters several challenges to implementation (Table 1). The tension between these benefits and challenges presented a need to develop a virtual care strategy to guide implementation efforts.

The Ottawa Hospital virtual care innovation strategy

The Ottawa Hospital's virtual care innovation strategy was established to support the obtainment of the hospital's quadruple aim (Figure 1) as developed by the Institute for Healthcare Improvement (IHI) to optimize health system performance. According to IHI, the goal is to improve the experience and outcomes of patients, improve the health of a population, reduce per capita healthcare costs, and provide an improved provider experience.⁹ The Ottawa Hospital is committed to evaluating virtual care innovations on the four aspects of the quadruple aim, with specific focus on ensuring the best possible provider experience.

Foundation

The strategy has five foundational characteristics deemed critical to achieving the quadruple aim:

1. Culture: Providers and patients who are motivated to adopt virtual solutions to transform their model of care delivery.
2. Organizational structure: Dedicated leadership and decision-making structure, with clear operational accountability for execution and delivery of the plan.

3. Digital innovation centre: An internal entity fostering partnerships with external individuals and technology companies rooted in Canadian healthcare digital innovation.
4. Engaged partners: Strong relationships with internal and external stakeholders that support and champion virtual care innovation.
5. Alignment with Ministry strategy: Explicit alignment with the Ontario government's Digital First for Health strategy and priorities.

Technology platform

In June 2019, TOH with five partner hospitals in the Ottawa region (named the Atlas Alliance) launched the Epic EMR system in all clinical service areas. The adoption of a complete EMR with enhanced capabilities allows TOH to now consider virtual care solutions within the Atlas Alliance and with other external clients. An additional benefit of the EMR is the ability to adopt previously integrated technologies and workflows from across the Epic community and around the globe. While supporting the creation of solutions unique to the Canadian context, this direction also emphasizes the need for solution integration into Epic, serving as the patient's sole health record (one patient, one record). Furthermore, solution integration supports the adoption of well-defined organizational processes and policies regarding privacy and confidentiality as well as documentation guidelines for clinical encounters.

Technological capabilities

Five digital capabilities were identified as areas of focus for virtual care innovation:

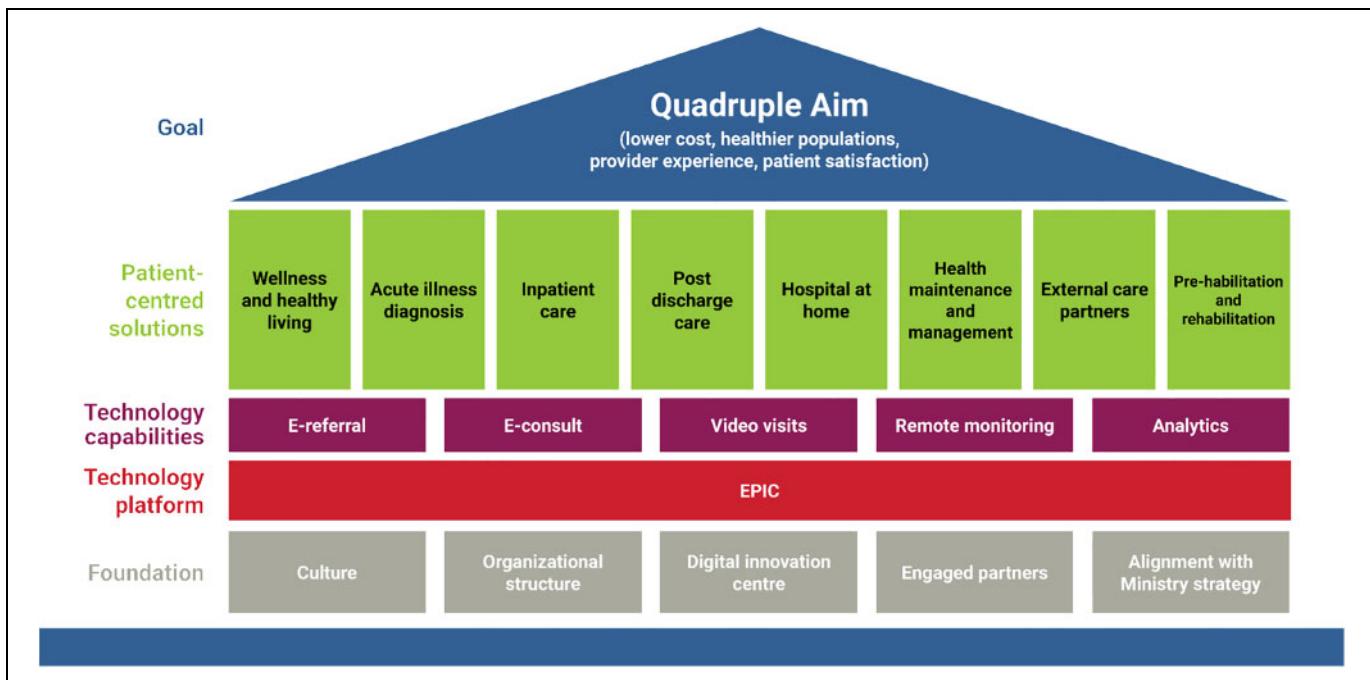


Figure 1. The Ottawa Hospital (TOH) virtual care innovation strategy.

1. E-referral: The ability for internal and external providers to electronically refer patients to tertiary and quaternary specialty care. This subsequently creates the ability to also monitor wait-times for patient access to care by specialty area.
2. E-consult: The ability for internal and external providers to communicate and share information with a specialist regarding a patient currently within their care, preventing the need to refer the patient for an in-person specialty appointment.
3. Asynchronous and synchronous virtual visits: Two-way digital communication between health providers and their patients that can include emails, teleconference, and videoconferencing/telemedicine.
4. Remote monitoring: Web and app-based health systems used with smart phones, tablets, or personal computers that encourage patients to play an active role in their health. Patient data are securely sent to providers or the care team for review and consideration in evaluation of treatment.
5. Analytics: Data integration and predictive analytics to increase access to health data for the purposes of improving population health and value for money across the health system.

Patient-centred solutions

Eight distinct areas of healthcare delivery were identified to help focus efforts of innovation development and deployment:

1. Wellness and healthy living: Digital applications designed to help individuals maintain or improve their

well-being through the promotion of healthy behaviours of living, such as diet, exercise, stress management, and illness prevention.

2. Acute illness diagnosis: Patients requiring urgent/emergent care for a new condition or worsening chronic disease/illness presenting at the hospital or in the community.
3. Inpatient care: Patients admitted to hospital requiring active monitoring of basic biometrics as well as the ability for bedside patient to provider or provider to provider virtual consultations.
4. Post discharge care: Patients discharged from hospital receiving post-discharge follow-up care to monitor their condition and symptoms, preventing re-admission and Emergency Department (ED) visit avoidance.
5. Hospital at home: Patient populations historically admitted to hospital or those that have been admitted or to the ED that can instead be safely discharged home with remote monitoring.
6. Health maintenance and management: Ambulatory patient consultations/follow-up care historically scheduled as in-person visits with providers or care teams.
7. External care partners: Patients undergoing care in external partner sites, such as hospitals, long-term care facilities, retirement homes, and so on, who require consultation and medical management.
8. Pre-habilitation and rehabilitation: Patients receiving pre-habilitation or rehabilitation care by a provider or care team in accordance with their active care plan.

Overall evaluation of the virtual care strategy will be completed through the identification of qualitative and quantitative

measures including patient and provider satisfaction surveys, utilization data, and clinical outcome measurements. These will help evaluate the obtainment of the quadruple aim within the eight patient-centred dimensions of healthcare delivery.

“Health maintenance and management”

case example: Virtual visits at an endocrinology and diabetes clinic

One example of adopting virtual care in the “health maintenance and management” dimension of the strategy was a pilot study in the Endocrinology and Diabetes clinic at TOH. In preparation for the pilot, a multidisciplinary committee was established to determine best practices based on a literature review, expert opinion, and an environmental survey of existing Ontario virtual care programs. Current and future state mapping and stakeholder engagement was used to develop and implement the program using TOH’s innovation framework.¹⁰ Eligibility criteria was established, including provider determination that the appointment was clinically appropriate to be conducted virtually, and patient access to a device with video/audio capability, internet connection, and an email account. Provider eligibility included access to an internet-enabled device with video/audio capability and registration with the provincial Ontario Telemedicine Network (OTN) platform. Both physicians and allied healthcare professionals in the clinical setting were included in the pilot.

After providers received one-on-one training of the virtual visit workflow and technology platform, the project was officially launched at a multidisciplinary Grand Rounds through an onboarding exercise. Providers received “at the elbow” support during their initial virtual encounters, and Plan-Do-Study-Act cycles were completed to refine the workflows throughout the pilot. A dedicated coordinator supported the booking of visits and reviewed associated workflows and technical requirements with patients in advance.

Methods and responses

Electronic surveys were distributed to collect feedback regarding patient and provider satisfaction with virtual visits. Of 492 surveys issued, 109 patients (22% response rate) and 149 providers (30% response rate) replied to survey invitations sent to patients and providers after each virtual visit. Over 76% of patients reported being satisfied or very satisfied with having their appointment conducted virtually as opposed to in-person, and being satisfied or very satisfied with their overall experience. Over 91% of providers reported that virtual visits improved access to care for patients, and both patients and providers felt that conducting appointments virtually saved time in their day.

Challenges experienced

Three main challenges were encountered during the virtual visit pilot:

1. Technical issues: Addressing technical difficulties experienced by patients and providers became significantly time consuming. Access to centralized technology experts may have helped address technical issues quickly as they arose. Hence, adopting a technology platform with a proven ease of use and efficient administration workflows could have improved the overall experience of providers and patients.
2. Engagement of healthcare providers: As with any new process, there were early and late adopters of virtual visits. Most healthcare providers became increasingly comfortable with this method of providing care after receiving additional at the elbow support. Therefore, allocating additional resources for training and support earlier may have helped alleviate frustration among some providers, ultimately leading to increased engagement and advancement of virtual visits during the pilot.
3. Framework for new method of healthcare delivery: As this pilot launched, virtual care was in its infancy in Canada with many unknowns concerning governance, physician remuneration, licensure for out-of-province care, guidelines for best practices, and safety and data security. Recently, there has been progress towards addressing these concerns and adopting professional frameworks. It is recognized that access to recognized and adopted guidelines and policies can aid institutions in designing and implementing safe and effective virtual care programs.

Overall recommendations of the virtual visit pilot

Establishing appropriateness criteria for inclusion of patients in virtual visits is recommended for providers. Patients who are independent and generally proficient with technology require less digital support, so understanding a patients’ ability in this regard is critical to enabling a positive experience. Appointing a physician lead to act as a champion as well as an administrative coordinator were also found to be important. Overall, this pilot demonstrated virtual visits are feasible and accepted by patients and healthcare providers as an alternate model of care delivery. At TOH, the lessons learned in this pilot helped inform the corporate rollout of virtual visits, which has seen the number of new active users increase from 167 to 442 (264% increase), and virtual video visits from 99 to 3,837 (3,775% increase) over the past 12 months. Health leaders seeking to implement virtual care in their organizations will first need to engage with physician and administrative leaders who are willing to champion new technologies. Providing appropriate training resources and technical supports for early adopters is highly recommended to help sustain troubleshooting and maintenance phases. Finally, corporate leaders will need to proactively collaborate with government partners to create sustainable and supportive

remuneration structures and policies that promote virtual care models to continue long term.

Conclusion

Unique enablers for adoption of virtual care innovations

In addition to the established organizational strategy, several unique enablers promoted rapid adoption of virtual care innovations at TOH:

1. Global pandemic—essential services mandate: In response to the global COVID-19 pandemic, Canadian hospitals moved to essential service models, slowing in-person visits, procedures, therapies, or treatments for non-urgent or emergent care. To enable continuity of care, many providers sought to adopt virtual care into their practices, such as video visits and remote monitoring sooner than previously anticipated.
2. Physician remuneration model: Although many physicians have provided care for some time through virtual methods such as phone, emails, or text messages on an ad hoc basis, historically these activities have not been remunerated. In Ontario, virtual care fee codes are now available within the Ontario's Hospital Insurance Plan (OHIP); therefore, creating no extra cost to insured patients. As an example, OHIP remunerates physicians for videoconferencing through the OTN at the same rate as face-to-face visits, and in one pilot, providers were paid an additional incentive fee for delivering the service using the technology. These changes to the local remuneration model have enabled practitioners to pivot their practice and integrate this new model of care delivery.
3. Epic system: As mentioned, on June 1, 2019, TOH launched its new health information system, Epic, bringing patient-centred care to the digital age. Providers now have real-time access to patient medical information, allowing them to make timely, informed decisions based on the most comprehensive and connected information available. This system served as a catalyst for virtual care innovation, with many providers promoting the maturity of its use to enable new models of care. As an example, patients now have greater access to their own information through a secure, on-line portal called MyChart which also allows them to communicate and upload information regarding their health and launch virtual visits.

Lessons learned and suggestions for success

The future of virtual care innovation is exciting, and leaders will naturally seek rapid adoption of solutions in clinical settings. However, it is important to recognize that some innovations represent significant changes to entrenched models of care and workflows. Fostering provider trust in

new technologies, including their ability to deliver safe, quality care, will take time. Innovations may be perceived as disruptive, inciting anxiety and creating potential for large-scale pushback. It is therefore critical that solutions be piloted in small groups with established relationships who can provide feedback for improvements prior to corporate rollouts. Early adopters who take ownership of the innovation's development are also required to help shape the final solution, recruit additional providers, and ensure adoption organizationally.

The promise of virtual care innovation

Rising healthcare costs, a critical shortage of access to care, and an aging population are creating an imperative for alternate care delivery models. The adoption and maturation of virtual care innovations in the Canadian healthcare context will bring about the system-level changes required to meet this need. To date, clinicians and patients at TOH have demonstrated great interest in leveraging this technology and early outcomes demonstrated in our case example include improved quality of care, effectiveness, and efficiency for patients, families, and providers. These outcomes will help propel the organization towards the achievement of the quadruple aim, and its vision “to provide each patient with the world-class care, exceptional service, and compassion we would want for our loved ones.”

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An innovation procurement clinical framework: A qualitative study

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Abstract

Innovation Procurement Strategies (IPS) strive for purchasing healthcare solutions that do not yet exist on the market and are increasingly being advocated to improve health outcomes while managing escalating healthcare costs. Due to the newness of IPS, there are limited resources available to healthcare organizations and professionals looking to engage in IPS. The purpose of this study was to develop an evidence-based clinical framework to guide healthcare organizations and professionals. Adopting a qualitative grounded theory approach, we interviewed participants with experience in innovation procurement to understand the skills, resources, and supports needed to initiate and oversee an IPS project. Using thematic design and open coding, three overarching themes emerged from the data and formed the basis of our IPS clinical framework. By describing the components, skills, and supports and resources necessary for engaging in IPS, our framework addresses the knowledge gap in healthcare organizations and professionals wishing to implement IPS.

Introduction

In Europe and North America, healthcare systems are experiencing increased pressure to provide quality care in the face of ageing populations and increasing prevalence of chronic disease while simultaneously trying to contain escalating costs.¹⁻³ This has led to the development of value-based healthcare initiatives, which place healthcare outcomes at the epicentre of healthcare planning and provision of services.⁴ In value-based healthcare, value is measured as a function of patient outcomes relative to the cost of delivering those outcomes.⁵ Healthcare outcomes are dependent on the healthcare problem being addressed and can include measures such as controlling blood pressure in a particular patient group,⁶ reduction of re-admission rate, or patient satisfaction with a medical device (eg, Norway opened a tendering process for new catheters after patients complained of pain with existing catheters⁷). Value in healthcare is varied according to the problem being addressed and the priorities of the stakeholders involved. In the Norway example, the traditional values would be product standards and costs, whereas in the second procurement, the values were expanded to include patient comfort and ease of use in evaluating the catheters. Value-based procurement supports value-based healthcare by applying value-based principals to procurement decisions. Evaluation of potential healthcare products and services is based on health outcomes, rather than exclusively on the cost of the product or service.⁴

Meeting healthcare demands sustainably also depends on the development and deployment of innovative products and services. The Conference Board of Canada defines innovation as “a process through which economic or social value is extracted from knowledge—by creating, diffusing, and transforming ideas—to produce new or improved products,

services, and processes.”⁸ To stimulate the development of innovative solutions to achieve better health outcomes and optimize the cost of delivering care, healthcare systems are beginning to leverage Innovation Procurement Strategies (IPS).^{9,10} Unlike traditional procurement, in IPS, the procuring organization focuses on understanding a specific problem, the stakeholders who will be impacted, and the health outcomes to be achieved, rather than fixating on what solution they perceive is needed at the lowest cost.¹¹⁻¹³ For example, when patients complained of pain from a catheter purchased through traditional procurement (where cost was the key factor), Norwegian health authorities launched a new tender for catheters. The new tender was structured to include patient feedback regarding pain (as well as ease-of-use feedback from healthcare professionals). The new tender was awarded based on a formula that included cost to purchase, as well as feedback from patients and healthcare professionals.⁷

Much of the momentum for innovation procurement has been driven by government policy-makers’ efforts to address the growing needs of healthcare and a desire to stimulate economic growth in the health technology sector. As a result, much of the current literature focuses on government policies needed to stimulate healthcare innovation, value-based healthcare, and IPS in general.^{7,14-16} There is documentation that provide procurement experts (PE) with guidelines on how to conduct an IPS.¹⁴ However, there is

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currently a dearth of literature addressing the skills, supports, resources, and culture needed for healthcare organizations and professionals to effectively engage in IPS. The purpose of this study was to develop an evidence-based IPS clinical framework for healthcare organizations and professionals. The research question guiding this research is, what are the major components of an IPS that are relevant for healthcare professionals and administrators at the clinical level?

Methods

Setting and participants

Our research adopts a qualitative grounded theory approach^{17,18} and took place in Ontario, Canada. We used purposive and snowball sampling to recruit 34 participants who had previous experience with IPS or HCP-IN.

Data collection

Three researchers conducted 22 interviews and 3 focus groups ($n = 5$; $n = 4$; $n = 3$) with PE ($n = 13$), government partners ($n = 3$), and healthcare professionals ($n = 9$) and centres ($n = 9$) with experience in IPS. Healthcare professionals included physicians ($n = 7$) and registered nurses ($n = 2$). Six healthcare professionals had previous experience with IPS and three had experience working in healthcare innovation, but not specifically with innovation procurement. Procurement experts included individuals who had experience in IPS and/or who worked in Shared-Service Organizations (SSO; eg, not-for-profit, non-share capital, supply chain services). Government partners included organizations working with the Ontario's Ministry of Health and Long-Term Care (in Canada, healthcare delivery has primarily a provincial or territorial mandate, with federal financial support). In addition, we approached two Ontario healthcare centres which had participated in innovation procurement. Interview and focus group protocols were informed by a needs assessment and research team discussions. Interview questions were designed to understand an inter-professional group of participants experiences with innovation procurement, perceived value of IPS, strengths, challenges, and lessons learned from previously completed IPS, as well as skills and training required to participate in IPS (see Appendices 1 and 2 here <https://healthsci.queensu.ca/source/opdes/IPS-Qual-Framework-Appendices.pdf>). To address reflexivity and mitigate bias,¹⁹ the interviewers had no connection to any of the participants, with the exception of one IPS expert who was also a member of the research team. Interviews and focus groups were conducted until data saturation was reached. All interviews and focus groups were audio-recorded and transcribed verbatim. Ethical approval for the study was obtained from the Queen's University Health Sciences and Affiliated Teaching Hospitals Research Ethics Board (File # 6024417).

Data analysis

We used the constant comparative method to analyse the data.^{20,21} We adopted an inductive, thematic design using open coding in NVivo 12 to allow overarching themes to emerge from the data.¹⁷ To ensure inter-rater reliability, two members of our research team independently coded two interviews and compared codes until shared meaning was reached. A codebook was developed and one researcher coded the remaining transcripts. Code saturation was reached when no new codes across all transcripts were required.²² Once all transcripts were coded, our research team met to discuss the codes, determine sub-themes, and identify overarching emergent themes. There were 57 independent codes that emerged from the data, which were subsequently grouped into 3 themes and 10 sub-themes. Pseudonyms were created using a participant group code and number: healthcare professionals with experience in IPS (HCP-IPS), healthcare professionals with experience in healthcare innovation (HCP-IN), government partners (GP), PE, and healthcare organizations/groups (HCG).

Results

Three overarching themes and 10 subthemes emerged from the data. The three themes included: (1) IPS processes, (2) building IPS capacity, and (3) supports and resources.

Theme 1: IPS processes

Theme 1 encapsulates the differences between traditional and innovation procurement, the goals and processes of innovation procurement, and the strengths and challenges of innovation procurement. Selected quotations can be found in Table 1 (available at: <https://healthsci.queensu.ca/source/opdes/IPS-Qual-Framework-Tables.pdf>).

Differences between traditional procurement and innovation procurement. Differences between traditional and innovation procurement were discussed by all participant groups. One critical difference between IPS and traditional procurement is that the final solution/product to be purchased is unknown at the beginning of the project. This contributes to the higher risk involved in undertaking IPS, making IPS only appropriate for a small number of purchases, where the value of the solution outweighs the high risk (and cost) associated with innovation procurement. Participants also described the goals of IPS relating to value and outcome, rather than the final product and/or cost. As compared to traditional procurement, considerable time is spent defining the health problem, engaging with stakeholders to understand the value the solution will bring, and working with vendors/industry to ensure the solution meets the desired outcomes.

Strengths of innovation procurement. Participants across all groups described key strengths of IPS as compared to traditional procurement. They discussed how IPS allowed for value creation and engagement of both healthcare

professionals and vendors. Healthcare professionals and procurement expert groups discussed the value of having clinician involvement, including creating greater buy in and ensuring solutions meet the needs of key stakeholders actually using the solutions (eg, patients). Additionally, participants in each group stated that increased dialogue and collaboration between a procuring team and vendors/industry were advantages of IPS. Several participants recognized the benefit of early market engagement events as well as design contests, co-design partnerships, shared risk models, and consortiums between the vendors themselves to provide the best solution.

Challenges of innovation procurement. All participant groups identified challenges of IPS, either through their lived experiences or through a theoretical lens. The most frequently discussed challenges were time commitment and lack of required skills. Innovation procurement strategies take considerable time to complete and thus require considerable time commitments from those involved in the process. Secondly, due to the newness of IPS in Ontario, some participants spoke about the lack of established competency within healthcare centres and the need for developing new skill sets. Additionally, participants from two participant groups (PE and GP) spoke of the increased complexity and risk involved when engaging in IPS as compared to traditional procurement. There was, however, little discussion about what factors contribute to the complexity or how to manage complexity.

Theme 2: Building IPS capacity

This theme describes the need to increase IPS awareness among healthcare professionals and hospital administrators as well as the skills needed to effectively participate in IPS. Selected quotations can be found in Table 1 (available at: <https://healthsci.queensu.ca/source/opdes/IPS-Qual-Framework-Tables.pdf>).

Increasing awareness and capacity. Due to the newness of IPS and to gain buy in, participants across the groups identified the need to increase awareness of innovation procurement by either utilizing individuals within an organization or accessing external experts. The most commonly discussed method for increasing awareness of IPS was by communicating successful examples within their own organization or to the larger community (eg, via showcases and/or case studies). One participant described the important role hospital leadership have in advocating the strengths and usefulness of IPS. In terms of building internal capacity, healthcare groups and healthcare professionals shared examples of how SSOs and healthcare organizations brought in external experts to relatively rapidly build capacity.

Skills needed. Participants were asked to identify skills needed to effectively participate in IPS. The most commonly described skill was being open-minded to change including the way they think about procurement. Other skills identified as essential

included creativity, systems thinking, design thinking, innovative thinking, critical thinking, good oral and written communication skills, and negotiating skills. The innovative aspect of IPS means that the end solution is not fully known at the beginning of the procurement process, so participants discussed the importance of having team members who can think outside of the box and who understand the health system at large. As IPS teams are generally large and multidisciplinary, team members must be effective communicators and be able to convey clearly desired outcomes with vendors/industry.

Theme 3: Supports and resources

This theme describes the different supports and resources, both internal and external, needed to implement an IPS project including human resources, stakeholder engagement, IPS expertise, and funding and time resources. Selected quotations can be found in Table 1 (available at: <https://healthsci.queensu.ca/source/opdes/IPS-Qual-Framework-Tables.pdf>).

Human resources. Participants in all groups identified the need for human resources to support IPS projects. Some participants spoke of the need for large and diverse teams to have all the necessary skill sets. Several participants spoke specifically about the importance of project champions, hospital leadership, and key opinion leaders for driving IPS projects.

Engaging stakeholders. One of the unique features of IPS is that of regular and ongoing stakeholder engagement. Some participants highlighted the opportunity for clinicians to be driving desired health outcomes as they would be the ones from which a health problem is identified. Additionally, participants discussed how clinicians can offer valuable insight into clinical workflows, which helps ensure that innovations meet the needs of clinicians and patients, and encourage buy in of the solution.

Engaging vendors/industry. Another feature of IPS is the nature of the engagement with vendors. Critical to the innovation procurement process are the collaborative relationships between procuring organizations and vendors. All participant groups spoke of the importance of working with vendors throughout the process to ensure an optimal solution that achieves the desired outcomes.

Dependence on IPS experts. Due to the novel nature of IPS and lack of capacity in most healthcare organizations, several participants believed there is a strong dependence on IPS experts. Most participants expressed that if healthcare organizations were to engage in IPS, they would need to rely on external expertise to guide and facilitate the project.

Funding and time resources. Innovation procurement strategies require large amounts of funding and time. Many participants spoke of IPS needing external funding because of the complexity and time required to complete an IPS project. One healthcare group elaborated on one of the reasons for

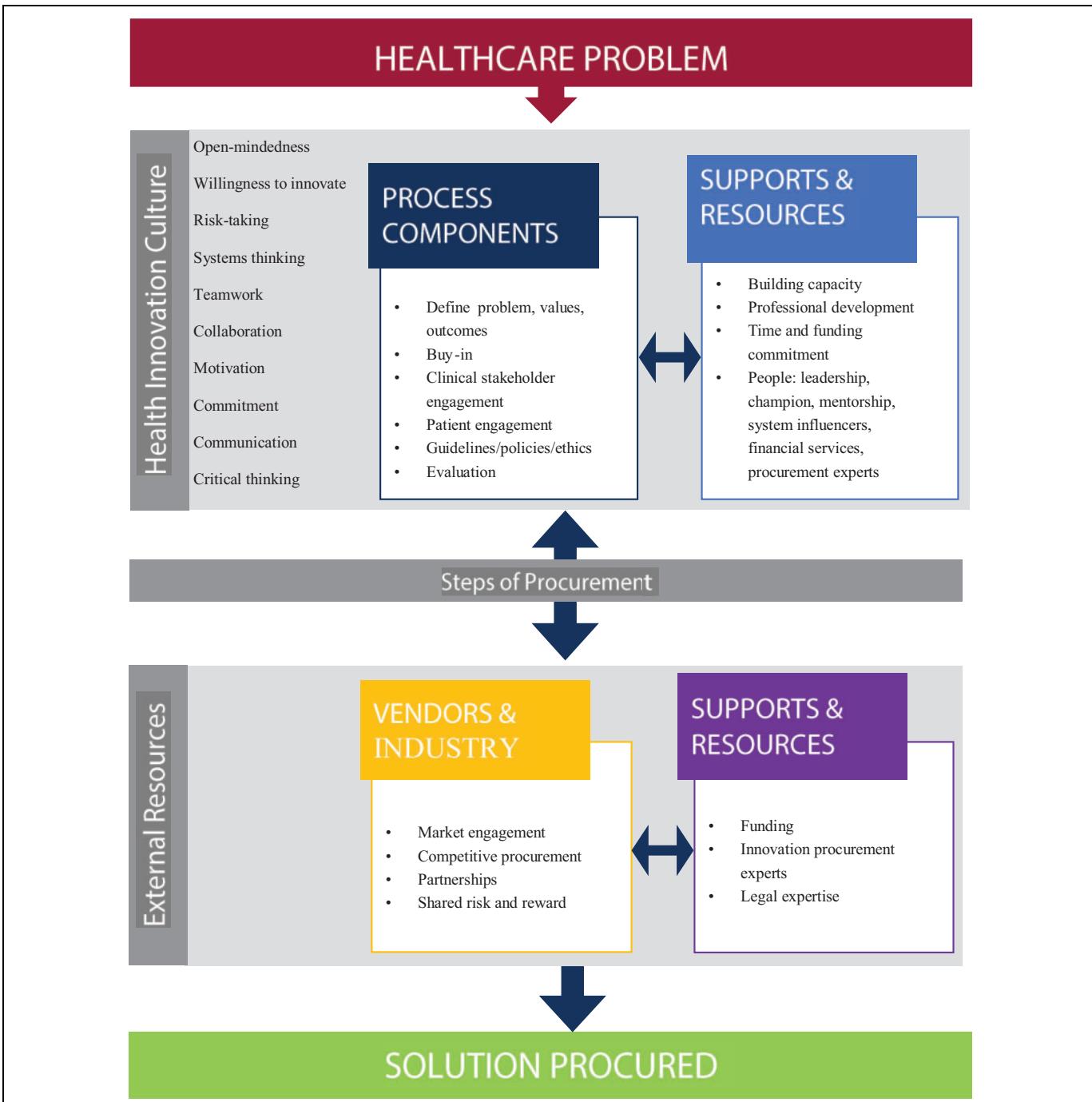


Figure 1. Innovation Procurement Clinical Framework. The framework illustrates four major components of an IPS at the clinical level: i) the healthcare problem that is being addressed, ii) internal supports and resources required within a healthcare organization that is looking to engage in an IPS, iii) external supports and resources needed to support the project, and iv) procurement of healthcare solution based on long-term value described in the healthcare problem.

the need for funding, being the need to hire external expertise. All participant groups specified that IPS was both time consuming and a long process. Given that most healthcare professionals are working at full capacity, both time commitments and managing schedules for an IPS project were difficult.

Discussion

Based on our findings, an IPS clinical framework was developed (Figure 1). This framework addresses the knowledge gap that exists for healthcare administrators and professionals and describes the process necessary for

engaging IPS at the clinical level. It provides a foundation for healthcare organizations wanting to engage in their own IPS project by identifying the required internal and external components.

The framework includes four major components for IPS at the clinical level: identification of the healthcare problem, essential qualities of a health innovation procurement culture, external supports and resources needed to support an IPS, and procurement of the solution.

The healthcare problem

First, in any potential procurement of an innovation solution, it is important to explicitly identify the healthcare problem. Healthcare professionals are the frontline of patient care and will be typically be the ones to first observe and articulate a health problem. In IPS, time is required to fully understand the problem and articulate it in such a way that invites innovation without prescribing a specific solution that addresses the problem.

Internal supports and resources

This component of the framework includes the internal culture, processes, supports, and resources required to engage in IPS. Many participants spoke of the importance of having an organizational culture that is open-minded and committed to engaging in IPS. As there is greater risk of failure associated with IPS as compared to traditional procurement, the procuring team should be open to risk-taking and understand how to balance it with the potential value of an IPS solution. Organizations undertaking IPS require motivated, collaborative, and committed team members.

An IPS project generally involves different processes than those found in traditional procurement. For example, health outcomes are defined through engagement with stakeholders such as patients, healthcare professionals, and hospital administrators, rather than solely through analysing the cost of the intervention.

In addition, IPS projects require additional internal supports and resources. For example, IPS requires a larger and more diverse team consisting of healthcare leaders, innovation champions, system influencers, patients, financial services, and procurement experts. Additionally, as IPS projects tend to take longer than traditional paradigms, these require extended time commitments from team members and funding to support their involvement.

External resources

Innovation procurement strategies projects also require external supports and resources. These include collaborative relationships with vendors/industry that develop through market engagement activities and, in some cases, partnerships to develop the innovation and share risks and/or rewards. Due to the novel nature of IPS in Ontario and the lack of IPS capacity within most healthcare centres, these strategies often rely on external experts to guide them

through the process. This expertise predominantly has been through SSOs and individuals with experience with IPS. Legal advice can be useful due to the increase complexity and risks in IPS projects and, in some cases, the creation of new intellectual property.

Solution procured

The IPS process eventually awards contracts based on the long-term value rather than solely on the lowest purchase price. Procuring teams should consider options including single contract, phased contract, or multiple contracts and exit strategy in case the vendor/solution is unable to deliver as promised. Teams must also consider the risk involved in production of solutions as well as who owns intellectual property rights. Given the increased complexity and risks in procuring an innovative solution, contract management becomes increasingly important as compared to buying an existing solution.

Risks and benefits of IPS

Due to the increase in complexity of IPS as compared to traditional procurement, the IPS process is more resource intensive and can incur more risks. One participant estimated that IPS are only appropriate for a few small number of procurements (~5%). When to pursue an IPS comes down to the desired outcomes and currently available market solutions. For example, a Canadian provincial health authority used IPS to purchase new pacemakers, cardiac resynchronization therapy devices, and implantable cardioverter defibrillators.⁷ A desired outcome was improved battery longevity as surgery is required to replace a pacemaker battery, therefore increasing the risk of medical complications and cost of care. Due to a lack of clinical data, a risk-sharing scheme was used, meaning that the supplier would pay for the cost of replacement surgery if battery longevity was shorter than predicted. This in turn provided incentive for suppliers to give accurate life span information and provided better patient outcomes.

Innovation procurement strategies are about addressing the process to obtain innovative solutions that can enhance the capacity of healthcare professionals to meet health outcomes, while facing fiscal and other challenges. For example, if hospitals do not have sufficient personal protective equipment, they cannot protect their workers or patients. However, once the health system articulates its needs, existing and non-existing vendors can rise up to meet the needs. Recently, distilleries across Canada have been making hand sanitizer to help meet the needs of hospitals,²³ while some clothing companies have turned to making scrubs and patient gowns.²⁴

Limitations

Limitations to this study include the limited inclusion of IPS expertise as a result of the lack of IPS experts in Ontario. While

considerable effort was made to identify and seek out professionals with experience in IPS, many of our participants had limited experience. Second, the framework does not include the legal components of IPS.

Conclusion

The purpose of innovation procurement is more than transforming the procurement practices; it is a shift from cost containment to value creation and health outcome improvements. Innovation procurement strategies enable the health system to adopt innovative solutions more effectively and attain better understanding and risk sharing in addressing complex problems. The innovative and value-based procurement approach focuses on the needs of patients, caregivers, healthcare providers, and health system priorities. Implementing an IPS differs significantly from conventional procurement in its objectives, process, timeline, cost, and risk. Innovation procurement strategies offer the potential of a significantly enhanced value proposition for large purchases, but it is important to have multidisciplinary expertise and committed healthcare professionals.

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Health City: Transforming health and driving economic development

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Abstract

Health City was established in the fall of 2018 as a Canadian not-for-profit corporation that works with numerous stakeholders to develop new pathways of care that can drive better health outcomes and economic development in the health sector. Data, artificial intelligence, and extended reality are technology platforms in healthcare that are highlighted in the context of Health City Initiatives presented here. Health City's future area of focus in addressing challenges in procurement for health innovations is also discussed as a new approach that connects the health industry to healthcare. Health City has been an active stakeholder in health innovation in Edmonton and will continue to focus on developing a global niche and owning that space through meaningful partnerships and impactful projects. This will drive improved health outcomes and economic development for the Edmonton region and Canada that can be scaled globally.

Introduction

In the summer of 2017, the mayor of Edmonton, Don Iveson, with leadership from a steering committee,¹ launched Health City.² The intent stemmed from a confluence of factors that included the need to diversify our regional resource-based economy, increasing cost pressures on our health system while relative healthcare performance in Canada continued to decline,³ and the Edmonton Region's potential to participate in the global disruption of the health sector.⁴ These factors also apply broadly to the rest of Canada where provincial healthcare costs are approaching 50% of annual budgets in several Canadian jurisdictions.⁵

What is also clear is the opportunity for the municipality to play a role in health. Health is impacted by all levels of government. Typically, municipal governments do not play a substantive role in health planning or investment decisions. However, municipal investments often have direct impact on social indicators of health. If municipalities better understand these indicators and make investments that are coordinated, they unlock the ability to influence the entire health value chain. This enables the health system to act strategically and proactively in concert with the municipality to make an impact on both health costs and outcomes. Although a complex task, other global jurisdictions have accomplished this⁶ and Edmonton must try as well.

The formation of Health City

Health City was officially established in the fall of 2018. Health City is a Canadian not-for-profit corporation that works with clinicians, innovators, philanthropic organizations, and companies to develop new pathways of care that can drive better outcomes and economic development in the health sector. Health City is Edmonton-championed with a national scope.

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Health City develops and executes transformational projects that leverage innovation and talent to increase patient access and to foster effectiveness within care teams. In doing so, Health City creates an innovative "living lab" environment that promotes the development of regional innovation. In turn, regional innovation retains and attracts companies to scale regionally and export globally. By bridging non-traditional partnerships and deconstructing silos, Health City can achieve its mandate to diversify our economy, drive cultural change and policy adoption, and provide validation opportunities for regional health-based companies.

Health City initiatives: Responding to trends and needs in healthcare

The digitization of healthcare has been a complex discussion over the last decade, but it has now arrived. To win in digital health—in the same way Netflix won in media streaming—organizations need to rethink their business models to meet goals related to cost, quality, patient engagement, and customer experience. To proactively embrace digital health, it is important to take note of other industries where digital convergence is a way of life. The pressure is on the health sector to catch up and keep up. As other industries have learned, disruption through digital innovations is full of threats and opportunities.⁷

There are many innovators from industry who are looking at the big picture and developing novel solutions to well-established healthcare challenges. Health City embraces these innovators and includes them as part of the team for health innovation. This collaborative effort enables Health City to

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impact health transformation and, of equal importance, to drive economic development. Thus far, the initiatives that Health City has been involved in are mainly related to digital health. As such, data, artificial intelligence, virtual care, and extended reality are trending areas of influence in healthcare that will be highlighted in the context of Health City Initiatives presented in the next sections.

The data opportunity

The use of data in healthcare has been bantered about for some time. The opportunity is not about “monetizing” the data; the real opportunity around data is to effectively track and use the right data to drive better health outcomes. Like in other industries, there is no reason why health companies should not play a defined role to join forces with health systems to address key public health or operational challenges in a transparent manner.

Industry consultation and participation is often done in sectors such as energy, agriculture, and the auto industry. It is key to find a way to do the same in the health sector. Adopting policies for proper use of healthcare data enable nations to both nurture a domestic healthcare industry and to reshape interactions with multinational companies that provide healthcare goods and services. The underlying motivation is clear: publicly funded healthcare is invariably a valued social program but can also contribute to economic development.⁸ In relation to data use, Health City has important initiatives underway.

One of the ways to address privacy with healthcare data is through the concept known as synthetic data. Synthetic health data sets are generated from real data sets that contain actual patient information. Statistical methods are used to maintain the quantitative properties of the original data set, yet importantly do not correspond to identifiable individuals from the original data set (the data set contains fictitious patient data). Thus, synthetic data maintains patient confidentiality. Since synthetic data contains no protected health information, the data sets can be shared freely among health investigators or those in industry, without raising patient privacy concerns or contravening the Alberta Health Information Act.

Health City is exploring the value of synthetic data in a collaboration with the Institute of Health Economics, Alberta Innovates, the University of Alberta, and an Ottawa-based start-up—Replica Analytics—as an innovation that can address existing reservations around de-identifying data, and the ability “re-identify” individuals’ personal data.⁹ This project is focused on achieving four key objectives, which are critical to the future scale and spread of a larger synthetic data initiative. These objectives are establishing a process for generating synthetic data that are representative of an existing Alberta Health database; identifying, documenting, and addressing the privacy and security concerns of key groups in Alberta (eg, Canadian Intellectual Property Office, data custodians, ethics boards) for future use and distribution of

the generated synthetic data set; analyzing and validating the synthetic data set to ensure their future utility; and presenting the results and outcomes to key government stakeholders that may assist in the development of required policy changes in data access, as well as acceptance of analyses conducted with synthetic data.

The initial stages of this work are expected to be completed by the fall of 2020. The anticipated outcomes could lay the foundation for future scale. Additionally, community and industry researchers may have increased opportunities for data accessibility and consequently, increased collaboration with the health system in a safe way that allows for the exploration of innovative solutions in various areas of healthcare.

Artificial intelligence to drive health outcomes

Remote and rural communities can be burdened with a lack of infrastructure and resources to ensure the delivery of adequate healthcare as compared to major centers. Equitable access to healthcare services is still a considerable barrier that must be addressed to meet the needs of these communities. Such barriers can lead to undiagnosed conditions that can result in long-term complications, straining an over-burdened acute care system. With rapid advancements in technology, closing the gap to equitable access is becoming a real possibility with solutions being developed within the Edmonton region. As an example, MEDO.ai, an Edmonton-based start-up, has developed technology which is being used in rural communities to aide in disease diagnosis and timely intervention. Through a partnership with Health City, WestView Primary Care Network (PCN), and Alberta Innovates, MEDO.ai has been able to deploy ultrasonography in remote and rural communities to diagnose hip dysplasia in newborns.¹⁰ Harnessing the power of artificial intelligence, the technology aims to better diagnose hip dysplasia in patients, with the anticipation of leading to timely intervention for improved health outcomes at the point of care in community care settings.

Another Health City initiative began with a collaborative partnership with Boehringer Ingelheim (Canada) Ltd (BI). The goal is to leverage artificial intelligence to examine patient data, with a focus on the social determinants of health, to better address health issues (including seniors’ health and chronic diseases). The project uses natural language processing on unstructured physician notes in patients’ electronic medical records where information on the patients’ social indicators of health often resides. Using such data, BI can develop risk prediction models that will support clinicians in augmenting and customizing care pathways for their patients.¹¹ The Health City partnership with BI is expected to drive innovation in the Edmonton region while yielding improved patient outcomes. The partnership, while in its infancy, has already created multiple collaborations with local innovators in the private sector, including Okaki Health Intelligence and AltaML, as well as partnerships with

the University of Alberta and SAGE Seniors' Association. At the heart of using artificial intelligence is the development of tools that can facilitate frontline providers to identify patients' needs, optimize care pathways, and focus on prevention.

Virtual care

Digital-based technologies not only address efficiency and improved tracking and measurement, but also enable basic tenets that Canadians hold dear, such as access to high-quality healthcare. While Alberta has slowly adopted virtual care, the COVID-19 pandemic has accelerated these changes thus creating opportunities to leverage gains and we are encouraged will likely to continue post-pandemic. Health City is currently involved in two key multiparty projects that demonstrate emerging models in virtual care delivery. The first is the Alberta Central Zone PCN Home Health Monitoring project (HHM). This initiative—a collaborative effort between Health City, Alberta Central Zone PCNs, Telus Health, BI, Alberta Innovates and Alberta Health Services—aims to deploy a community-based HHM solution for individuals with chronic conditions.

Patients across three PCNs in central Alberta will soon be participating in an HHM technology trial. The aim is to implement and rapidly scale proven remote monitoring digital technologies. This will alleviate stress on the health system while serving as a national model for ongoing stability of care. By reducing the risk of infection, enhancing patient recovery at home, and promoting self-management, it may be possible to shorten the time necessary for (post-pandemic) economic resurgence in Canada.

The second project pertains to virtual care delivery in Long-Term Care (LTC) facilities. Health City has partnered with Centric Health and BI to implement an initiative that will provide access to remote treatment to senior residents in LTC facilities in rural communities. In view of the scope of practice of Alberta Pharmacists, the Centric Health team will work closely with the selected LTC sites to establish a process whereby the pharmacist will send a daily schedule to the on-site staff member with a list of patients to be seen virtually. This project will be able to provide essential services to seniors while offering a proof of concept for how virtual services can be scaled across Centric Health and other organizations.

The overarching goal of virtual care Health City initiatives is to develop both operational and outcomes data around community-based models of care that can inform policy-makers as they consider virtual care solutions as part of the healthcare delivery toolset.

Extended reality

The extended reality market is also a key area of focus for Health City. In particular, *Enhanced Learning Incorporating eXtended Reality* (ELIXR) has the ability to

bring Edmonton-based post-secondary institutions together under one umbrella, building critical mass for such an important health subsector. Educators and practice experts will have the ability to create virtual and augmented reality simulations, training, and learning experiences. Using agile strategies, content can be distributed collaboratively through ELIXR's network of publishers to ensure that high-quality, extended reality learning experiences are made widely available to benefit students' and practicing professionals' continuing education and development.

Health City's mandate is to help pave the way for the transformation of our health economy through connecting ELIXR to companies and organizations in Health City's network. This will enable a marketplace for both Business-to-Business and Business-to-Consumer transactions that will serve as an economic driver for extended reality in the health sector.

Health City's future areas of focus

One of the challenges to innovation is procurement. In most Canadian jurisdictions, when innovators initiate the process of demonstrating an application's utility on a broad scale, procurement presents a hurdle. This is true whether innovation is developed internal or external to the health system. Health City—through its collaborations with various stakeholders in government, private sector, and health systems—expects to facilitate the adoption of healthcare innovations by addressing barriers in procurement. These barriers include inadequate early warning, lack of engagement between procurers and suppliers, overly prescriptive and burdensome procurement processes, risk aversion, and procurement capability shortfalls.¹² Procurement teams often focus almost exclusively on the lowest up-front prices for products and services not fully considering the potential greater return on investment in a total cost of ownership model.

Health City's strategic initiatives and collaborations have the potential to facilitate embedding innovation in procurement policies and procedures while maintaining transparency, integrity, economy, openness, fairness, competition, and accountability as core fundamental principles of public procurement. A new approach that connects the health industry to healthcare, going beyond the traditional purchaser-vendor relationship that currently exists, is much needed. There is also an imminent need to address increasing healthcare costs while improving health outcomes that are stagnant at best.

Canadian innovation is not wishful thinking: It is already happening

Canadian innovation is already happening and Health City has been an active stakeholder. A tangible and exciting example is Edmonton's representation in the Canada-Chicago Mentoring

Program (C2MP). C2MP was formed as a partnership between the Canadian Trade Commissioner Service and the Chicago Innovation Mentors at MATTER.health. C2MP delivers tailor-made mentorship focused on life sciences and healthcare innovators working in pharmaceuticals, health IT, and medical devices to Canadian companies. The competitive application process saw the admission of three Edmonton-based companies (RUNWITHIT Synthetics, UMAX Care, and Health Gauge) in the 2019 six-month program, emphasizing the strength of the Edmonton region's med-tech companies.¹³

As an opportunity to celebrate these companies, but also create opportunities of collision with C2MP and other local innovators, Health City hosted a unique forum to showcase the Program as part of its 2019 Breakfast Series. The panel-centric breakfast featured a participating C2MP mentor, regional innovators excelling within the C2MP, and the Canada Trade Commissioner Service. The anticipation is that more regional-based companies will apply to future C2MP cohorts, gaining access to expertise from mentors in the Chicago area while excelling and growing their companies locally. For those interested in following Health City's initiatives and exciting news, the web site <https://edmontonhealthcity.ca/> and the Twitter account @Yeghealthcity are the places where the most current information can be found.

Conclusion

Canada's estimated spending is \$264 billion in 2019, representing 11.4% of its gross domestic product. While many jurisdictions boast about their clinical and academic excellence globally, or innovations they have developed that are having global impact, most view the Canadian health systems through a single lens—a “cost centre” that needs to be managed. The progress and success achieved by Health City come in part from the organization's ability to host a table to explore projects that are informed by many stakeholders. Health City has an opportunity to drive innovation in the health system while simultaneously building a sector that can play a role in Alberta's economy. This combination will be even more vital in Alberta's post-pandemic recovery.

Overall, the emerging health economy is being disrupted by trends in healthcare, including digital health, virtual care, artificial intelligence, and extended reality. If the Edmonton region is to compete in these high-growth markets, Health City needs to continue to focus on developing a global niche and owning that space through meaningful partnerships and impactful projects. This will drive improved health outcomes and economic development for both the Edmonton region and Canada which can be scaled globally.

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Embracing the Quadruple Aim: One hospital's experience

Mike Lapaine, BA, CGA, MBA¹ 

Abstract

Healthcare institutions have for some time pursued the Triple Aim: improve patient health outcomes, improve patient experience, and reduce costs. More recently, it has been recognized that the “missing piece” of success is to improve the experience of their clinicians in order to improve the three aims. The leadership of Bluewater Health has been using the Quadruple Aim since 2016 and, by working to improve employee engagement, has succeeded in also delivering exemplary care that has improved patient outcomes and experience and reduced costs.

Introduction

Healthcare institutions have for some time pursued the Triple Aim: improve patient health outcomes, improve patient experience, and reduce costs. But improving outcomes in the three areas cannot be achieved by simply pushing physicians and staff harder. In fact, more recently, it has been recognized that the “missing piece” is to improve the experience of their clinicians in order to improve the three aims.¹ The importance of the Quadruple Aim has now been recognized by the Ontario Ministry of Health: the Ontario Health Teams (OHTs) self-assessment form asks organizations to address it.

The leadership of Bluewater Health has been using the Quadruple Aim since 2016. We first encountered it at a conference on mental health for healthcare professionals, and it resonated with our experience. Healthcare entails unique stresses and vicarious traumas that can lead to burnout and a loss of resilience. In fact, 30% of Canadian doctors are assessed as burned out according to the Maslach Burnout Inventory,² and nurses report depression: a 2005 Statistics Canada report found 9% of male and female nurses acknowledged depression in the previous year versus 7% of women and 4% of men in the general population.³ Additional workplace research demonstrates that when people get burned out, they are not able to feel caring or compassion.⁴ It is easy to see how that would negatively affect the patient experience. If our workers are not having an exemplary experience, our patients can't either.

Furthermore, compassion begins at the top. As leaders, we need to show compassion to our employees and physicians first: recognize the pain and suffering they themselves experience and take the steps to alleviate it so that our employees can regain their natural resilience and experience joy in the workplace.⁵ As Olivia O'Neill, an expert in compassion in the workplace, has stated: “There's nothing worse than an employer rolling out a program on compassion while the boss himself is the same as always.”⁴

Employee and physician burnout negatively affects not only the quality of care but financial outcomes.⁶ One hospital leader reports that improved nurse well-being and experience resulted

in a 30% reduction in turnover in an organization with 1,800 nurses.⁵ This represented significant financial savings.

At Bluewater Health, when our biennial survey of healthcare organizations was conducted by NRC Health in 2016, leadership was not satisfied with the level of employee engagement, and especially the level of trust, that we discovered. An earlier period of job cuts had decreased morale and increased stress and distrust. Team dynamics were tense. Our Alternate Level of Care (ALC) numbers were high compared to our peers. And the stresses on our hospital were mounting: demand for our services increased as more patients arrived with higher acuity. The situation was not sustainable.

In the 4 years since adopting the Quadruple Aim, Bluewater Health has seen employee engagement increase, in particular trust in leadership. Meanwhile, time to bed transitions and the ALC rate have reduced, while patient experience results have improved (see Step 2). These have been achieved as the result of two major initiatives in the last 4 years designed to pursue the Quadruple Aim: developing a culture of kindness and building NOW—No One Waits. A third phase continues today, as we prepare to apply the Quadruple Aim to expanded relationships with partners.

Step 1: Creating a culture of kindness

Faced with low trust and engagement scores, our work with compassion fatigue and resilience specialists suggested one simple area to focus on—kindness. Liz Jazwiec, writing on workplace positivity, notes that kindness doesn't require money, training, or even a lot of effort.⁷ Bluewater Health began to create a culture of kindness in our hospital.

Through a series of focus groups, we considered “what does kindness look like?” A total of 27 frontline employees formed a

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new Culture of Kindness Employee Council, meeting monthly to shape a process to engage employees, and recommend activities and initiatives to strengthen our culture of kindness. Council members committed to performing a random act of kindness each day, and this was soon noticed by their colleagues; momentum gathered.

Teams throughout the hospital were encouraged to find ways to incorporate kindness into their daily routines. One step was to build a community by increasing inclusion: recognizing allied healthcare workers as full team members in all areas of the hospital. Teams held open houses or quizzes to let other teams better understand the work they do. As a result, staff are now more likely to help someone from another team. Some activities have been light-hearted as well as effective: the dietary team has a Random Acts of Kindness Cart that brings treats to various departments, and the pharmacy team offered colleagues “prescription refills” on acts of kindness.

As leaders, we demonstrated our commitment to kindness by making a public commitment that there would be no cuts to jobs or education. We updated our critical incident stress management process and were more ready to engage in caring conversations with employees at all levels. Our leadership training courses made it clear that expecting frontline workers to “tough it out” through difficult or traumatic experiences was a thing of the past. And we increased our efforts to acknowledge those who go further to help their colleagues or in providing patient care.

Kindness has made a difference. Bluewater Health now conducts annual surveys on key engagement questions. In 2016, when asked if Bluewater Health promotes a culture of kindness, 62% of employee respondents agreed. Two years later, 70% agreed, and in 2019, 76% agreed. Asked whether they could trust the organization in 2016, only 39% agreed; in the 2018 survey, 44% agreed, and 55% agreed in 2019. That is spectacular growth, but we need to continue growing that number.

It has made a difference for patients at Bluewater Health, too. Patient experience scores increased from 47% to 55% for emergency department patients and from 66% to 73% for general hospital patients. These are significant improvements in areas that are difficult to shift. Bluewater Health has continued to develop a culture of kindness, encouraging others to join us knowing that, “people who are kind, generous, and compassionate tend to be attracted to and be selected by organizations that match those qualities.”⁴

Step 2: Soliciting staff solutions to deliver care NOW

The second step in improving our results for the Quadruple Aim was our NOW campaign which launched in spring 2018. Increasing demand for care of an aging population in a time of fiscal restraint poses a sustainability challenge, and to find a solution, we knew we had to involve Bluewater Health staff and physicians. We asked them “what is our biggest

challenge for the future?” In more than 1,000 responses, there was a widespread conviction about the importance of strengthening patient transitions and increasing the well-being of staff: a clear articulation of the Quadruple Aim from our staff.

This led to the development of NOW, aimed at ensuring all patients will reach the next stage of their care journey within 2 hours. Our analysis indicated that, on average, each patient stayed one to one-and-a-half days longer than needed due to delays in transitioning and discharge, and our ALC rate was higher than our peer comparators (16.2% vs 12.7%).

We returned to our staff and physicians for their insights to identify and overcome the barriers in our processes that were causing delays in transitioning patients. Staff feedback led us to attach teams to three priority areas for improvement, researching, generating, and testing solutions, then scaling them up hospital-wide. From polling staff to testing solutions was approximately 18 months.

The first priority area, Matching Capacity to Demand, developed a collaborative model of care involving multidisciplinary teams and multiple ways to communicate and collaborate. Improved scheduling and a flexible short stay transition unit in our emergency department were also put in place.

Process efficiencies was the second priority area, where the team streamlined admission and discharge processes and established an estimated date of discharge, calculated and communicated to the patient and family upon admission. Physician-led initiatives supported patient journey mapping and added physician involvement to discharge bullet rounds.

The third priority was shaping and decreasing demand, which involved focussing on what only we can do—acute care—and strengthening our collaboration with our community partners so they can help patients with what they do best.

NOW’s primary targets were two aspects of the Quadruple Aim: improving patient health outcomes and reducing costs. When a patient must wait hours or days before moving from acute to rehabilitation care, or half a day to access a diagnostic test, this adds cost without providing benefit. Moreover, it prevents the next patient from accessing timely care, which can affect both patient outcomes and experience. In its first phase, from fall 2018 to December 2019, NOW succeeded in some key indicators. The average time to bed shrunk significantly from a baseline of 8 hours to 3.5 hours in December 2019. During the same period, the ALC rate reduced from a baseline of 16.2% to 9.1%, which represents a reduction in costs. At the same time, the overall patient experience rating improved from 65.9% to 73.3%. These are significant improvements, especially considering NOW had not yet fully rolled out to all areas of the hospital.

As progress was made for patients, it became clear that there was just as much benefit for employees: consistent delays are as frustrating for staff as they care for patients and families; a frontline worker in our emergency department described arriving for her shift and being shocked and delighted to find

that no one was waiting to be admitted. Other staff have commented on the relief of leaving a shift without the burden of guilt of leaving behind patients who still haven't been admitted after hours of waiting.

These anecdotes aligned with survey results in employee engagement: during the NOW campaign, trust increased from 44% to 55%, and as mentioned earlier, employee agreement that Bluewater Health promoted a culture of kindness grew from 70% to 76%. In addition, the number of employees who felt that senior management was committed to improving workplace safety jumped from 61.5% to 83.4%, and those who found the organization promoted staff health and wellness increased from 51.6% to 78.6% (all results from 2018 compared to 2019).

There is no question that our hospital could not have succeeded with NOW as we have to date without the foundation created by the culture of kindness, which increased trust in senior management, and elevated staff resilience and cross-departmental cohesion.

The next step: Involving partners

At Bluewater Health, we have established semi-annual leadership forums, where we come together to talk about how well our hospital is achieving our Quadruple Aims. We highlight various departments and look at their challenges, successes, and innovations. We get positive feedback that these forums are helping leaders to understand what is going on across the hospital and to develop a sense of common purpose across departments.

This model may guide us in our third phase: as we move towards the establishment of OHT and bring the Quadruple Aim to these integrated relationships. Ontario Health Teams will bring together hospitals with home and community care, primary care, and community service organizations. At Bluewater Health, we have spent 4 years developing good relationships with our community partners through, for example, Health Quality Partners (HQPs) of Sarnia Lambton, a regional quality improvement initiative that has developed a systems approach to improving care delivery involving improved communications and effective transitions for patients.

Together we have established standards of care for patients with chronic disease and included a common indicator on our annual Quality Improvement Plans (QIP) related to Chronic Obstructive Pulmonary Disease (COPD). The group achieved its target to reduce readmissions within 30 days for patients with COPD: improving from 18.5% to 16.35% in 1 year through a pulmonary rehabilitation referral including a standardized process and form that brings best practices to patients in the region. Another planned and shared QIP indicator is the early identification and assessment of patients with palliative care needs.

As we transition and expand HQP to an OHT, the trust we have developed among leaders must now extend to the employees of 35 organizations with different cultures. We need to begin the process of developing a shared culture based on our commitment to our patients. There is a real danger that in the face of so much change, including a change in organizational culture, employee engagement may suffer. So this is an area that we as leaders must focus on as we continue to pursue the Quadruple Aim.

Conclusions

By pursuing the Quadruple Aim and working to improve employee engagement, Bluewater Health has succeeded in improving patient outcomes and experience and reducing costs. Bluewater Health's experience has demonstrated that focusing on employee experience and engagement will help achieve everything in the Quadruple Aim. As a result, we have embedded it in our strategic plan and conduct annual employee well-being audits in addition to standard biennial third-party employee engagement surveys. We are investing in our physicians and staff to deliver the exemplary care that our patients deserve.

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Applied systems thinking: The impact of system optimization strategies on financial and quality performance in a team-based simulation

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Abstract

At its core, this research was undertaken to explore the extent to which system optimization leadership strategies such as innovation, collaboration, and data-driven decision-making affect financial and quality performance in organizations. A quasi-experimental pretest-posttest research design was used to examine the increase or decrease in system performance as a result of treatment in the form of a systems thinking workshop and strategy discussion. The application of three-core system strategies lead to significant gains in financial performance across all teams, and an increase in quality performance in all but one team. In addition to an increase in performance, this research also revealed the tendency of social systems to reflexively sub-optimize their performance and at times lose focus on higher order system goals. Helpful recommendations for leadership practice and future research are presented with a view to helping optimize whole systems and not solely their parts.

Introduction

This article presents a quasi-experimental study conducted with the intent of answering the question: “to what extent do system optimization leadership strategies, such as innovation, collaboration, and data-driven decision-making, impact measures of cost and quality in a healthcare organization system simulation?” The premise of this research is that simple system strategies can help overcome a tendency for system leaders to sub-optimize performance often to the neglect of whole system performance. This concept connects deeply to the systems thinking notion that structure drives behaviour and how departmental silos can emerge naturally and organically.^{1,2} Through the application of practical system leadership strategies, whole systems can improve their performance in the polarity³ of cost and quality. Practical recommendations for system leaders are presented and discussed toward the end of this article.

Using simulation and gameplay for learning systems optimization strategies

As Senge^{4,5} advises, system transformation and growth will have a number of challenges to be addressed in the initiating, implementing, and sustaining stages of change. One challenge in particular related to willingness and enthusiasm to commit to change is to show organizational colleagues that they should support the change “because it works.”⁴ The systems thinking learning tool *Friday Night at the ER*⁶ was chosen as a vehicle for this research since clear metrics are available to demonstrate how application of whole system optimization strategies “work” in the domains of financial and quality performance metrics.

Bacon et al.⁷ found that active cooperative learning through such simulations and games was effective in teaching systems

thinking and mobilizing that knowledge into practice. Young also indicates that “simulations of real-life scenarios directly link course theory to practice in a controlled learning environment, allowing learners to develop essential skills, gain confidence, and experience empathy.”⁸ In terms of effectiveness, Bacon et al. also found in their pretest-posttest design with undergraduate nursing students, that using *Friday Night at the ER*⁶ to help improve systems thinking abilities yielded “significantly higher average STS [Systems Thinking Scale] scores” in the posttest.⁷

In their most recent review of the systems thinking literature, Cabrera and Cabrera’s⁹ meta-analysis identified the works of significant contributors to the burgeoning field yielding 97 different approaches to systems thinking, 3,800 entries in a systems thinking encyclopedia and a network diagram containing 648 nodes of important systems thinking authors which led to thousands of connections among these authors. The literature in the systems field, therefore, has become vast, at times inaccessible and conflated in terminology.^{10,11} Systems thinking, a term proffered by Richmond,¹² is defined as the art and science of making reliable inferences about behaviour by developing an increasingly deep understanding of underlying structure. Authors such as Ackoff et al.¹³ take this notion further when they say that systems thinking is the practice of looking at relationships connectedness, process, the whole the patterns of a system, and its context. Williams’¹⁴ view is that systems

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thinking involves three key fundamental notions: boundaries, interrelationships, and perspectives. Others such as Arnold and Wade¹⁵ have examined multiple definitions of systems thinking and take a much more structured view whereby they apply the notion of systems thinking to itself as a definition: “a set of synergistic analytic skills used to improve the capability of identifying and understanding systems, predicting their behaviours, and devising modifications to them in order to produce desired effects. These skills work together as a system.”¹⁵

Cabrera and Cabrera’s⁹ analyses indicate that systems thinking involves four simple metacognitive processes: making distinctions, seeing systems as both part and whole, relationships as both a cause and effect, and perspectives as both a point and a view. Williams makes a similar case for three fundamental processes in systems thinking: boundaries, interrelationships, and perspectives.¹⁶ Boundaries can therefore serve as elements of structure both conceptually and practically, which is not something obvious in the *Friday Night at the ER*⁶ simulation, but which are latent in terms of what participants think can and cannot be done by certain professions within healthcare.

Authors such as Stroh,¹⁷ Senge,⁷ and Cabrera and Cabrera⁹ also state the importance of understanding our mental models in terms of shaping our views of the world, how we think things *should* work, and their ability to help us approximate what should happen in the real world. It therefore follows that we need feedback by way of data in one form or another in order to either (a) reshape our mental models or to (b) affirm our approximations and strategies for affecting the outer world. Without such feedback, it is possible for both individuals and teams to fall into our personal preferences for action rather than our awareness of how context guides our decision-making.¹⁸

Methodology

Design

A quasi-experimental¹⁹ pretest-posttest research design^{20,21} was used to examine the effect of the independent variable, simple system optimization leadership strategies on the dependent variable, cost and quality performance in an organizational systems simulation. Y₁ (pretest scores) were compared to Y₂ (posttest scores) to determine D (gain or loss scores expressed as a percentage) as a result of experimental treatment T in non-randomized group assignment. A non-randomized design was used since (a) there was an opportunistic sample of convenience available; and (b) the intended outcome of the use of a system simulation at a group conference was to demonstrate the potential value of systems thinking-related leadership strategies on cost and quality performance in an organizational system setting.

Research setting

In total, there were 45 participants who were senior executives of a global medical technology firm operating in the major

medical equipment space. Participants came from a variety of Central and Eastern European countries, representing an array of cultural, social, and ethnic backgrounds. Although English was the language of instruction and facilitation, the research participants represented 16 different countries and spoke no less than 13 different languages. Teams were comprised of four members and one observer. Teams were created based on maximum diversity across the organization so that they could also network and get to know one another while concurrently engaging in learning and team building.

Simulation gameplay

*Friday Night at the ER*⁶ is a systems thinking simulation-style game which demonstrates that systems thinking is the key to success in a variety of different metrics.²² In this table-top simulation, participants play the role of a manager in one of four departments: Emergency, Surgery, Critical Care, and Step-Down, for a simulated 24-hour period. Each hour, participants see patients arrive through a variety of means, they need to make decisions each hour (ie, staffing, open or closed departments, defer or accept ambulances) and they see patients exit each hour. At the end of the first round of simulation gameplay, participants calculated their financial penalties and quality errors resulting from their decisions, which served as a performance baseline.

Treatment between rounds

After completion of the first round, participants engaged in a 1-hour systems thinking workshop (T), centring on core system optimization strategies. Including how elements of structure drive behaviours related to innovation, collaboration, and decision-making. Innovation in this context refers to the ability to challenge mental models related to policies, procedures, practices, and widely held assumptions.⁶ Collaboration in the simulation occurs to varying degrees from minimal communication through to shared planning and shared accountability. Data-driven decision-making in the simulation refers to the performance metrics and feedback associated with cost and quality as opposed to past practice, mental models, and assumptions.

Participants then engaged in a second round of gameplay wherein the core strategies for system optimization were implemented. The gain or loss between Y₁ and Y₂ was calculated using the following formula:

$$\frac{Y_1 - Y_2}{Y_1} \times 100 = \%D$$

In addition to quantitative data collected, reflective observation notes were also taken. Such observations helped contextualize the gain or loss scores (D) between Y₁ and Y₂ which also gave rise to additional learning beyond the research question and treatment effect.

Table 1. Team cost and quality data from *Friday⁶ Night at the ER* paperwork^a

Team	Y ₁ = Round 1		Y ₂ = Round 2		D = Percent Change	
	Financial (\$)	Quality (Weighted)	Financial (\$)	Quality (Weighted)	Financial (\$)	Quality (Weighted)
1	90,240	10,525	24,840	7,320	72.47%	30.45%
2	187,230	10,275	41,520	7,760	77.82%	24.47%
3	143,210	9,890	11,640	1,700	91.87%	82.82%
4	118,910	10,080	21,440	3,650	81.96%	63.79%
5	43,330	4,355	19,410	4,500	55.20%	-3.32%
6	117,770	10,010	30,110	5,275	74.43%	47.30%
7	118,170	8,620	29,220	5,275	75.27%	38.80%
8	98,330	7,435	31,780	3,755	67.68%	49.49%
9	138,210	9,980	62,540	6,650	54.75%	33.36%

^aWeighted quality scores are negatively indicated and expressed as “Quality Errors.” A lower score in Y₂ compared to Y₁ is desirable.

Findings

At the end of each round, individual scores were transferred to a team summary sheet for their hospital. Table 1 below shows financial and quality performance for each team over two rounds, followed by the percentage improvement in the second round. Observer field notes were then compared and discussed by way of a thematic analysis which yielded common themes across observation data points.

Finding 1

System optimization strategies, when they are aligned with the basic principles of systems thinking, make a demonstrable, measurable difference in system cost and quality performance. The data in Table 1 demonstrate a substantial net increase in financial performance across all groups when applying three-core system strategies. Team three in particular shows a 91.87% financial improvement and an 82.82% improvement in quality between rounds.

The three system optimization strategies applied in the second round align with common, fundamental principles of systems thinking.^{7,9,17} It is worth noting that no team asked for data (costs and penalties), which supports Snowden and Boone’s assertion that we do not often consider the nature of the system we are in, rather, we make decisions and take action based on our personal preferences for action, which resonates with the notion of mental models influencing our behaviours.¹⁸ In this regard, innovation by way of challenging convention, practices, and rules is critical in unlocking other possibilities to help improve whole system performance.

Finding 2

When working across boundaries within an organization context, both individuals and teams reflexively sub-optimize. During round 1, participants were told that each team represented an acute care hospital in a large city with the superordinate goal of providing the greatest quality care at the lowest possible cost. In spite of this, teams stayed focused on their local issues and concerns to the neglect of the larger system goal. This “sub-optimization reflex” leads

the participants to take care of their own department only, while causing downstream problems beyond their immediate environment.

Finding 3

Differentiation both precedes and outpaces homogenization. During *Friday Night at the ER*,⁶ teams clearly set out with a common goal, but the notion of a “clock” (time required to complete the simulation) appeared to have caused teams to accidentally work *against* one another rather than work together for a common goal. Teams did not collaborate with one another; collaboration was seen as a hypothetical possibility during the team debrief and discussions between rounds 1 and 2. Further, teams became competitive with one another by virtue of their team’s identity relative to another, which is consistent with the social psychology of group identity theory.¹⁹ Collectively, however, the system of nine teams in one room acted as discrete agents arguably not connected through homogenization or commitment to a common mission. In round 1 of gameplay, this phenomenon was also evident at the team level, with each department managing within their differentiated organizational boundaries and functions until they were encouraged to collaborate to the greatest extent possible in round 2.

Finding 4

Identity, created through clear local boundaries, can limit system optimization. Boundaries^{9,16} are clearly evident in *Friday Night at the ER*⁶ (departments, arrows indicating flow, role titles, local and city boundaries). At the department level, Senge’s⁵ organizational learning disability “I am my position” became evident as managers first sought to use resources in their own department almost exclusively, to ensure it was performing as well as it could, but often to the neglect of the other departments, the whole system suffered since parts of the system were interdependent. Since structure drives behaviour,²³ the simulation lends itself to see the negative unintended impact of clear, albeit rigid boundaries, on the performance of the whole system.

Finding 5

Teams most often make system decisions based on factors other than data, most often mental models about how things are supposed to work. Participants knew that team performance would be measured along three dimensions: financial, quality, and the team's ability to complete the gameplay within a reasonable (1 hour) amount of time. Although participants were informed that financial penalties might occur, at no time during gameplay did they ask for data related to relative costs and penalties for decisions they had to make. Participants clearly and quickly identified how powerful mental models had led them to take certain courses of action rather than seek out data to help make decisions. Participants also commented on how the pace of the game drove behaviours; they did not want to underperform as a hospital relative to their peers in the room.

Finding 6

Even when provided time to consider the benefits of collaboration and to plan ways in which collaboration can occur, teams most often continue to demonstrate low levels of voluntary collaboration. During the workshop (T) between rounds 1 and 2, participants were shown a model of collaboration ranging from very low levels where only minimal information was shared between individuals and groups, up to higher levels with shared planning and shared accountability. Prior to round 2, the entire group was asked to share all strategies they could think of in order to reduce costs and improve quality. While participants recognized the value of collaboration, particularly in light of the overarching goal, no team collaborated beyond the boundary of their own local hospital during round 2.

Finding 7

Teams and departments, when seeking to respond to local surge demands on their system, often fall into the archetypal pattern of "tragedy of the commons." During round 2 of gameplay, participants avoided the highest financial penalty (deferring an ambulance) by calling in extra staff to assist (the lowest financial penalty). However, temporary over-use of part-time staff as a way to deal with system demand is an acceptable episodic strategy, in the simulation, but in reality it would not be sustainable. Qualified agency or part-time staff would realistically be a limiting condition and a limiting factor.^{7,24} For example, the Canadian Nursing Association reports that by the year 2022, Canada will see a shortage of Registered Nurses in the order of 66,000 full-time equivalent positions.²⁵ During gameplay, this phenomenon was evidenced by some teams occasionally running out of extra staff to call into work when needed.

Finding 8

When system performance decreases while implementing optimization strategies, the performance drop can be

attributed to a result of the over-focus on financial costs to the neglect of the quality care. In Johnson's³ work, he posits that systems will experience the downside of one pole in a polarity if there is an over-focus on that pole to the neglect of the other. In the simulation gameplay, all participant efforts appeared to be directed toward cost containment in round 2. As a result, teams were observed overcrowding bed spaces, hallways, and waiting areas, which is an indication of problems in the cost and quality polarity identified by Levknecht.²⁶ From the data shown in Table 1 above, Team 5 experienced a net loss in quality performance of -3.32%, which the team quickly identified as occurring as a result of their concerted efforts to keep their financial penalties as low as possible.

Implications

Implications for practice

The implications of whole system optimization strategies for organization leaders both inside and outside of healthcare are clear and actionable. As the data in Table 1 show, the application of basic system strategies can lead to significant gains in performance. Leaders will need to see value in non-clinical activities in harmony with clinical activities, particularly at the social system integration level²⁷ to show that such efforts make a difference and, can help overcome limits to growth.⁶

Leaders can benefit from whole systems strategies by seeking to create settings for integration and homogenization in harmony with individuation and differentiation both at the operational and strategic levels. Practically speaking, this means creating space for discussion of the mission and purpose of the organization system; its goals, commonality, and awareness of system issues. This might be achieved through large group sessions using specific design strategies such as Future Search,²⁸ Open Space Technology,²⁹ World Café,³⁰ and others.

Organization leaders can also benefit from shared planning, as compared to separate and discrete planning efforts. To increase organizational collaborative practice^{31,32} with a view to whole system optimization, gaining clarity on the types and nature of information needed by each party can yield higher levels of overall performance rather than relying solely on mental models to drive decisions and action. Collaborative planning requires an element of horizontal leadership³³ at a peer-to-peer level in order to be meaningful up, down and across the organization.

Organization leaders can benefit directly from the use of polarity maps^{3,34} to help manage what seem to be ongoing and at times intractable issues and challenges. Polarity maps, when created by groups of people directly involved in the issues at hand, can help provide a mechanism for both management and leadership of the issue(s). Polarity maps can help leaders identify upsides and downsides of efforts, downsides of over-focusing on one pole to the neglect of the other, and early warning signs and action steps required when engaging either pole.

Implications for future research

This study employed a quasi-experimental, pretest-posttest research design where group composition was predetermined based on the sponsoring organization's operational needs and considerations. Future research designs should include an experimental design with randomized group composition and a randomized control group to test the effect of the research treatment on round 2 performance.

Conclusion

Whole system optimization strategies such as innovation, collaboration, and data-driven decision-making facilitate a demonstrable improvement in areas such as system cost and system quality. Leaders can foster exploration and implementation of such strategies by creating large-group integration settings, shared learning opportunities, engaging in activities aimed at exploring structural factors limiting self-organization, and putting strategies into practice. Lastly, tools such as polarity maps can help leaders manage various tensions in systems in domains specifically aligned with performance metrics relevant to the organization's mission.

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Innovation processes for ageing-related health technologies

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Abstract

Innovative technologies offer potential benefits for the health and care needs of an ageing population, but the processes by which these innovations are developed and implemented are not well understood. As part of a Canadian research network focused on ageing and technology, we explored how technologies currently being developed to support older adults and their caregivers fare through the processes of innovation. We conducted a multiple case study focused on development of four technology products. Interviews were conducted with project members ($n = 8$) during site visits to the locations of the four cases, as well as with other key informants ($n = 12$). Directed coding, guided by the Accelerating Diffusion of Proven Technologies for Older Adults (ADOPT) model was used to analyse the data. Findings illustrate the complexities of innovation processes, including the challenges in developing a business case as well as benefits of a collaborative network.

Introduction

Practitioners, health leaders, and policy-makers are grappling with two concurrent realities: a rapidly growing ageing population and the growth of healthcare costs.¹ Innovative solutions and technologies have increasing potential to enhance the health and quality of life of a growing population of older Canadians who are living longer with increasing chronic care needs.^{2,3} In addition to the potential individual benefits, investments and attention paid to technology-enabled solutions could benefit the healthcare system in terms of reducing the growth of healthcare costs and improving productivity and health outcomes.⁴ Novel health technologies include telehomecare, GPS/locating technology, mobile health, telemedicine, sensor technology such as wearables and motion sensors, smart home systems, social networking and communication technologies, assistive robots, intelligent scooters, digital games, and more.^{2,4-7} These technologies may potentially promote physical function, facilitate early diagnosis, enable self-monitoring of health, encourage social interaction, and promote adequate treatment.⁵

Canadian innovators face a number of challenges for new and emerging technologies, including multiple jurisdictions creating separate privacy legislation, reimbursement criteria, different policy priorities, and multiple procurement systems.^{8,9} Challenges specific to the technologies which may help older adults age in place include difficulties in building sustainable business cases, a lack of interoperability among systems of different vendors, and a lack of robust scientific evidence on cost and outcomes.⁷

In addition to system-level challenges, innovators struggle with finding the necessary financial and human resources.^{9,10} Further, user-centred design can be more challenging with older people than with other user groups.¹¹ Because of these

challenges, promising ideas and pilot projects are rarely turned into commercial products or rapidly diffused across the healthcare system.^{12,13}

Recognizing the need to catalyse technological innovation and uptake, Industry Canada developed the Networks of Centres of Excellence (NCE) program. An NCE is designed to mobilize interdisciplinary research capacity across Canada focused on a social, economic, or health issue.¹⁴ The NCE funding structure incentivizes collaboration among industry and researchers.⁹ The AGE-WELL (Aging Gracefully across Environments using technology to support Wellness Engagement and Long Life) NCE is focused on technology and ageing and was established in 2015 with \$36 million dollars in funding over 5 years (and was recently renewed for another 3 years). The network brings together over 150 researchers from 37 universities and research centres across Canada and over 200 governmental, industry, and non-profit partners.¹⁵ The aims of this network include increased independence and quality of life for older Canadians, improved health outcomes, reduced caregiver burden, and stimulating economic growth in the technology and ageing sector.¹⁶ AGE-WELL provides a platform to facilitate technological innovation and opportunities to study the processes of innovation.

We aimed to explore, within the context of a technology and ageing research network, the factors that facilitate or constrain new technologies (specifically with a focus on health

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technologies to support older adults) from ideation to development through to implementation, as well as the relevant policy, regulatory, and/or health system issues.

Methods

We used a multiple case study design to examine technologies being developed within the AGE-WELL NCE.^{17,18} Our work was guided by the ADOPT theoretical model: Accelerating Diffusion of Proven Technologies for Older Adults, which discusses considerations for diffusing health technologies for older adults from development through to implementation.¹⁹ The centre of the model highlights factors that affect technology adoption and use relevant to older adults, their collaborators, and their context. The model then overlays seven strategies for designing and promoting the use of technologies: design user-friendly relevant technology, establish technology value, create a business model, promote technology, form partnerships, identify technology champions, and coach users.¹⁹ This model is aligned with the goal of AGE-WELL, which seeks to develop commercializable products that will be used to benefit older adults and their caregivers.

We focused on four AGE-WELL cases representative of the technologies being developed in the network that could help older adults and caregivers maintain independence, health, and quality of life. To ensure confidentiality, only general characteristics of the cases are summarized. The cases were chosen purposefully to represent different contexts/locations—three Canadian universities in two provinces (Ontario and Alberta). The types of technologies being developed included smart devices, wearables, web-based games, and sensor systems. Project Leads had multidisciplinary expertise including clinical practice, engineering and design, computer science, health informatics, and public health. All four cases identified older adults and family caregivers as intended users of the technology; three of the four (cases 1, 3, and 4) also identified healthcare providers as possible users. Cases 1, 3, and 4 had intended uses related to screening or diagnosis; case 2's intended use was to mitigate a disease or symptom. Cases 2 and 4 also aimed to promote healthy behaviour. Intended purchasers were health authorities (cases 1, 3, and 4) or healthcare agencies (all four cases), as well as consumers (older adults and family caregivers). All four cases anticipated involvement of older adults in research, development, testing, or commercialization. Cases 1, 3, and 4 also planned to involve healthcare providers, cases 2 and 4 planned to involve family caregivers, and case 4 planned to involve manufacturers.

Interviews were conducted with AGE-WELL project members ($n = 8$) during site visits to the locations of the four cases, as well as with key informant stakeholders ($n = 12$) with knowledge of Canadian health technology development and implementation processes. For each case, one industry representative, one researcher, and one government representative were interviewed. Semi-structured interviews averaged 60 minutes and were digitally recorded, transcribed, and entered into NVivo 11 for analysis. Two

trained qualitative researchers (MK/MM) conducted the interviews.

Directed coding,²⁰ guided by the ADOPT model,¹⁹ was used by one researcher (MK) to analyse the data; identified themes were then reviewed with another researcher (MM). Any discrepancies in coding were brought to the research team to resolve. This study received ethics clearance from the [University of Waterloo Office of Research Ethics]. Our ethics clearance did not permit placing study data (interview transcripts) into an accessible on-line repository.

Results

We have organized the results according to the ADOPT framework. Consistent with our objective, we outlined barriers (Table 1) and facilitators (Table 2) for each ADOPT domain. The facilitators include both current factors and future actions which would further the development and implementation of technologies for older adults.

Context, older adults, and collaborators

For the seven domains of the ADOPT model to improve health outcomes, we must also be mindful of the context, older adults, and collaborators involved in the process.¹⁹ The cases we studied are occurring simultaneously in two distinct contexts, the broader Canadian policy, healthcare and regulatory environment, and within the framework and infrastructure of the research network (AGE-WELL).

Context. The Canadian context is a complex environment in which to enact change and promote the adoption of new technologies. Complexities include fragmentation across provincial jurisdictions, privacy legislation that differs by province, siloed funding sources, informatics platforms lacking interoperability, an aversion to risk sharing, and an overemphasis on initial cost avoidance or savings as opposed to longer term value. One participant explained:

... Of all the procurement that went on, the piece that drove people insane was the Assistive Devices program, because it was geared to try to get the lowest possible cost ... and even if something new was cheaper, it wouldn't get on the list because it had to get on as a new product, and if it was new and more expensive that could save the system, a massive amount of money it definitely wouldn't get on ... (Stakeholder: Researcher)

Specific case context. The research network. Within a broader Canadian context that is replete with challenges and hurdles, members of the AGE-WELL research network were emphatically positive about the program and the ability to connect research with industry. Participants noted that the research network structure promoted collaborations and transdisciplinarity. For example:

It [the research network] has facilitated things because whenever we go to the annual meeting for instance and we hear what people are doing, we talk to them afterwards and say hey that's kind of cool ... we are doing this ... is there any way we can work

Table 1. Barriers and challenges to developing and implementing technologies for older adults

ADOPT framework domain: the seven factors and strategies	Barriers and challenges	Sample quote
User-friendly design	<ul style="list-style-type: none"> Finding older adults to engage in the technology design and trialling process and moving the technology theory from the lab—to the reality of trialling the technology with real people, as the context and settings are much different. Designing and re-designing for different setting as information will travel differently, and the physical space will differ, depending on where the technology will be used. 	“... we have to redesign it because in the community the information is going to travel differently than in a hospital. In a hospital ... we were fortunate, they were doing some construction anyways, so we actually put a computer in the ceiling in a storage room and we ran cables all through the ceiling down into people's rooms so there was nothing wireless. It was all completely connected. But that only happens once every 25 years that a hospital gets renovated and that you happen to be there with technology that they can plug in. In the community, obviously, there's other challenges. We have to redesign it. We have to look at wireless or whatever. Where does that information go, where does it get analysed and all those things?” (Case I: Project Lead)
Establishing technology value	<ul style="list-style-type: none"> Challenges in understanding and choosing the correct health outcomes or data to measure to determine a technology's value, and often it can be difficult to translate metrics into real-world value. Understanding requirements (eg, from regulatory and technology assessment bodies, purchasing organizations). Unintended costs generated from the technology, as well as implications to workflow. Establishing value when cost of a technology is incurred by one entity (eg, community care) while savings are seen in another entity (eg, emergency department) is a challenge. 	“Sometimes you have a new approach or a new technology that everybody agrees, no single one disagrees, that this is very, very helpful to people. It will save a tremendous amount of life, and it will provide better care. You would think in a regular market environment that this would sell really great, but the problem here is it saves money to entity A but entity B has to spend money ... the CCAC (note ¹) buys fall detection equipment. The people don't fall, the fall was prevented. Where the money is saved is in the emergency room because that's where they're not going.” (Case I: Project Lead B)
Business model	<ul style="list-style-type: none"> Technology researchers having a lack of capacity to commercialize, a lack of business expertise, and a lack of desire to develop their own company. Technology companies also struggle with putting together the business and economic cases for their technology. 	“... because you mentioned home monitoring, in our research we've looked at one spinoff that created home monitoring and what really hit this spinoff very hard was that they could not articulate a business model ... they had a great team, they really worked closely with clinicians, and the whole idea was to reduce unnecessary hospitalization and emergency room visits, so two things that we would love to be able to address, and at the same time, they really struggled to find who's going to pay for this system.” (Stakeholder: Researcher)
Promote technology	<ul style="list-style-type: none"> Being aware of what types of technologies are available as there are many different technologies on the market. There are many consumer-directed type technologies but no guidance on which ones are appropriate which may cause reluctance from providers to promote any off-the shelf devices. Regulators and innovators may also have difficulty determining whether or not technology products fall in the medical device realm or within the health and wellness realm. Marketing was identified as a potential obstacle in terms of cost, the packaging, and delivery of final technology products. 	“That's what it really comes down to, is how the manufacturer represents the product in terms of labelling, web site, promotion material, the whole spectrum. We take all that information into consideration and then determine whether or not it qualifies under the regulations. A lot of the emerging general health and wellness-type technologies that we're seeing, that's a big challenge right now for us to determine on which side of the fence those land. A lot of it is certainly geared towards the mobile, medical device applications, but there's also the wearable sensors and things of that nature that are ... it's tricky ...”(Stakeholder: Government-Federal)
Form partnerships	<ul style="list-style-type: none"> May be difficult to gain access to clinicians and allied health to gather expertise and sustain a committed partnership, as long-term attention to the project may be needed. 	“One of the big obstacles ... is fear, fear that the care staff have about technology. They envision it very differently from what it actually looks like ... where the initial reaction is very negative and essentially

(continued)

Table I. (continued)

ADOPT framework domain: the seven factors and strategies	Barriers and challenges	Sample quote
Identify champions	<ul style="list-style-type: none"> It can be challenging to form partnerships with providers if they have negative reactions to the technology or if they do not see trialling or engaging with the technology as part of their job. Research on technologies may not be a priority for healthcare organizations and they may not have sufficient resources or capacity to begin with (eg, processes such as obtaining data transfer agreements, such as with a home care agency, can be time-consuming). Miscommunication that can occur between the different fields of business and health, as they use different language. Anyone that has a stake in healthcare could be a potential champion. However, resistance can occur if there is not a strong motivation to use the technology. 	“... unless there’s a strong incentive in why the technology should be adopted, I think there will always be resistance and again going back to the invention or the technology itself, unless it can be demonstrated that it actually works, like nobody will care about it”. (Case 3: AGE-WELL Project Lead)
Coach users	<ul style="list-style-type: none"> A lack of instructions/tutorials for technology end users, in particular for older adults, can become a challenge. If the technology provides information/metrics about a particular condition, lack of education to support interpretation of the metrics could cause confusion/panic among end users. Coaching users can be difficult for those who have to overcome workflow challenges to use the technology (eg, shift changes in hospital that do not fit the pattern of use for the technology) or if they need to use the technology on behalf of the older adult (eg, caregiver or healthcare organization). 	“There are a number of medical devices that would be useful for the elderly that cannot be applied or used by the patient himself. So he needs help. And in the homecare setting, to provide this support by either a visiting nurse or something like that, it can be very very difficult to manoeuvre... we have, for patients still insufficient structural support so that people can really stay at home and enjoy their aged life.” (Stakeholder: Industry)

Abbreviations: ADOPT, Accelerating Diffusion of Proven Technologies for Older Adults; AGE-WELL, Aging Gracefully across Environments using technology to support Wellness Engagement and Long Life.

together? So definitely we have sprouted new ideas that would not have happened if it had not been that we all get together on a regular basis. (Case 1 Project Lead)

Participants, however, also noted an overarching emphasis on early commercialization:

Actually AGE-WELL is one of the best things I’ve been associated with in this space ... It probably will take 15 years before it can really say we’ve got more jobs, more companies. My fear is that people will look for hard outcome measures to test commercialization too soon. And that could cause us to chase some low-hanging fruit when we would be better off—the more important thing would be build really strong collaborations and culture change. (Stakeholder: Industry)

Older adults. The most salient barrier related to older adults was that of negative perceptions or assumptions about older adults and their use (or lack of use) of technology. As one participant explained:

... there is still a cultural barrier in terms of perceptions of what seniors can do in terms of technology adoption ... I speak with some colleagues ... and they’re like “oh, my grandma’s not going to be able to use an iPhone” and I’m like have you given an iPhone to your grandma? Because if a 3-year-old can use it I’m pretty sure grandma can use it. (Stakeholder: Provincial Government)

Understanding people’s motivations for using technology was an identified facilitator as older adults are more likely to accept technology if they perceive it to be useful for improving their quality of life and not replacing, but rather supplementing, interpersonal relationships. Additionally, ageing at home is a strong motivation for many, and older adults may be more likely to accept technologies if they allow them to age in place.

Collaborators. Interviewees noted that the pool of potential collaborators is both large and highly diverse. There are numerous stakeholders involved in developing and implementing technology, most of whom are difficult to access. An added complexity is the hierarchy within

Table 2. Facilitators and future actions to support the development and implementation of technologies for older adults

ADOPT framework domain: the seven factors and strategies	Facilitators	Sample quote
User-friendly design	<ul style="list-style-type: none"> Iterative design and end user involvement, not only in the idea generation but also the development, to avoid technology that is irrelevant or built as a one-size-fits-all solution. Designing easy-to-use, personalized, tailored, and customizable technologies that align with the individual's physical location, personality, and state and physical condition are also important factors. Working in a transdisciplinary way (eg, partnerships between clinical field and engineering/computer science). Dedicated space to trial technologies. 	"Instead of a technology push, it's a technology pull. Because the user is pulling the technology exactly where they want it to be, instead of a vendor or even a researcher trying to push technology where they think it should be but might not be where the user might think it would be." (Stakeholder: Researcher)
Establishing technology value	<ul style="list-style-type: none"> Early conversations with whomever is responsible for making technology adoption decisions. Understanding the potential need for stakeholder buy in and participation in the evaluation of technologies (eg, healthcare staff). Policies that allow for trialling technology before purchase and concepts like risk-sharing where the company is not paid until the results are seen of the value they suggest the technology provides. Value-based procurement, the idea of looking at other long-term factors of success and patient preferences instead of only the upfront cost of the technology. Measuring outcomes and value that happens incrementally. 	"So, talk to the rehab centres, talk to the folks who make the decisions regarding what they are going to spend money on and what they're not and what they look for in terms of what's good value and what isn't. So, you know in rehab hospitals, at least in Alberta, it's not that they would do a formal health technology assessment but they certainly want to know what they're getting for their spend. So it might be important to talk to the CEO or talk to whomever is responsible for making those decisions around what technologies they bring in and see what their evidence expectations would be." (Stakeholder: Researcher)
Business model	<ul style="list-style-type: none"> Understand the financial/budget constraints for potential purchasers of the technology and understand the financial or other benefits of the technology for the purchaser. Access to the right resources and expertise (eg, University commercialization offices). 	"If there's a home care nurse that right now has a case load of 30 people, and that's the absolute maximum she can take from a normal, current-work-load point of view . . . if you can show that she can take 35 patients if you add this technology and help her triage her patients . . . Now, I have some sensor in the home that says, 'Look, Mrs. Jones didn't get up this morning, something's wrong'. She's one of the people I need to visit . . . now I've increased my case load without increasing the number of hours I worked. That's real efficiency." (Case 1: Project Lead)
Promote technology	<ul style="list-style-type: none"> Developing a registry of potential technologies, eg, of home care technologies that could be deployed. Innovators and developers need to be realistic about their technology product, and what it is used for. It is better to be forthcoming and upfront in their representation as it makes the regulatory path clearer. 	"If they're truly realistic about, and truthful about what their product is for . . . because the companies that are realistic, upfront and really know where they're going, then we can really clearly define the regulatory path. It's the ones that are . . . They sit on that fence that it's uncertain. Then they experience the regulatory drift or different interpretations down the line because they didn't do the work upfront or they weren't really forthcoming up front." (Stakeholder: Government-Federal)
Form partnerships	<ul style="list-style-type: none"> Programs or people that help with linking clinicians and start-ups, as well as capacity-building and brokering in healthcare. Varied expertise is needed during the innovation process, so early engagement is key to understand the requirements for the technology. 	"The beauty of what . . . sort of a hub concept would be is we'd have a whole group of clinicians, a whole group of engineers, academic engineers, a whole group of engineers that have companies that know how to make things . . . take the proof of concept and build the prototype and get it to market. If you bring all those people together, hopefully we all will get

(continued)

Table 2. (continued)

ADOPT framework domain: the seven factors and strategies	Facilitators	Sample quote
Identify champions	<ul style="list-style-type: none"> • Having industry partners to help move innovations along and university commercialization offices were seen as important partnerships to form in order to leverage their expertise. • Creating innovation communities, hubs, or ecosystems to facilitate face-to face opportunities to meet potential collaborators, and working in a synergistic way with different disciplines. • There are a variety of potential champions, including family caregivers, volunteers, and students/grandchildren to promote intergenerational benefits. • Anybody who has a stake in healthcare could be a potential health technology champion (eg, clinicians, healthcare providers). 	better at translating what we're doing academically into permanent products." (Case 1: Project Lead).
Coach users	<ul style="list-style-type: none"> • Create standard procedures or practices of continued user education and training once the end-user is given the technology and identifying a "coach" with a continuing relationship with the end user. 	"I think anybody who has a stake in healthcare is a potential user and could be a potential champion so that includes you know caregivers, all of us trying to stay healthy, so it's not just patients, but it is also everybody across different age groups and also clinicians and other healthcare providers, they could all buy into this . . ." (Case 3: Project Lead). "But I think the tricky part on who the right person is, somebody who has some continuative relationship. So family members have continuative . . . but if they're far away, not so much . . . care providers . . . so somebody who has frequent or regular and not infrequent meetings . . . Because they will be in a position to see, if it fits . . . they would be in a position to teach people." (Case 4: Project Lead)

Abbreviation: ADOPT, Accelerating Diffusion of Proven Technologies for Older Adults.

healthcare, which places a greater emphasis on some stakeholders over others. An interviewee explained:

... that there are established players with a seat at various tables and their interests . . . not necessarily in any nefarious way . . . are heard [for example] physicians and surgeons, the tools that they use and their mechanisms, to get them used. If they're home and community care, it's just a total . . . So yes, so you're in the messiest space of all for technology adoption. (Stakeholder: Researcher)

This raises the concern that the adoption of some technologies, such as medical devices for acute care, may be more readily facilitated than innovative technologies that might support ageing in place.

Cross-case analysis

The four cases had many similarities, some related to their membership in AGE-WELL which gave them similar supports and reporting requirements. Two of the projects (cases 3 and 4) raised concerns about AGE-WELL's emphasis on commercialization; the others had not yet started to seriously consider commercialization. All projects had identified potential purchasers and end users—the health system for case 1, the consumer for case 2, and potentially both for cases 3 and 4. Establishing a technology's value will thus vary depending on intended markets. All groups talked about challenges creating a business model. Case 1 saw challenges in

determining who might pay to realize benefits achieved through prevention. The other cases saw a business model exercise as premature (2 and 3) or unhelpful (4). All projects saw the potential for scepticism from potential users—getting buy in from stakeholders was key. All projects saw potential challenges with complex systems of reimbursement and procurement.

Cases had varied experiences with external partnerships. Cases 1 and 4 had well-developed working relationships with community partners; while for cases 2 and 3, initial industry and community partnerships did not turn out as hoped. Partnerships between co-leads also varied. Cases 1 and 4 had synergistic partnerships of co-leads with different expertise (clinical and technical), which aided in the development of clinically and technologically relevant solutions.

All four cases understood the importance of designing for the end user and the associated complexities—such as participant recruitment. All saw particular challenges in engaging with older adults, but all planned to involve older adults in their processes of development and testing. See Table 3 for a summary of the cross-case analysis.

Discussion

This study has emphasised the wide-ranging complexities involved in developing and implementing technology and the varied expertise that is required from a motivated chain of people. The development of the AGE-WELL NCE illustrates

Table 3. Cross-case analysis summary

Case	1	2	3	4
Theme				
Technology progression	Advanced prototype testing	Usability/prototype testing	Acceptability testing	Usability/prototype testing
AGE-WELL	Had not yet started to seriously consider commercialization	Raised concerns about AGE-WELL's emphasis on commercialization		
Design user-friendly technology	Although complex, all projects saw the importance of designing for the end user			
Establish technology value	All projects described challenges related to creating a business model			
Promote technology	Marketing and promotion will be explored as the projects progress further			
Form partnerships	Well-developed working relationships with community partners	Initial industry and community partnerships did not turn out as hoped		Well-developed working relationships with community partners
Identify technology champions	Community care nurses	Family caregivers	Older adults, clinicians, caregivers	Long-term care homes, assisted living facilities
Coach users	All projects saw potential resistance or scepticism to the technology by healthcare providers or older adults.			
Context	All projects saw potential challenges with complex systems of reimbursement and procurement.			
Older adults	All projects planned to involve older adults in their processes of development and testing, despite challenges			
Collaborators	All projects felt getting buy in from stakeholders was key			

Abbreviations: AGE-WELL, Aging Gracefully across Environments using technology to support Wellness Engagement and Long Life.

the value of creating diverse networks of qualified people and enabling funding for interdisciplinary and transdisciplinary work. However, this research has also highlighted the importance of having realistic expectations about what a time-limited network such as AGE-WELL can achieve, as culture change and building strong collaborations can take time.

The demands for collaboration on technology development and implementation require investments in time, money, human resources, information sharing, and relationship building.⁸ There are a vast range of providers involved in technology development and implementation to ensure the technology is effective. This means there is a place for early communication and input from those making healthcare decisions, allocating resources/care services, carrying out care tasks, and receiving care.

Further, a continued focus on the implementation challenges that exist in Canada is needed to create a system that supports the scaling, spread, and sustainability of transformative ideas, instead of focusing on building more promising pilot projects,²¹ for which Canada has a reputation.¹³ Exploring opportunities for risk sharing and managed entry agreements is ripe. For example, one major challenge that spanned several domains in this study is the difficulty of identifying means by which resources can be reallocated between and among siloed program budgets to achieve the most valued and cost-effective delivery of care.²²

Another key consideration is managing expectations about technology and questioning what the technology can

realistically do to assist older persons with their health and wellness within the current system. System-level transformations may be needed for technology to be more integrated and relevant in healthcare and service delivery. Technology has the potential to transform health system performance and improve patient and caregiver outcomes. Barker and Donnelly discuss several technologies that offer solutions to health system challenges if adopted and scaled across systems,²³ for example, solutions that help practitioners with information about when interventions should occur in the management of chronic diseases. Technology-generated data that are fed back to health systems or health providers can help in planning care, as well as in making good decisions about the quality and cost of the services provided. The challenge is moving from selling products to creating solutions that meet health system needs and achieve better patient outcomes.^{24,25}

The COVID-19 global pandemic occurred while this article was being prepared for publication. The pandemic has necessitated critical reflection on our healthcare system priorities and on what research may be most relevant. We recognize that the attentions of health leaders, clinicians, and researchers have appropriately been placed on the urgent responses required by the pandemic. This may call into question, at least in the short term, the value of research which does not have a direct impact on the pandemic. On the other hand, the challenges presented by COVID-19—such as maintaining social connection while remaining physically distant, or providing clinical care or patient monitoring

remotely—have served to heighten the importance of technological solutions—especially for older adults—such as those considered in this study.^{26,27}

Limitations

This study was limited by the resources and time available for data collection—a longer period of observation, and additional follow-up interviews, could have yielded additional findings. Although the cases in this study included a range of health technologies, from health and wellness devices to medical devices, caution would be advised in generalizing the findings to all technologies designed to support older people, given the great variability in the types of technologies being developed and their applications.

We also note that there are unique characteristics associated with innovating within a technology and ageing research network, including support for networking, knowledge mobilisation, and partnership opportunities. Thus, the views of the Project Leads may not reflect the views of innovators developing technologies independently. On the other hand, because the informants who were interviewed beyond the AGE-WELL NCE were not specifically linked to the projects, their commentary has provided more general insight on the development and implementation of health technologies.

Recommendations

Based on this study, we make the following recommendations which are of particular relevance to health leaders in Canada:

1. The Canadian healthcare and policy context is a complex environment within which to introduce new technologies—to realize the potential of innovative technologies to improve health or healthcare, or to reduce costs, we recommend active involvement of health leaders to address barriers such as siloed jurisdictions or outdated procurement policies.
2. A research network such as the AGE-WELL NCE provides a positive framework for collaborative research and the development of the partnerships that can support commercialization and adoption of new technologies. As the Canadian government has suspended calls for future NCEs in favour of other research funding models, we recommend that health leaders lobby for the continuation of NCEs or to find other vehicles to achieve these aims.
3. For all of the cases described in this study, the development of business models was a significant challenge. While this is most obviously a challenge for innovators, it can also be a societal and health system challenge if useful innovations are not adopted as a result, for example, of complex reimbursement and procurement mechanisms. We recommend that in developing their business plans,²⁸ technology innovators and entrepreneurs work with health leaders to develop value propositions that

clearly address health system challenges for specific customer segments, with attention to the mechanisms (channels)—including reimbursement or purchasing methods—through which the users or beneficiaries of the technology can be reached.

4. Finally, we recommend leadership and advocacy to realize the potential benefits of technological innovation for older adults, both to overcome age-related stigma and to address health system barriers. As an example of these barriers, current funding models and procurement systems make it easier to support reimbursement of a medical device for acute care hospitals than a home-based technology that enables ageing in place.

Technologies have the potential to help older adults maintain their independence, health, and quality of life. Understanding the factors that facilitate or constrain the development and implementation of ageing-related technologies can help health leaders and policy-makers to promote their diffusion and adoption. Continued research studies, particularly with a focus on implementation, creative funding approaches, and commercialization, are needed to ensure that older adults and family caregivers can receive the benefits of these technologies.

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Note

1. Community Care Access Centres were the body that coordinated community care and long-term care placement in Ontario at the time of data collection.

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The Team Assessment of Self-Management Support (TASMS): A new approach to uncovering how teams support people with chronic conditions

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Abstract

Canadian and other healthcare systems are adopting primary care models founded on multidisciplinary, team-based care. This paper describes the development and use of a new tool, the Team Assessment of Self-Management Support (TASMS), designed to understand and improve the self-management support teams provide to patients with chronic conditions. Team Assessment of Self-Management Support captures the time providers spend supporting seven different types of self-management support (process strategies, resources strategies, disease controlling strategies, activities strategies, internal strategies, social interactions strategies, and healthy behaviours strategies), their referral patterns and perceived gaps in care. Four unique features make TASMS user-friendly: it is patient-centred, it uses provider-level data to create a team profile, it has the ability to be tailored to needs (diagnosis and visit type), and visual presentation of results are quickly and intuitively understood by both providers and planners. Currently being used by providers and planners in Nova Scotia, scaling up will allow more widespread use.

Background

Evidence is clear; patient self-management is associated with better health outcomes, quality of life, and reductions in unplanned healthcare utilization.^{1,2} A key function of primary healthcare systems is, therefore, to assist and support patients living with chronic conditions to take ownership of and self-manage all aspects of life affected by their condition(s).^{3,4} With one in three Canadians⁵ now living with at least one chronic condition, effective, patient-centred self-management support, provided by proactive teams, is needed. Delivering integrated and patient-centred support, however, is challenging. Innovative ways to assess and improve the work of primary healthcare teams are needed in Canada^{6,7} and across the world.

Self-management is broadly defined as the daily “tasks that individuals must undertake to live well with one or more chronic conditions.”⁸ This includes the confidence to undertake medical, role, and emotional management of their conditions.⁹ Audulv et al. described and categorized the extensive strategies people use to manage everyday life with a neurological condition, creating the Taxonomy of Everyday Self-Management Strategies (TEDSS)¹⁰ (see more below). Others have detailed the meaning of learning to self-management¹¹ and the ongoing “fluid, interactive process” (p158) that it requires.¹²

Planning for and delivering strong self-management support, however, is challenging. Integrated and comprehensive self-management support requires synchronized actions from all healthcare providers and community resources in order to address the heterogeneous needs of patients.¹³ This includes

the provision of both generic and disease-specific self-management skills and supports.¹⁴ Challenges are also experienced by patients seeking support. Frequent interactions with multiple healthcare providers in different settings often result in a lack of care coordination, conflicting information, and inconsistent care plans.¹⁵

To overcome existing problems, Canadian and other healthcare systems are implementing primary care models founded on multidisciplinary,¹⁶ team-based care.¹⁷ This includes chronic disease teams, primary care teams, and most recently, primary care networks.¹⁸ The ability of teams to meet patient needs is dependent on complex and nuanced factors such as the disciplinary composition of the team, team roles, collaboration and function, and chosen models of care. More than ever, multidisciplinary teams, managers, and policy-makers need to understand the types of self-management support being provided by teams, who provide support, when, why, and to whom they refer patients and what they perceive as gaps in their support.¹⁹

This paper describes a new tool, the Team Assessment of Self-Management Support (TASMS), currently being used by primary healthcare teams, managers, and decision-makers in Nova Scotia to assess self-management support offered to

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patients with chronic health conditions. The tool is first described followed by two examples demonstrating how it is informing quality improvements and reforms to chronic disease self-management support in Nova Scotia.

Development of the TASMS

The TASMS emerged in response to health provider and policy-maker input during a study to develop a patient-reported self-management outcome measure: the Patient-Reported Inventory of Self-Management of Chronic Conditions (PRISM-CC).²⁰ As part of that study, health providers working with people with chronic conditions and multimorbidity were consulted about the relevance and use of the TEDSS framework. This framework was developed to describe and organize a wide range of strategies people perform to manage life with a chronic condition. Development began with a concept review,²¹ then validated using qualitative interview material from 117 people living with neurological conditions. It consists of 7 domains and 26 subdomains.¹⁰ The TEDSS has been used as a framework to examine self-management interventions²² measurement tools²³ and in systematic reviews.

During focus group discussions and an on-line survey, providers identified the TEDSS as a valuable framework to understand the type and quality of their self-management support, prompting them to ask questions such as the following:

- Are we currently meeting patients' needs as outlined in the framework?
- Who on the team is supporting which domain? and
- Do we have overlaps or gaps in the support we are providing?

To assist teams to answer these questions, a structured worksheet based on the TEDSS framework was developed and tested over a period of 12 months. Using an iterative design process, each version of the worksheet was tested, redesigned, and tested again. At each stage, one to three teams completed the worksheet, data were analyzed, and results presented back to the teams using visual representations. Based on their feedback, the questions they asked, and requests for additional information or analysis, the worksheets were gradually finalized with 31 rather than the original 26 TEDSS subdomains (Table 1). Visual reports of the team and provider self-

Table 1. TASMS domains and subdomains adapted from TEDSS framework

Domain	Domain definition	Subdomains
Process strategies	Strategies used to be well informed and to make good decisions. Often used to support the use of other, non-process strategies	<ul style="list-style-type: none"> • Finding credible and accurate information • Problem-solving • Decision-making^a • Goal setting^a • Creating action plans^a • Advocating for needs and self^a • Explaining needs, asking for help, delegating^a • Finding community and paid services and supports^a • Seeking help from and working with health providers^a
Resource strategies	Proactively seeking, pursuing, and/or managing needed formal or informal supports and resources	<ul style="list-style-type: none"> • Pacing planning and prioritizing • Organizing routines and equipment • Choosing/using aids (mobility, ADL, technology) • Staying engaged in valued activities (work, home, and community) • Accepting condition • Staying positive • Allowing time for sadness and grief • Controlling stress and negative emotions • Seeking comfort in spiritual or religious support • Disclosing condition • Choosing social relationships and situations • Staying in contact • Optimizing social relationships
Activities strategies	Finding ways to participate in everyday activities (leisure activities, work activities, and household chores) despite problems such as fatigue, pain, memory loss, or disability	<ul style="list-style-type: none"> • Healthy diet • Exercising • Sleep hygiene • Cognitive/mental exercise • Managing medications^a • Monitoring symptoms^a • Using alternative or complementary medicine^a • Preventing complications • Controlling symptoms (eg, pain, wound care)^a
Internal strategies	Preventing and managing stress, negative emotions, and internal distress; creating inner calm	
Social interaction strategies	Managing social interactions and relationships to be able to participate without exposure to negative reactions	
Healthy behaviour strategies	Maintaining a healthy lifestyle in order to enhance health and limit the risk of lifestyle-related illness	
Disease controlling strategies	Preventing, controlling, and limiting symptoms, complications, and/or disease progression	

Abbreviations: TASMS, Team Assessment of Self-Management Support; TEDSS, Taxonomy of Everyday Self-Management Strategies.

^aModified from original TEDSS subdomains.

management support were developed. Concurrent with this process, team managers and policy-makers began to take notice, recognizing the value of the tool to inform planning at both local and provincial levels. They began requesting aggregated information across and between teams to assist with planning at the provincial level.

The TASMS (available by request from the authors) is a one-page worksheet that gathers information about both domain and subdomain level support provided by each healthcare team member, then combines it to create a team profile of self-management support. Orientation of the team, prior to completion of worksheets, clarifies and standardizes team understanding of terms and concepts (approximately 30 min). Completion of TASMS worksheets requires an additional 30 to 45 min from each provider. Debriefing and action planning by the team follows. Information gathered from each provider includes:

1. the proportion of appointment time they estimate supporting self-management in each TASMS domain, and
2. for each of 31 subdomains, whether they:
 - refer patients for support and/or
 - perceive it as a gap in support.

Depending on the intended goal, data are then aggregated in different ways: by the team, across multiple or similar teams, or by provider type across multiple teams.

Using TASMS to inform local and provincial planning

Description of data. The Primary Health Care & Chronic Disease Management Portfolio of the Nova Scotia Health Authority (NSHA) holds the responsibility to plan, deliver, and evaluate primary healthcare programs, services, and initiatives for the province of Nova Scotia. Data collected from six Collaborative Family Practice Teams (CFPTs) and three Chronic Disease Management Teams (CDMTs) from NSHA provide examples of TASMS use. Collaborative Family Practice Teams are typically composed of physicians, nurse practitioners, and/or registered nurses or licensed practical nurses; a few include an additional health professional (ie, social worker or pharmacist). They provide care to a panel of patients of all ages living in the community. Chronic Disease Management Teams are generic or condition-specific with a mandate/function to provide care for patients with chronic conditions. Chronic Disease Management Teams are typically multidisciplinary, with or without an on-site physician.

All data gathered had a common, overall purpose: to understand the self-management support provided to patients with chronic conditions and/or multimorbidity. Some teams chose to report time spent supporting individual patients, whereas other teams provided overall estimates of time spent supporting patient populations (insulin- and non-insulin-dependent) or during specific visit types (intake, follow-up, and discharge | individual and group). To compare support to different patient groups or by visit type, each team member completed multiple worksheets. In total, 62 healthcare

providers completed 176 worksheets. The Nova Scotia Health Authority Research Ethics Board determined this project to be a Quality Assurance/Program Development initiative and, according to Tri-Council Policy Statement/ Article 2.5, did not require ethics approval.

Analysis. Provider data, reported at the worksheet sheet level, were combined to determine the average proportion of time teams spent supporting each domain. The proportion of worksheets recording referral or perceived gaps for each subdomain were then calculated and, where requested, aggregated to the domain level.

Example 1: Use at the local level: Team self-assessment of support

Example 1 was a CDMT from rural Nova Scotia providing complex care, chronic disease management and health and wellness programs. The service is composed of a chronic disease team and a wellness team. Together they have approximately 2,600 appointments per year. Five team members from four disciplines, nursing ($n = 1$), physiotherapy ($n = 1$), dietetics ($n = 2$), and counselling ($n = 1$), completed worksheets based on different visit types, resulting in completion of 43 worksheets.

Visualization of the time spent by team members was presented to teams showing how each team member supported self-management (Figure 1). Results demonstrated that:

- Supporting healthy lifestyle behaviours occupied the greatest amount of time for the nurse (33.7%), physiotherapist (33.3%), and dietitians (33.5%). This was also identified as a gap (35.0% of worksheets; data not shown).
- Complementing this, the counsellor spent more time supporting internal management (35.7%) and social interactions (14.9%). Despite this focus, 40.0% of worksheets identified support for internal management to be a gap.
- While the dietitians and nurse spent time supporting disease controlling strategies (20.8%, 26.6%), the physiotherapist's time supported internal strategies (15.8%), complementing the efforts of the counsellor.
- Collectively the team spent almost no time linking patients to resources or maintaining daily activities nor did they identify this as a gap (5.0% of worksheets).

The debriefing process triggered conversations about what the team was doing well and where improvements might be possible. The small amount of time spent linking patients to formal and informal resources/supports surprised team members but allowed them to understand the hidden internal and informal referral patterns that occurred within the team.

Example 2: Use at the planning level: Understanding different types of teams.

Whether and how the support provided by CFPTs and CDMTS differed was of interest to managers and decision-

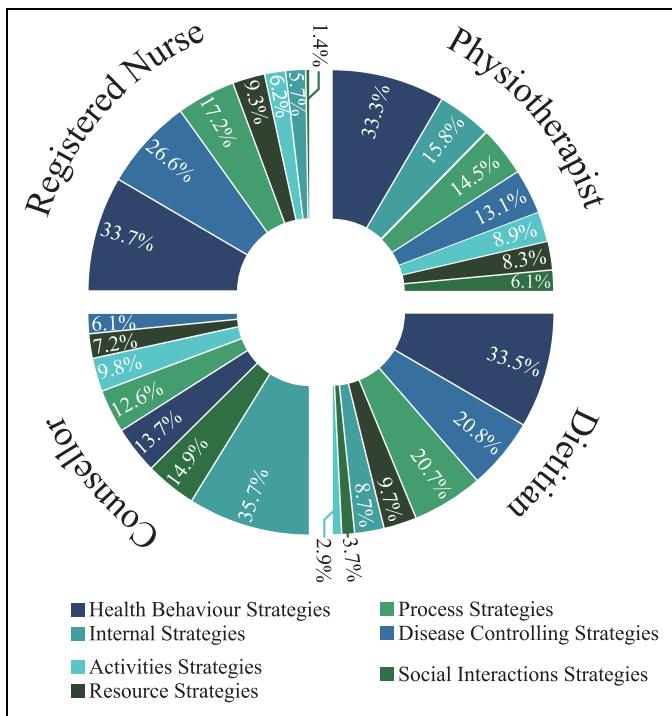


Figure 1. Percentage of appointment time spent supporting TASMS domains by members of one chronic disease management team. TASMS, Team Assessment of Self-Management Support.

makers at NSHA planning new chronic disease management models of care. Aggregated data from six CFPTs and three CDMTs provided insight into how time spent supporting TEDSS domains differed by team function and composition (Figure 2). Collaborative Family Practice Teams, generally small teams composed of primarily physicians and nurses, with high demands and short appointment times, spent a greater amount of time (34%) supporting disease controlling activities (medication and symptom management) than any other type of support (range 7%to 15%). In contrast, CDMTs divided their time almost equally between three areas: healthy behaviours and lifestyles (diet, exercise, and sleep) (22%), internal and emotional consequences of living with a chronic condition (21%), and disease controlling activities (15%). Findings reflect how CDMTs are more professionally diverse than CFPTs, have a focused mandate to support patients with chronic conditions, tend to have longer and more frequent appointments, and provide more comprehensive self-management support.

Regardless of team type, however, almost 60% of team time was spent on only three domains of self-management support: Disease Controlling, Internal, and Healthy Behaviours Strategy domains. Time spent supporting patients to adopt positive social interaction, maintain daily activities, and access formal and informal resources, areas that patients often identify as gaps in service,¹³ amounted to less than 30% of team time. Collaborative Family Practice Teams identified many more gaps than CDMTs, suggesting that the mandate and context of CDMTs allow more comprehensive self-management

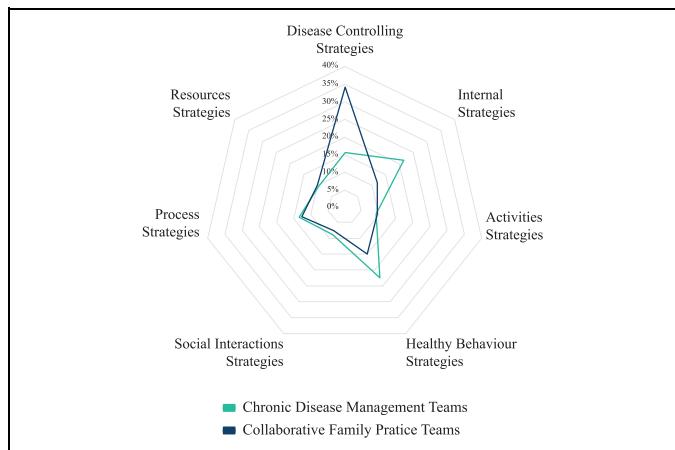


Figure 2. Chronic disease management teams and collaborative family practice teams: percentage of appointment time spent supporting TASMS domains. TASMS, Team Assessment of Self-Management Support.

support, information important for design, and composition of teams and primary care networks.

Discussion

Team Assessment of Self-Management Support presents a new way to uncover and decipher team-based self-management support for patients with chronic conditions. The seven TASMS domains provide a new, non-discipline-specific language that allows teams, managers, and policy-makers to discuss the self-management support provided to patients. Knowledge of time spent, referrals made, and perceived gaps is the information teams need to reflect on and improve their practice while situating these reflections in their unique geographical and contextual environments. Examples presented illustrate how four unique features of TASMS make it user-friendly for both providers and planners: it is patient-centred, it uses provider-level data to create a team profile, it has the ability to be tailored to needs (diagnosis and visit type), and visual presentation of results are quickly and intuitively understood.

Teams and policy-makers have used TASMS to improve teamwork, identify gaps, and facilitate working to full scopes of practice. For example, TASMS results facilitated one team (example 1) to understand and communicate team roles. Uncovering hidden referral patterns strengthened team function. A second team (data not shown) identified a gap in their service that led to the addition of a social worker. Yet another team discovered and reduced overlapping roles, finding time to optimize their scopes of practice. Teams and managers in Nova Scotia were interested in benchmarking TASMS results to similar teams and/or aggregated provincial data. Example 2 illustrates how TASMS highlighted the strengths of teams with two different mandates. This knowledge, paired with perceived gaps and referral patterns, is informing decisions on the allocation of resources, adjusting

team composition, and training for providers. Caution, however, is warranted when interpreting and generalizing findings from these examples which are intended to be illustrative rather than conclusive. With the small sample sizes, findings may have been influenced by differences in disciplines or differences in the personality/style of individual providers.

Existing self-management tools, developed for use in quality improvement projects, differ from TASMS in two important ways: (1) the components of self-management support assessed and (2) the focus on specific disciplines. The TASMS itemizes support in seven domains. Most other quality improvement tools are less focused and/or measure fewer components. For example, the “5A’s” tool²⁴ focuses primarily on behaviour change, and the Assessment of Chronic Illness Care²⁵ evaluates delivery of care on all six areas identified in the chronic care model; self-management support is only one of the six. Other tools, such as the Self-efficacy and Performance in Self-management support Instrument assess support provided by a single discipline²⁶ or for patients with specific diagnoses.²⁷

The tool that most closely approximates the TASMS is the Assessment of Primary Care Resources and Supports for Chronic Disease Self-Management (PCRS). Self-management support is the exclusive focus of both TASMS and PCRS, and both aim to help team members improve self-management provided to patients. However, the PCRS and TASMS are fundamentally different in several ways. The PCRS was originally designed to support patients with diabetes while TASMS is based on a patient-centred framework designed to be used with patients with any chronic condition including those with multimorbidity. The PCRS assesses only two domains (patient support and organizational support) compared to the seven domains assessed with the TASMS. Finally, and most importantly, TASMS collects information on individual provider support, then aggregates it to the team level. The PCRS is also designed to promote self-assessment and to stimulate discussion in order to build consensus and identify strengths and gaps in resources and services. However, this is achieved by each provider completing a team self-assessment questionnaire followed by discussion of discrepancies in scores. Contributions of individual providers and how that contributes to the team are only possible using TASMS.

The TASMS is one component of a series of tools being developed to advance patient-centred self-management support for patients with chronic conditions. The relevance and accessibility of its foundation (the TEDSS framework) to both patients and providers has created an unexpected platform for communication and planning. This framework has become the basis for a new patient-reported outcome measure (PRISM-CC) and the TASMS. The PRISM-CC is now in the item reduction and calibration stage²⁰ with an expected completion date of early 2021, and a Swedish version is already under development.

Further development of TASMS, to allow it to be scaled outside the research context, is now underway. Design of an

App to capture information from team members and automatically generate visual results has begun. Experimentation with an on-line version indicated that providers need real-time data entry with rapid response options (limited drop-down menus and “clicks”). Teams and health authorities are requesting generation of results by team, by discipline and across jurisdictions. In addition, providers are now asking for a patient version of TASMS in order to assess congruence between their views and those of patients; they particularly want to know if patients’ needs for self-management are being met. This tool is now in development beginning with qualitative work, again using a patient-centred approach.

Conclusion

Few quality improvement tools meet the needs of both providers and planners. While both are committed to quality improvement, providers typically focus on improving individual patient care, whereas planners often focus on models of care, scopes of practice, and system improvement. The TASMS emerged from provider questions. Development of TASMS included researchers, planners, patient-partners, and providers, with an end result being a tool that satisfies the different needs of both providers and planners and strong support for future scaling-up of the TASMS.

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Setting the standard for healthy eating: Continuous quality improvement for health promotion at Nova Scotia Health

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Abstract

Healthcare organizations engage in continuous quality improvement to improve performance and value-for-performance, but the pathway to change is often rooted in challenging the way things are “normally” done. In an effort to propel system-wide change to support healthy eating, Nova Scotia Health developed and implemented a healthy eating policy as a benchmark to create a food environment supportive of health. This article describes the healthy eating policy and its role as a benchmark in the quality improvement process. The policy, rooted in health promotion, sets a standard for healthy eating and applies to stakeholders both inside and outside of health. We explain how the policy offers nutrition but also cultural benchmarks around healthy eating, bringing practitioners throughout Nova Scotia Health together and sustaining collaborative efforts to improve upon the status quo.

Background

Benchmarking for healthcare quality improvement

Originating in a critique of patient safety,¹ quality improvement in healthcare management has evolved into a diverse field of practice.² Organizations engage in quality improvement to improve performance and value-for-performance, but the pathway to change is often rooted in practice—for instance, changes optimized in a specific service area, which can then be scaled (eg, virtual care pilot projects in rural Nova Scotia).^{2,3} Continuous quality improvement refers to the idea that quality improvement is a process and requires repeated tests of change.^{4,5}

Identifying and setting benchmarks has become a critical component of quality improvement measures.⁶ Benchmarks are measures that set intra- and inter-organizational performance goals while balancing cost considerations and stakeholder/public expectations.⁷ They are essential to achieving the healthcare “triple-aim.”^{8,9} Benchmarking can also be considered an active *method* for quality improvement.⁷ For instance, intra-organizational benchmarks can be established in an integrated care pathway development process¹⁰; inter-organizational benchmarks such as wait times can support analysis of appropriateness of care.¹¹

In the following article, we focus on benchmarking in intra-organizational quality improvement through an applied discussion of the Nova Scotia (NS) Health healthy eating policy. As per Ettorchi-Tardy, we will examine benchmarking as a “comparison of outcomes...to stimulate *cultural* and organizational change *within* the organizations being compared” (*emphases added*).⁷ Although benchmarking commonly occurs between organizations, we examine this benchmark within NS Health, an organization with a wide variety of facilities, areas of practice, and past histories with healthy eating policies.

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In addition, we address gaps in the literature on benchmarks that serve health promotion functions. To date, much healthcare benchmarking research has centred upon inpatient care.^{6,12,13} Some authors have examined how healthcare benchmarking and quality improvement *can* be adopted in health promotion organizations¹⁴ and community settings such as schools.¹⁵ Others have challenged whether or not benchmarking *should* be applied to health promotion, given benchmarking’s more transactional industrial origins and focus on quantitative metrics, in contrast to the relational issues central to health promotion.¹⁶

However, increasingly, attention has been drawn to the role that healthcare service delivery organizations themselves play in broader population health and health promotion.¹⁷ Health organizations’ internal policies and practices can affect health behaviours well beyond their patient populations and have even been referred to as anchors within their communities.¹⁸ By examining a healthcare organization’s healthy eating policy, we have the opportunity to consider how benchmarking in healthcare can benchmark *health* for a wider variety of stakeholder audiences.

First, we will provide a brief introduction to healthy eating policies developed in Canada for healthcare organizations. Second, we will describe the governance context and content of the NS Health healthy eating policy. Third, we analyse the NS Health policy as an internal benchmark to influence culture

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Table I. A comparison of major healthy eating policies in Canadian provinces and territories

Province or territory	Administering organization or agency	Policy	Increase access to healthy foods	Nutrition requirements/criteria	Fundraising	Altering industry practices (e.g. marketing)	Collaboration	Evaluation or research
Nova Scotia	Nova Scotia Health	Healthy Eating Policy (2018) ²²	Y	Y	Y	Y	Y	Y
Alberta	Alberta Health Services (AHS)	Nutrition Guidelines for Foods and Beverages in AHS Facilities (2018) ²³ Healthy Eating Environments (2011) ²⁴	Y	Y	Y	N	Y	Y
British Columbia	BC Ministry of Health	Healthier Choices in Vending Machines in BC Public Buildings (2014) ²⁵	Y	Y	N	Y	N	Y
Ontario	Champlain LHIN (20 participating hospitals)	Healthy Foods in Hospitals Program ²⁶	Y	Y	N	N	Y	Y
Quebec	Quebec—Santé et Services sociaux Quebec	Miser sur une saine alimentation: une question de qualité (MSSS, 2009) ²⁷	Y	N	N	N	Y	N
New Brunswick	Vitalité Health Network/ Government of New Brunswick	Health Food Environment Framework ²⁸	Y	N	N	Y	Y	Y
Northwest Territories	NWT Health and Social Services Health	Healthy Foods in Facilities (2006) ²⁹	Y	Y	Y	N	Y	N
Newfoundland and Labrador	Government of Newfoundland and Labrador	Provincial Food and Nutrition Framework and Action Plan ³⁰	Y	N	N	N	Y	Y

and explain how benchmarking has begun to emerge through Plan-Do-Study-Act cycles following adoption of the policy. Fourth, we conclude with the generalizable lessons from this health promotion example for quality improvement and the potential application of findings in cases of external benchmarking.

Context and setting

Healthcare organization healthy eating policies in Canada

Healthy eating policies are a growing healthcare priority.¹⁸ Diet-related diseases are a leading cause of death and disability in Canada and driver of healthcare costs,¹⁹ making dietary improvement essential to population health promotion.²⁰ Previously, healthy eating initiatives in healthcare tended to fall within service lines for cardiovascular disease prevention.²¹ Over the last decade, hospital healthy eating policies have shifted to focus on the consumer food environment (eg, retail merchandising such as placement, promotion, and pricing) and the information environment

(eg, nutrition labelling, sponsorship). Table 1 provides a comparison of major healthcare healthy eating policies in Canadian provinces and territories.

Some jurisdictions have cross-cutting policies that cover public institutions. For example, the Northwest Territories policy deals with nutritious and affordable food and beverage options in schools, recreation centres, and government buildings. Other policies target specific consumer environments to encourage upstream food supply reformulation, such as the BC vending machines policy.

Two provinces have comprehensive healthcare healthy eating policies, integrative of the food environment. The policy by Alberta Health Services looks at food and beverages offered, optimizing the availability of nutritious choices, but also looks at promotions, marketing, and an overall culture of healthy eating. Similar to NS Health, Alberta is the only other province whose policy centres upon supportive environments. In 2009, Nova Scotia's Capital Health (now NS Health Central Zone) was the first health authority in Canada to establish a comprehensive organizational healthy eating policy and strategy.¹⁸ However,

the standard, or benchmarks, of a supportive eating environment within health institutions has not been well defined, which makes it difficult to compare inter-organizational healthy eating policies and engage in inter-organizational benchmarking. Therefore, we will focus on the benchmarks and benchmarking (intra-organizational) of the NS Health healthy eating policy.

Nova Scotia Health

In 2015, NS Health amalgamated to one health authority, becoming the largest provincial health authority in Atlantic Canada, responsible for delivering healthcare services to 923,598 provincial residents³¹ through 10 hospitals, 8 ERs, and 135 community locations.³²

Prior to amalgamation, five of the nine regional authorities had their own healthy eating polices. Each policy defined healthy eating differently and differed in scope, resulting in a patchwork. For example, in 2009, the aforementioned Capital Health was an early adopter of a healthy eating policy.^{18,33} Their policy focused on promoting health and wellness through measurable standards for food retail settings, cafeterias, and vending machines. In contrast, the Colchester East Hants Health Authority targeted healthy eating within occupational health and safety³⁴ but did not mandate nutritional standards when serving food and beverages at internal and external events.²²

Three years after amalgamation, NS Health adopted a new healthy eating policy, resembling elements of former regional policies, while embracing a new population health approach.²² This policy replaced the five former policies and integrated updated nutrition evidence, federal guidance, and best practice (see Figure 1) across all NS Health facilities.

NS Health healthy eating policy

The 2018 NS Health policy falls under the service mandate of NS Health Nutrition and Food Services, with advisory support from a Steering Committee comprised of a Senior Director, Nutrition and Food Services directors and leadership, dietetic and nutrition practitioners, communications, and representation from the Foundation and Auxiliaries, patient and family advisory, and external research.

The policy applies to all food and beverages sold or served at NS Health facilities, events, or functions and draws an explicit evidence link between food, nutrition, and downstream health outcomes. The policy is aligned with other jurisdictional frameworks on healthy eating, including the federal Healthy Eating Strategy and Canada's Food Guide.³⁵ Its explicit purpose is the creation of supportive food environments, which according to best practice is one of the most effective ways to influence health (see Figure 2).²²

The policy goes beyond physical locations. It is applicable to all NS Health social and built environments in which food and beverages are served: food retail and food services settings across the province, including cafeterias, coffee shops, and

vending machines; special events and catering; associated procurement; and staff-specific consumption in healthcare settings as well. These social and built environments vary across the province, in communities ranging from urban centres to rural villages. This broad conceptualization of the food environment is consistent with other institutional contexts such as schools and shows that healthy eating is more than what we eat—it is how, why, when, and where eating occurs.³⁵ The policy explicitly states its intent to shift food "culture" towards healthier eating by engaging stakeholders throughout the system¹⁸ and moving away from healthy eating as a "cafeteria policy" or "nutrition policy."

Notably, the policy takes a food systems approach, addressing the pathway from farm to table. It also considers food waste and sustainability, including the ecological footprint of procurement, prioritizing food that is locally grown or combination meals cooked from scratch ingredients and prepared in site kitchens.

The policy reaches beyond food as an individual choice. The policy reinforces that food choices are more than the combined choices of individuals alone. It names NS Health as the "leader" to create a supportive environment, establishing avenues to implement further evidence-based programs and interventions under the auspices of the policy. The nutrition standards associated with the policy are based on province-wide nutrient composition guidelines within the Nova Scotia Food and Beverage Nutrient Criteria, also adhered to by public schools, recreation centres, and daycares.³⁶

The policy accommodates both exceptional and everyday circumstances. In comparison to the earlier patchwork of regional policies, the new policy addresses routine service delivery as well as special circumstances where performance standards might be needed. For instance, while past regional policies contained exceptions, the new policy is inclusive of all events under the auspices of the health authority—from a retirement celebration to an auxiliary fundraiser.

Healthy eating and quality improvement

Healthy eating policy and benchmarking

The following section will explore two specific aspects of intra-organizational benchmarking based on the criteria and definition by Ettorchi-Tardy: to set a standard for healthy eating culture, and second, how it prompts tests of change.

First, the policy is clear that a culture of healthy eating must be cultivated through practices of all individuals engaged through NS Health mandate—from executives to clinical service and support managers, frontline care and service providers, volunteers, patients, and visitors. These stakeholders have different priorities and roles when it comes to food decision-making. For example, a hospital foundation may raise money through catered events; clinical practitioners may be customers at the cafeteria; retail workers make decisions through everyday stocking and cooking operations.



ADMINISTRATIVE MANUAL
POLICY

TITLE:	Healthy Eating	No:	AD-AO-015
Sponsor:	NSHA VP Integrated health Services Primary Care and Population Health	Page:	1 of 7
Approved by:	NSHA Executive Leadership	Approval Date:	Dec 14, 2017
Effective Date: Jan 19, 2018			
Applies To: All foods and beverages served or sold by NSHA owned or operated facilities, settings, events and programs.			

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PREAMBLE

The Nova Scotia Health Authority (NSHA) is committed to providing foods and beverages that promote health throughout its facilities.

The NSHA Healthy Eating Policy was developed using evidence, research and best practice. Evidence and research shows that the most effective way to enhance healthy eating and support the health of a population is through the creation of supportive environments.

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Figure 1. The NS Health healthy eating policy.

Yet a supportive food environment requires aligned efforts by each of these individuals and service teams.

Bringing together frontline practitioners to build consensus and manage change is a key aspect of benchmarking.⁴ The involvement of practitioners relies on lived experience and knowledge at the patient or staff level and sets up the process of quality improvement for a greater orientation to the specific changes to practice that need to be implemented.^{4,5,37}

By creating a Steering Committee that features experienced interdisciplinary and frontline representation from diverse teams across the province, NS Health has

attempted to create a forum for advancing a cultural conversation. The committee flattens the management hierarchy and gives voice to those with differing responsibility and power in the organization. In meetings to date, discussion has featured practical observations about “junk food hot spots” to concerns about being labelled “food police” among those responsible for monitoring and measuring implementation of the policy. The design of the policy has served as a guide for deliberation: to challenge the way things are done, comparing what is to what could be, and to ask “how can this be done better.”³⁸

To shape a supportive environment the Healthy Eating Policy promotes:

- Increasing access to healthy food and beverages for all staff and visitors
- Selling foods and beverages that are nutrient dense, as according to the Nova Scotia Nutrient and Beverage nutrient criteria guide
- Fundraising that is non-food and beverage item based, or if fundraising with food, items meet the maximum and moderate nutrient criteria
- Restricting the marketing and advertising of foods that are of minimum nutrient criteria
- Raising awareness that breastfeeding is welcome and providing physical space for staff and visitors to breastfeed
- Engaging in food safety practices that meet provincial standards
- Collaborating with internal and external stakeholders

Figure 2. Excerpt from the NS Health Eating Policy, 2018, defining supportive environments.

Second, the NS Health healthy eating policy embeds principles of health promotion within a quality improvement implementation paradigm. The Plan-Do-Study-Act cycle (Shewhart or Deming cycle)^{16,37} is a way of ordering tests of change to organizational practice within quality improvement. The cycle involves an assessment of the problem (*Plan*), followed by a change in practice (*Do*) and analysis of the outcome (*Study*) to informs future practice (*Act*).

Accessibility, comprised of affordability and availability/variety of healthy products, is a key part of the healthy eating policy and provides an opportunity to integrate healthcare organizational (cost) and health promotion (equitable access) considerations. Price promotions to encourage purchasing of healthier options have been a growing area of food environment research,³⁹ becoming increasingly relevant to concerns of nutrition managers. A workplace survey had also been carried out with retail food services employees, prior to implementation of the policy, where staff shared the perception that healthy foods within the cafeteria were “too expensive.” Healthcare organizations are different from other retail food operators in that they may be able to operate on a “break-even” rather than profit motive. This is the case for NS Health, which used this capacity to establish a linked standard operating procedure to the healthy eating policy explicitly targeting affordability and accessibility for consumers—who might be staff at different compensation grades or diverse patients and visitors.

The NSH’s Nutrition and Food Services team has also begun to experiment with retail merchandising efforts that integrate price promotions to incentivize healthier choices. A PDSA cycle “makes it easier for previous practice to be discontinued and innovations to be accepted, implemented and spread throughout the healthcare organization.”³⁷ Rather than implementing these best evidence practices simultaneously throughout the province, price modifications were first identified by staff and then tested incrementally. Further, partnering with academic research partners (our team of co-authors), NS Health has evolved these tests of change to evaluate the impact of targeted *pricing* changes (increase in

price for less healthy options, decrease in price for healthier options) in combination with *placement* (healthy and unhealthy alternatives side by side) and *promotion* (large pull-up banners marketing healthier items) strategies, through analysis of point-of-sales (POS) data.

Sales data represent a valuable administrative dataset within healthcare organizations and food environments research. It is typically used for supply management, but the nutrition literature has demonstrated the value of in-depth sales data analysis as an important proxy measure for dietary outcomes.⁴⁰ The NS Health policy has catalyzed the development of both internal and external expertise to evaluate sales data. The findings from the initial evaluation will inform the next cycle of testing and facilitate a comparison of sales outcomes between sites.

Discussion and implications for future practice

This paper describes the NS Health healthy eating policy and its role as a benchmark to shift the food environment towards one that is supportive of healthy eating for staff, families, and entire communities within NS Health. Benchmarking within healthcare systems is a method of practice within quality improvement that often focuses on comparing clinical indicators between organizations; however, it is also used for intra-organizational or system-wide evaluation.^{7,41} Benchmarking for health promotion, and specifically nutrition promotion, is a newly evolving area of study, primarily studied within schools. For instance, Biggs et al recently used a process map to analyse the quality of a nutrition primary prevention program in Australian schools. In Nova Scotia, researchers have also assessed policy adherence to nutrition policies in schools from an implementation perspective.⁴² Yet as we have discussed in this paper, NS Health has demonstrated that healthcare healthy eating policies can become an important exemplar for benchmarking for health promotion purposes. Furthermore, the internal benchmarking process initiated by the NS Health healthy eating policy has highlighted emergent areas for future research in this area.

Novel data collection: Benchmarking within health promotion can be challenging because the indicators and goals are often focused “upstream” on concepts like empowerment, resilience, and here *culture*.¹⁶ These changes may be difficult to measure using traditional benchmarking methods. Collecting qualitative data, or in our case, establishing deliberative forums, and creative use of administrative data (eg, POS data) are just a couple of promising approaches.

Ongoing improvement is critical: An upfront investment is required in quality improvement to demonstrate value and cost-effectiveness. As we have discussed in this essay, healthy eating policies, because of their organization-wide impact, can support diverse managers and frontline staff alike to adopt processes to evaluate practices within and across teams.^{16,43} This must be done with some care, since engaging in tests of change, without controlling for context or confounders, may oversimplify findings.⁴⁴

Systems approach: Healthy eating policies are designed for internal impacts within the organization, yet due to their harnessing of food systems, integrate community impacts as well.¹⁶ Since there is skepticism among some scholars and practitioners that quality improvement leads to practical changes, critics may suggest quality improvement may simply pave the path to cost containment rather than the health of a patient or community^{16,45}—in essence, the opposite of a systems shift. A food system lens integrated into healthy eating policies can help healthcare organizations refine their understanding of healthcare service delivery beyond service lines. It can alert staff and decision makers to the broader opportunities for society-wide change.

Conclusion

In this article, we have explored the NS Health healthy eating policy as a benchmark for creating supportive environments to promote health. The policy emphasizes the importance of the food environment and its impact on improving diets at a population level. The policy brings NS Health stakeholders together and prompts tests of change to shift towards a culture of healthier eating.

Benchmarking in healthcare is not yet well understood outside of clinical care. In health promotion, the definition of the population and methods can diverge from the traditional quality improvement literature and present challenges when trying to “fit” health promotion within the traditional quality improvement approach.¹⁶ Healthy eating policies can serve as a bridge for healthcare organizations to consider the pathways to enacting supportive environments for changing population health.

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The ELIAS framework: A prescription for innovation and change

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Abstract

Healthcare is a complex adaptive system with multiple stakeholders and dynamic environments. Therefore, healthcare organizations must continuously learn, innovate, adapt, and co-evolve to be successful. This article describes a systematic, comprehensive, and holistic performance management framework that healthcare managers can use to achieve these goals. The framework involves the ongoing assessment, modification, or replacement of current programs or services aimed at adapting successfully to achieve the organization's strategic objectives. This is engendered by the presence of a culture that is premised on continuous learning and innovation. The foundation of the framework is based on accountability, the organization's strategy, and its culture. This then acts as the basis for an ongoing process of measurement, disconfirmation, contextualization, implementation, and routinization that enhances learning, innovation, adaptation, and sustainability within the healthcare organization.

Introduction

Healthcare environments can be described as complex adaptive systems. These systems can react to stimuli in unexpected non-linear ways and jolts to the healthcare system such as the COVID-19 pandemic can make it challenging to predict how they will respond.^{1,2} Nevertheless, complex adaptive systems can allow for learning, innovation, and adaptation by utilizing dynamic capabilities based on Organizational Learning Mechanisms (OLMs) that incorporate action learning, interdisciplinary teams, and practice-based evidence as well as the presence of a culture of learning and innovation.³⁻⁷ The Enhances Learning, Innovation, Adaptation, and Sustainability (ELIAS) framework (Figure 1) incorporates these characteristics into its design with the intent of enhancing learning capabilities and innovation within healthcare organizations and systems.^{4,8-11}

Learning and innovation

Innovation has been defined as “a novel idea, product, service or care pathway that has clear benefits when compared to what is currently done.”¹² An innovation can arrive from continuous incremental change or from radical or disruptive change. Most innovations follow an incremental path for financial and human resources reasons. Nevertheless, there are occasions when disruptive innovations demonstrate major gains in effectiveness and efficiency for patients and providers.^{7,13-16} Innovations are accepted and diffused if they can demonstrate relative advantage over previous practice; there is a fit between the innovation and current culture; the benefits can be easily tried and observed under local contexts, and there are organizational networks for spreading the innovation.^{13-15,17,18} A learning organization can be described as one that continuously creates, acquires, and routinizes knowledge and modifies its behaviour to reflect the new knowledge.¹¹ A positive correlation has been observed between learning capability and innovation capacity. Therefore, an organization

that learns continuously through external knowledge acquisition or from knowledge creation and experimentation improves its chances of service and process innovation.^{4,8,19-21} The culture of organizations dictate how they respond, learn, and adapt to changing environments. A culture of learning and innovation increases an organization's successful pursuit of continuous improvement and environmental adaptation as a result of learning and innovation. The characteristics of a learning and innovation culture are outlined in Table 1.^{3,9,11-20}

The ELIAS performance management framework

The ELIAS framework is a dynamic capability based on OLMs that integrate action learning, shared reflection, and continuous improvement aimed at increasing the absorptive capacity for learning and innovation.^{4,8,10,22,23} Organizational strategy, accountability, and culture are critical aspects of the framework (Figure 1). *Measurement* helps to clarify cause and effect relationships thereby directly affecting learning, innovation, and improvement capability. Gaps in performance highlighted by measurement information leads to deliberate reflection aimed at developing evidence-based solutions to close the gap.²³⁻²⁷ *Disconfirmation* of the processes and activities designed to achieve the outcomes of programs and services being assessed is an important step in the framework.^{10-16,28-30} This leads to a search for solutions and innovations and then testing them within the organization's context to improve performance (*contextualization*). This process is an important source of learning and innovation.^{4,5,7,16,25} Following evaluation

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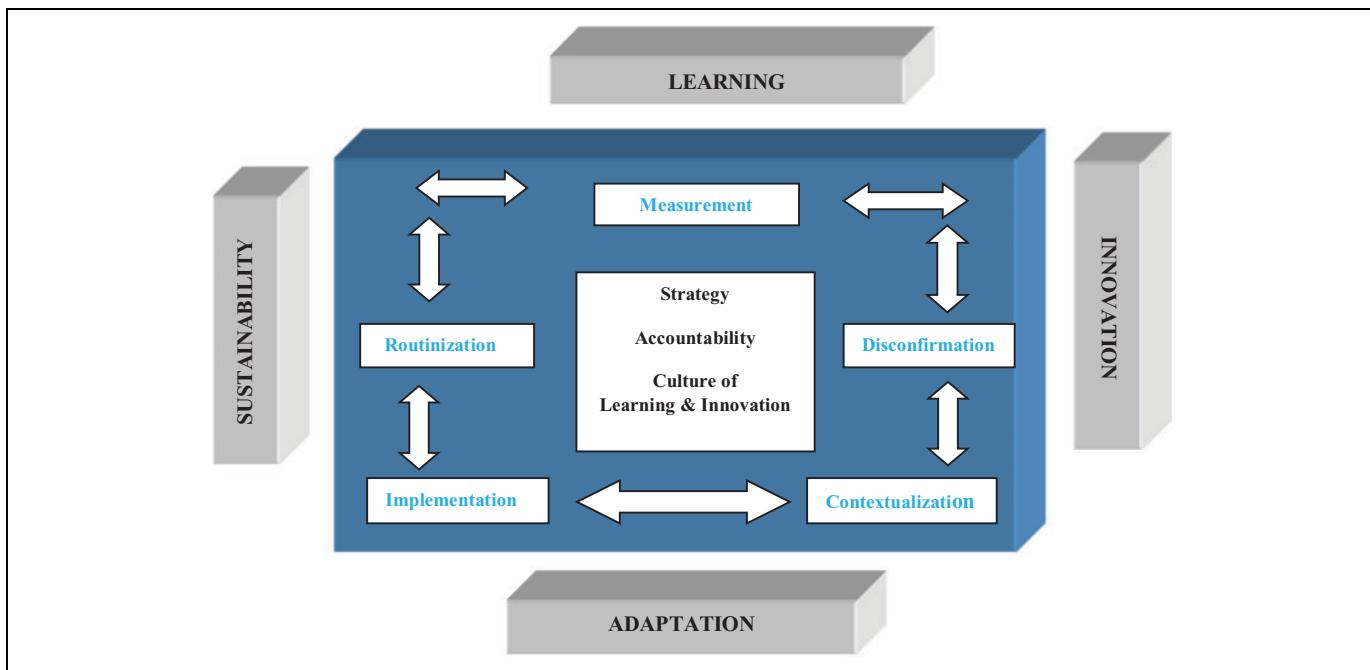


Figure 1. The ELIAS framework. ELIAS indicates enhances learning, innovation, adaptation, and sustainability.

and acceptance of proposed solutions, the next phase is *implementation* of the innovations. These innovations then become incorporated into standard operational procedures and policies and procedures in the *routinization* phase (Figure 1).^{15,17,31-33} Although the ELIAS framework is represented as cyclical, moving from one stage to the next may not always be linear because evaluation may cause a shift to a previous stage due to unanticipated factors such as inadequate resources, changes in strategic direction, or poor performance of proposed solutions.¹⁰

Using the ELIAS framework

Measurement

Performance measures are best designed by a multi-disciplinary team that includes patients as well as those who will use, affect, and be affected by the measures being contemplated.^{24,26,28,29,34} This enhances ownership of the measures and makes it easier to accept the information provided by the measures when they signal a gap in performance. The operational level of the organization (program, unit, department) is reflected in most performance measures because cause and effect associations between processes and outcomes can be determined at this level and is where interventions to improve performance are made. A balanced set of domains represented by process and outcome measures can be reported in dashboard formats. This makes assessment easier since the multiple visual representation of related measures has been shown to enhance understanding.^{24,26-28,34} Gaps in performance initiate assessment, reflection, and solution development using improvement strategies such as Plan Do Study Act

(PDSA), Lean, or Six Sigma. The search for and testing of solutions generates knowledge, learning, and innovation that is reflected in modified processes or new innovations.^{8,10,14,19,20}

Disconfirmation

This stage of the ELIAS framework is reflected in an awareness of a performance gap between observed and expected performance. Unfortunately, sometimes the awareness of a performance discrepancy is not enough to cause the disconfirmation of current practices and a search to close the performance gap.^{10,16,28,29,31} This is the reason emphasis was placed on input in measurement design from all stakeholders affected by the measures or who affect them. This way there is an improved chance of acceptance of the information provided by the measures. In addition, the presence of a culture that embodies the precepts outlined in Table 1 is also important for the acceptance of the information provided by performance measurement.^{3,9,31-33}

Contextualization

The development of solutions to close the perceived performance gap involves all stakeholders who act on the performance measures, as well as those who affect and are affected by them. It is done using OLMs based on action learning, shared reflection, and experimentation.^{4,8,10,23,29} Methods used to generate solutions can include logic models, failure mode effects analysis, root cause analysis, Lean, and Six Sigma.^{26,28,34} Solutions represent a congruence between the resources of the organization; the organization's culture; its strategic direction, and the criteria for success set out by stakeholders involved in solution generation.^{23,29,31,32,35} Solutions must also demonstrate practice-based evidence

Table 1. Characteristics of a culture of learning and innovation

A recognition that healthcare is a complex adaptive system and a commitment to co-evolution aimed at both adapting to and influencing healthcare environments	
The use of accountability mechanisms such as performance measurement and management	
Participation of all stakeholders including medical staff and frontline personnel in the design of performance measurement systems	
A data-driven entity that emphasizes continuous improvement and performance driven change	
The usage of organizational learning mechanisms (OLMs) that incorporate action learning, feedback, shared reflection, and low-risk ethical experimentation to engender individual and team learning	
The utilization of facilitated learning techniques such as collective reflection, simulations, e-learning, and case presentations to enhance problem assessment and solution generation	
The use of integrated information systems and knowledge management practices aimed at improving the organization's capacity to generate, acquire, and integrate knowledge into organizational services and processes to transform and adapt to changing environments	
The utilization of interdisciplinary teams and organizational networks to collaboratively develop, test, and implement solutions, spread innovations, and implement changes	
The continuous development of a psychologically safe environment that is reflected in fair organizational policies and practices as well as tangible management support	
Leadership that actively promotes a climate of openness to innovation	
Leadership that demonstrates transparency, honest communication, collegiality, and inclusiveness that is aimed at building trust throughout the organization	

reflected by local pilot testing to assess their viability within the organizational context where it will be implemented. This makes it easier for previous practices to be discontinued (*disconfirmation*) and innovations to be implemented. This form of practice-based evidence or social proof is critical for successful implementation of the innovation.^{17,29,31-33}

Implementation and routinization

The successful implementation of innovations must consider the beliefs of those who will be recipients of the change.³⁰ These organizational members readiness for change is affected by the following: perceptions of a *discrepancy* in actual versus expected performance; the perceived *appropriateness* of the innovation; tangible *management (principal) support* for the change; perceptions of *efficacy* regarding implementation of the innovation; *personal valence* for the innovation; and the presence of *purposeful facilitation* to enhance implementation of the innovation.^{17,30-33} Employees must perceive implementation of the innovation as being necessary. This is the reason for stakeholder involvement in the design of performance measures. This enhances the legitimacy of a perceived *discrepancy* between current and expected performance.²⁷⁻³² The acceptance of a discrepancy and disconfirmation of current practices initiates the development of solutions (innovations) that demonstrate

their *appropriateness* for implementation. The innovation must be perceived as being able to close the perceived performance gap.^{16,30} As outlined in the contextualization phase, this is enhanced by choosing innovations compatible with the culture, resources, and strategic direction of the organization. This helps to overcome resistance and enhances perceptions of the innovation's *appropriateness*.^{3,29,31-33}

Implementation of innovations will not occur without *management (principal) support*. Management must ensure that financial, technical, and human resources are in place to support the change.^{15,30-33} In addition, people charged with performing the new tasks must feel a sense of *efficacy* in their capability to successfully perform them.^{14,19,30,31,33} Management can enhance this perception by providing the necessary training, resources, and support for performing the new behaviors for successful implementation of the innovation. It is also important for management to show those who will be affected by the change that they will benefit directly and indirectly from it. This increases their *personal valence* and commitment to performing at high levels.^{14,18,30-32}

Change agents and champions must possess the requisite skills and organizational supports to guide *purposeful facilitation* of implementation of the innovations. Examples of these include experience with the innovation, as well as the utilization of social, clinical, and technical networks and communication channels to enhance collaboration, coordination, and implementation. Champions must also be empathetic to the concerns of change recipients and initiate regular feedback conversations and sessions to maintain commitment to the change.^{14,15,17,18,29} Routinization is an extension of the implementation phase and is accomplished when the innovation becomes integrated into standard operating procedures and institutionalized as policies and procedures. Routinization is also greatly enhanced if the readiness for change factors outlined previously has been addressed and collaboration, networking, and connectivity among stakeholders are maximally utilized.^{14,15,17,19,33}

Examples of cases mapping onto the ELIAS performance management framework

The three case studies are from healthcare facilities within the Nova Scotia Health Authority (NSHA). The NSHA possesses and stresses the importance of a culture of continuous improvement, learning, and innovation (Table 1). It is accepted within the organization that the presence of such a culture is the key driver for developing and maintaining a high performing health system. These cases all had tangible senior management support and was conducted by interdisciplinary teams in a climate of collaboration and support.

Case study 1: Tenecteplase for ST elevation myocardial infarction

Tenecteplase (TNK) is a lifesaving thrombolytic drug administered to patients with ST Elevation Myocardial

Infarction (STEMI). Best practice is to administer the drug within 30 minutes of arrival at hospital. Measurement time from arrival at the hospital to administration of TNK revealed performance below the 30-minute benchmark (*discrepancy*) and directly conflicted with the beliefs held by clinical staff. All stakeholders then collaborated on a refined data collection and performance assessment (*Measurement*) protocol that was presented at specified interval over several months. Assessment of the performance information and team reflection led to a shift in the mindset of clinical staff. They accepted that there was indeed a performance gap (*discrepancy*) and clinical care could be improved (*Disconfirmation*). The search for solutions then began with audits of the current processes and all staff advised on process improvements appropriate to their local emergency department (*Contextualization*). Examples included making a dedicated stretcher for performing ECGs and developing “Code STEMI,” a process to mobilize key staff. Frontline staff took ownership of the project (*Implementation*) and it was successful because it was designed and led by the local care team. Monthly meetings were held to review performance and tweak processes to ensure sustained improvement (*Routinization*). This combination of regular meetings to collaborate and reflect on performance information and learn what was working and what needed to be changed, as well as discussing the associated process drivers, resulted in more modifications and eventual routinization of this innovation. This success and resulting team efficacy reinforced the learning and innovation culture and staff became open to reviewing other areas to determine whether improvement may also be needed.

Case study 2: Pressure injury prevention and management

Pressure injuries are a major concern in health systems across the world. Within Nova Scotia, there has been a dedicated focus on the prevention and management of pressure injuries for 5 years. Annual prevalence studies provide key information on the extent of pressure injuries as well as contributing factors. Initially, staff and management were resistant to data indicating that pressure injuries were an issue (*discrepancy*). However by collecting, analyzing, and disseminating this information on a regular basis (*Measurement*), attitudes have now shifted (*Disconfirmation*), with stakeholders now focused on improving this situation. Since each jurisdiction is different, each area is responsible for developing a local improvement plan that is contextualized to their population and facility (*Contextualization*). This ensures that the selected improvement methods will fit each jurisdiction rather than assuming a one size fits all approach (*Contextualization*). Interdisciplinary teams developed and implemented solutions in their respective locations. Outcomes were evaluated using accepted benchmarks and results were analyzed and reflected upon by team members. Modifications were made to care processes

using PDSA type iterations. Each cycle of improvement has produced substantive gains (*Contextualization, Implementation, and Routinization*). This process has also served to reinforce the benefits of a culture of learning and innovation (Table 1).

Case study 3: Information sharing during COVID-19

COVID-19 forced a rapid transition in the approach to analytics and operational decision-making at the NSHA. An Emergency Operations Centre and several Incident Management Teams were implemented; each with unique analytical needs to support rapid decision-making. Daily information to support operational decisions and strategic planning was needed. This shift in the utilization of analytics and decision-making resulted in a need to alter existing processes within the Performance and Analytics Team. The team had been producing operational reports and dashboards on a quarterly basis and it became apparent that this strategy would be unsuccessful given the new environmental realities and needs of decision-makers (*Disconfirmation*). The team developed solutions to fulfill the information needs of each team of decision-makers. The information each team needed was slightly different so team-specific indicators and modes of presentation were developed collaboratively to meet each teams’ specifications (*Contextualization*). Although the new way of producing information was effective and efficient, ongoing education was required to support key leaders understanding and use of it (*Implementation, Efficacy, Facilitation*). A shared learning situation emerged whereby senior management learned how to use the new technology (visualization platform) and to incorporate new information at a much quicker pace into their decision-making. At the same time, the Performance and Analytics Team learned to maximize the utility of this new technology and make the information a routine aspect of decision-making (*Routinization*). A real innovation has emerged as often does with complex adaptive systems such as healthcare. In addition, increased investment in the team and the technology has continued and has led to an innovation-driven transformation in the use of analytics within the NSHA.

Conclusion

Healthcare organizations need to continuously learn in order to innovate and adapt to their changing environments.^{7,15,19-21} The ELIAS framework (Figure 1) is specifically designed to enhance learning, innovation, and adaptation by using performance measurement systems that are already being utilized by healthcare organizations for accountability and improvement. Therefore, in terms of the costs and benefits of utilizing the ELIAS framework, this makes it a valuable extension of what is already being done. The presence of a culture of learning and innovation is an important aspect of the successful functioning of the ELIAS framework and leadership is important for building and reinforcing this culture (Table 1).^{3,6,9,19,35} The ELIAS framework uses

measurement to inform on the ongoing success of current practices while appraising the need for change. If change is necessary, the framework can then be used to develop, test, implement, and routinize evidence-based solutions. The execution of these processes within the organization's context is where learning and innovation occurs and allows for the resulting evidence-based innovations to be implemented and routinized thereby leading to adaptation to changing environments.^{4,14,18,19,28} The paper's prescriptive intent provides management with methods that can be integrated into standard operating procedures and adapted to their individual contexts. The result is the development of a culture where beliefs and mindsets naturally lead to the development of learning systems and where innovation and adaptation to changing environments becomes the norm.

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Ethical health leadership: Lessons from low- and middle-income countries during COVID-19

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Abstract

We adopt a holistic—micro, meso, macro—approach to health leadership ethics to examine how low- and middle-income countries have responded to the COVID-19 pandemic. Healthcare delivery happens within complex settings in low- and middle-income countries and high-income countries. These settings are riddled with systemic political and economic challenges which, in some instances, make it difficult for health leaders to be ethical. These challenges, however, are not unique to low- and middle-income countries. Globally, countries can learn from ethical health leadership missteps that occurred during low- and middle-income countries' responses to COVID-19. We discuss the implications of problematic ethics in health leadership on managing pandemics in low- and middle-income countries, using Zimbabwe as an example. We offer suggestions on what can be done to improve ethical health leadership in response to future health crises in both high-income and low- and middle-income nations.

Introduction

The COVID-19 pandemic challenged the definition of ethical health leadership worldwide.¹ Low- and Middle-Income Countries (LMICs) bore a significant burden in maintaining good ethics in their healthcare systems during the COVID-19 pandemic. Fragile economies, scarce resources, conflicts, political uncertainties, fragmented healthcare systems, and corruption tested the ethical response to the pandemic from health leadership in these regions.² The case of Zimbabwe provides a quintessential example of the perils of mismanaged micro, meso, and macro healthcare ethics in response to a pandemic.

We adopt a population health approach to define health leadership which focuses on health and wellness rather than illness.³ This definition recognizes that health leaders work in clinical and non-clinical settings to understand the needs and find solutions for the delivery of clinical services, community outreach, intersectoral partnerships, and social determinants of health.⁴ The traditional definition of ethical health leadership narrowly focuses on the dyadic relationship between clinicians and patients. Albeit dichotomous and somewhat cloistered, this relationship occurs in a larger setting of healthcare systems run by institutions and governments. We would be remiss not to adopt a holistic definition of ethical health leadership that focuses on the micro, meso, and macro levels of healthcare systems⁵ to examine the response to COVID-19 in LMICs. The micro level deals with systems at the individual level, the meso level focuses on the middle level of systems including organizations and communities, and the macro level focuses on large national systems.⁵

While medical ethics are as old as medicine itself, the four commonly adopted biomedical ethics principles of respect for autonomy, beneficence, non-maleficence, and justice were

developed by Beauchamp and Childress in 1989.^{6,7} For the better part of the past few decades, these principles have been maintained as the ethical foundation of the clinician-patient relationship. COVID-19 demanded an overarching systematic healthcare response with population-oriented ethical healthcare principles. In addition to the four biomedical ethics principles, health leaders were called to consider principles of planning, safeguarding, and guiding in ethically managing the COVID-19 pandemic.⁸ Given these ethical principles, what remains to be understood is how well leaders in LMICs responded to the COVID-19 pandemic and how ethical their response was in preventing the spread of the pandemic, and the aim of this paper was to address these questions.

Challenges to managing COVID-19 in LMICs

The challenges related to ethical leadership while managing COVID-19 and other pandemics are shaped by LMICs' fragile political and economic systems. When COVID-19 struck, many health leaders in LMICs had not planned for the pandemic, could not properly safeguard their population, and faced challenges in guiding the healthcare response.⁸ Low- and middle-income countries are home to more than 80% of the global population, but their share of the world's resources is about 30% of the global domestic product.⁹⁻¹¹ COVID-19 added to all these pre-existing resource constraints and contested health leadership ethics in the pandemic response.

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Lack of good governance, including corruption (note 1), incompetence of public officials, and mismanagement of healthcare resources, plagues countries worldwide, but it is amplified in LMICs because of their tenuous domestic economic and political positions.^{12,13} In some LMICs, public officials in key positions lack the capacity to address the issues they face including health crises. Incompetence and mismanagement of healthcare resources translates to poor health delivery outcomes. Some public health officials spend resources on non-essential services and leave little resources left over to spend on essential services due to the lack of capital budgeting skills or the ability to prioritize expenditure given a constrained budget. Different forms of incompetence and mismanagement of resources contributed to the spread of COVID-19 in LMICs.

Corruption, which consists of deliberate incompetence for personal gain, has been characterized as the ignored pandemic in the healthcare setting.¹⁴⁻¹⁷ The ultimate ethical obligation for leaders in any healthcare system is the well-being of the patient and population. However, corruption superseded ethics for some health leaders in LMICs who had an opportunity to reduce the spread of COVID-19 but resorted to corruption instead and failed to safeguard their population's well-being. Health systems in High-Income Countries (HICs) are not immune to corruption. Large investments in the healthcare systems provide a protective veil on corruption in HICs. Nevertheless, the persistent inequalities in managing COVID-19 revealed that corruption as the ignored pandemic is very much alive in both LMICs and HICs.¹²

Foreign aid to LMICs in response to COVID-19 was not spared from the lack of good governance. An abundance of aid resources and a tangled bureaucratic chain of command to distribute aid is an impetus for corruption and mismanagement of resources for some unethical healthcare leaders in LMICs.¹³ Aid that comes without added interventions such as building robust public investment systems to safeguard resources from misuse and training on how to best utilize resources is as good as throwing away money and resources. Most LMICs do not have the institutional capacity to administer aid funds. Furthermore, funds may be diverted for other purposes given the lack of resources within the healthcare sector. Providers of foreign aid need to build the capacity of healthcare systems and leaders in LMICs to address the health priorities targeted by the aid. Corruption and resources mismanagement affected health service delivery, research and development, health workforce management, and procurement of COVID-19 supplies.¹⁸ Globally, there have been calls to mark 2020-2030 as the decade of anti-corruption in healthcare,¹⁹ but the COVID-19 response presented an opportune but missed moment to begin to address corruption in healthcare.

Most LMICs rely on the informal economy,^{20,21} and their populations do not have Universal Health Coverage (UHC). When COVID-19 struck and imposed lockdowns globally, many people lost their jobs. Job losses in HICs differed significantly from job losses in LMICs because many HICs

with stable economies had contingency measures to provide social support for their unemployed populations, UHC for their populations, and functioning healthcare systems. In LMICs, COVID-19 lockdowns were almost impossible to institute and not sustainable for longer than a few days. Individuals faced the debilitating choice of either dying from hunger or taking the risk to work in the informal sector without physical distancing or protection from the spread of COVID-19.²² Worldwide, political leaders were called on to enact physical distancing rules that do not bias against any population group.²³ This was not feasible in most LMIC economies. Being accosted into choosing between livelihoods and appropriate measures for preventing the spread of a pandemic is obviously a choice which no individual has to make if healthcare leaders are deliberate and ethical about healthcare equity and equality.

The case of Zimbabwe

Zimbabwe is a low-middle-income country in Southern Africa with a population of 14.6 million.²⁴ It has experienced more than its fair share of political and economic turmoil.²⁵ A few months after COVID-19 began to spread globally, some government officials were alleged to be at the centre of an elaborate corruption scandal, where they misappropriated close to \$60 million in funds that were earmarked to procure COVID-19 supplies for the public.^{26,27} Until the end of May 2020, Zimbabwe had less than 100 confirmed cases and 4 deaths from COVID-19. By September 2020, confirmed cases had risen to more than 6,000 and deaths from COVID-19 rose to more than 200.²⁸ These data only reflect known official cases and deaths from COVID-19; they may underestimate the actual data as a result of under-reporting or inadequate testing in some Zimbabwean communities, especially rural areas. While these numbers are relatively low compared to the prevalence and mortality rates in other HICs and LMICs, healthcare leadership in Zimbabwe missed an opportunity to ethically lead the COVID-19 response early on to prevent the spread of the pandemic.

Lack of good governance in the form of corruption, incompetence, and mismanagement of healthcare resources in the pandemic response happened in the milieu of a failing economy where nurses and doctors did not earn a living wage and struggled to make ends meet. Doctors and nurses went on strike to protest for better wages and proper protective gear amid COVID-19.²⁹ Some frontline workers in Zimbabwe did not have personal protective equipment during COVID-19. It was unethical for health leaders and public leaders to send health workers to the frontlines to fight the pandemic without protective gear. Doing so exponentially increased the odds of spreading COVID-19 since frontline workers came into contact with a lot of people.

Most of Zimbabwe's COVID-19 cases were imported from other countries. When travellers arrived back in Zimbabwe after the lockdown went into effect, they did not have access

to good accommodation for the designated quarantine period. Even though Zimbabwe quarantined travellers and returning residents, the quarantine facilities were inhabitable and forced many returning residents to escape quarantine. Failure to properly quarantine returning residents potentially increased community transmission of COVID-19 from imported cases.

About 98% of Zimbabwe's working population is employed in the informal sector.²⁹ When COVID-19 struck, the informal sector ground to a halt and the government was not able to provide a social and economic safety net for informal workers. Without some kind of government assistance in cash or in-kind, employees in the informal sector were left with the difficult choice of staying home with no livelihood or going to work and risking contracting COVID-19. In instances where workers chose to continue working in the informal sector, they also risked being victimized by law enforcement or being arrested for not following the lockdown rules. The majority of the public who work in the informal sector should have never been put in such a compromising position. In all the confusion and when healthcare leaders failed to uphold their ethics in responding to the pandemic, ordinary Zimbabweans used on-line crowdfunding to raise funds for COVID-19,³⁰ but it was not adequate to compensate for failures of the health system.

The response to COVID-19 from healthcare leaders in Zimbabwe failed to fulfill the ethical principles of respect for autonomy, beneficence, non-maleficence, justice, planning, safeguarding, and guiding at the micro, meso, and macro levels. Misappropriation of already insufficient pandemic resources failed to fulfill the four values of maximizing the benefits produced by scarce resources, treating people equally, promoting and rewarding instrumental value, and giving priority to the worst off.^{31,32} Without the poor governance, incompetence, mismanagement of resources, corruption, political uncertainty, and economic instability, the number of COVID-19 cases and deaths in Zimbabwe could have been contained.

While few countries experience political, economic, and healthcare problems at the magnitude that Zimbabwe does, some nations in both HICs and LMICs have experienced some version of these issues. Zimbabwe's case may not be generalizable to all countries, but some of the ethical health leadership missteps in managing COVID-19 are perhaps similar to what transpired in other countries globally. Efficient and effective ethical health leadership in managing COVID-19 was found wanting in both HICs and LMICs. In 2019, the United States ranked first, and the United Kingdom ranked second on the Global Health Security Index (GHSI), an assessment of 195 countries' capacity to deal with infectious diseases.³³ However, the United States and the United Kingdom failed to plan, safeguard, and guide their populations in response to the COVID-19 pandemic and underperformed compared to countries that ranked lower on the index such as Germany and Canada. In principle, the GHSI was a poor predictor of performance in a pandemic response for some HICs. The GHSI predictions can only

become true if there is a political will to achieve the predictions from leaders at all levels.

The lessons to be learnt from Zimbabwe apply in all countries with similar ethical healthcare management issues. These lessons include:

1. The need for nations to be prepared to deal with health crises such as pandemics.
2. Healthcare leadership ethics training at the micro, meso, and macro levels of leadership.
3. The importance of ethical leadership and political will to achieve healthcare equity and equality.
4. The need for good governance that addresses corruption, incompetence of public leaders, and mismanagement of resources in healthcare through research, policy, and strengthening oversight and accountability locally and globally.
5. The importance of concerted efforts between the political sector and the economy to address health crises.

Lessons learned

If we are to achieve Goal 3 of the UN's *2030 Agenda for Sustainable Development for All*, which is to ensure healthy lives and promote well-being for all at all ages,³⁴ health leaders worldwide at the micro, meso, and macro level need to uphold principles of ethical health leadership.

First, LMICs have been plagued by more health calamities including infectious and viral epidemics and pandemics than HICs. Diseases such as SARS, HIV and AIDS, cholera, and Ebola have ravaged these countries at various times in history. In this regard, LMICs should have been more prepared to mobilize resources to respond to COVID-19.³⁵ Even though the response may not have stopped the spread of COVID-19, nations globally can learn that they need to be more prepared for pandemics in order to be agile when they strike.

Second, inadequate regard for ethics in the public health sector's response to COVID-19 in some countries highlights the importance of ethics training in response to health crises. Most health leadership training programs target physicians,^{36,37} and they are usually relegated to electives in the curricula.³⁸ We have unpacked the fact that health leadership transcends the clinical setting to include health budgets in the economy. This calls for action that has not been considered before where health leadership ethics training and refresher courses are essential to all leaders to deliver healthcare programs that can ethically respond to emergencies.

Third, lack of good governance including corruption, incompetence, and mismanagement of resources in healthcare costs lives. It is essential to ensure that health resources are distributed fairly and to those who need them the most during health crises.³² Setting a precedence of equity and equality in distributing healthcare resources has the potential to reduce the spread of diseases and reducing the negative impact of health crises on the economy.

Fourth, health professionals and patients need guidance, assurance, and compassion from their health leaders,³⁹ especially in times of health crises. When the principles of ethical health leadership are contravened, healthcare workers are demotivated and mistrust is born between the system, the workforce, and the population; once trust is lost, it is difficult to regain it.³⁸ Failed health leadership means increased illness and mortality which both have ripple effects on all sectors of the economy.

Finally, given the importance of ethics in health leadership, we can infer that a nation's political health plus its economic health will equal excellent public health. To this end, ethical health leadership that responds well to pandemics and health crises cannot happen in isolation. COVID-19 has underscored the importance of UHC for all. Faced with a health crisis, having health coverage would have helped populations access health services to reduce mortality from COVID-19. According to the World Health Organization, implementation of UHC requires effective health systems governance to ensure that strategic policy frameworks exist and are combined with effective oversight, coalition-building, regulation, attention to system design, and accountability.⁴⁰ The interlocking nature of government sectors, such as finance, education, and health, for instance, requires that governments ensure full functionality in order to achieve equitable and ethical healthcare responses to future pandemics.^{41,42} Lack of political will can indeed make science obsolete.

Implications on pandemic management

Compromised ethical health leadership in response to COVID-19 in LMICs led to lagged responses to pandemic management that were reactionary rather than proactive. This lackluster health leadership resulted in resources intended to prevent the spread of COVID-19 not reaching the public.⁴³ Incompetence, mismanagement of resources, corruption, and theft of COVID-19 resources potentially increased COVID-19 cases and widened the persistent health inequalities between the rich and the poor.

Lack of health leadership ethics in the COVID-19 pandemic response in LMICs undoubtedly increased instances of underreporting of COVID-19 cases and deaths.⁴⁴ Failure to account for pandemic illness and deaths infringed on healthcare ethics because healthcare data and information are important baseline tools to support the ethical principles of planning, safeguarding, and guiding a national pandemic response.⁸

What has worked well

We would like to assert that even though ethical health leadership in response to COVID-19 seemed absent in some LMICs, by design or default, some things worked well in managing the pandemic. Stuck between a rock and a hard place in deciding whether to stay safe in lockdown or to go and work in the informal sector, most employees in LMICs chose to go to work. Breaking physical distancing rules

imposed by public health officials meant full exposure to COVID-19. This forced the public to be vigilant about wearing masks in public as a form of self-preservation without the need for enforcement and it may have contributed to the low spread of COVID-19 infection in some LMICs.

Low- and middle-income countries are rich with a culture of social capital structures that carry a fabric of caring which is called *ubuntu* in sub-Saharan Africa.⁴⁵ Among other things, *ubuntu* is about community, acknowledging that your pain is my pain, your wealth is my wealth, and your salvation is my salvation. These social structures were crucial in providing support in the face of the uncertainties presented by COVID-19 in LMICs and they probably did not exist to a great extent in HICs. In the case of Zimbabwe cited earlier, the community-led fundraising efforts show the concept of *ubuntu* in micro-level ownership of healthcare ethics.

Conclusion

The essence of ethical health leadership lies in the fact that delivering quality healthcare to the population occurs when health inequalities are reduced. Health inequalities driven by the lack of good governance including corruption, incompetence, and mismanagement of resources were persistent during the COVID-19 pandemic worldwide. The pandemic was a missed opportunity for HICs and LMICs to address healthcare priorities. Improving health leadership ethics has the potential to reduce healthcare inequalities and enhance future pandemic responses in particular and healthcare systems in general. Ethical health leadership in response to health crises for all nations does not occur in a vacuum, and it requires concerted ethical economic and political leadership.

Note

1. Corruption is the abuse of public office and trusted authority for private gain using mechanisms such as bribery, nepotism, graft, and extortion.¹³⁻¹⁵

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