

DEVELOPMENT OF A PROVINCIALY-ENDORSED MATURITY MODEL FOR CLINICAL INFORMATION SYSTEMS

Centre for Digital Health Evaluation

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Acronyms

C-COMM Continuity of Care Maturity Model

CDHE Centre for Digital Health Evaluation

CIS Clinical Information System(s)

CISMM Clinical Information System Maturity Model

EMR Electronic Medical Record

HHF Healthcare Human Factors

HIMSS Healthcare Information and Management Systems Society

MM Maturity Model

MOH Ministry of Health

OH Ontario Health

OHT Ontario Health Team

WCH Women's College Hospital

WIHV Women's College Hospital Institute for Health System Solutions and Virtual Care

Operational Definitions

Clinical Information System: Integrated information management platforms supporting the collection, access, use, and sharing of personal health information for the delivery of health services to persons and populations (1). Clinical information systems also provide a platform to embed clinical best practices and standards based on leading evidence and are usually different for each sector (e.g., hospital information system in acute care settings, electronic medical records in primary care settings, community-based specialist practices, etc.) (2).

Criteria: The categorization of specific indicators within a domain that drive a particular goal.

Domains/Focus Area: The specific area(s) of focus being measured in the draft maturity model (e.g., Patient experience, Technology infrastructure, etc.).

Entity: Any persons, groups, or organizations that provide, directly or indirectly, healthcare services. In the context of this project, an entity refers to an establishment of an OHT via its member organizations coming together to act as a unified body with established processes for collaboration and governance.

Health Sector: An area of healthcare in which individual or groups of organizations share the same or related activities, products, and/or services to facilitate the provision of healthcare and safeguard the health of individuals or populations. Activities, products, and/or services may include healthcare services and facilities; medical devices, equipment, and supply manufacturers; medical insurance, medical services, and managed care; and pharmaceuticals and related segments. The health sectors of interest for this project include Acute Care, Primary Care, Home Care, and Community Services.

Indicators: The quantifiable measurement used to evaluate the success of an organization in meeting the objectives of clinical information systems maturity.

Maturity Levels: Measurement of the capability of an integrated delivery system (e.g., OHTs) and its member organizations, for continuous improvement in a particular domain/focus area. In the draft Clinical Information System Maturity Model, maturity levels refer to the scale in which each domain is measured against (i.e., scale ranging from 1 (basic) to 3 (advanced) for each domain). Higher values typically refer to higher maturity levels.

Maturity Models: A tool that helps people, groups, or organizations assess the current effectiveness of a structure/process, object/technology, or people/culture and supports figuring out what capabilities need to be acquired to improve performance. In the context of healthcare,

maturity models are conceptual frameworks that can be used to evaluate and facilitate the development of healthcare practice, operations, and infrastructures (3).

Member Organization or Healthcare Organizations: A formalized group of people or businesses that provides, directly or indirectly, healthcare services. In the context of this project, member organizations refer to all the formal groups and businesses providing healthcare services that comprise an OHT (e.g., hospital, primary care clinic, community support service, home care organization).

An **Ontario Health Team (OHT)** is a practice model that supports the full and coordinated continuum of care within and across different practitioners and organizations, including primary care, acute care, home care, and community services, in a certain geographic catchment area. Specifically, the goal of the OHT is for patients to receive all their care from one team of practitioners so that patients can navigate the system and transition easily between different practitioners and health services (4).

Organizational Leaders: Individuals (e.g., managers, directors, Chief Medical Information Officer) overseeing operational aspects of clinical information systems and related digital technologies within and across different healthcare settings in primary care, acute care, home care, and community services.

Healthcare Practitioners: Frontline staff (e.g., physicians, nurses, social workers) that provide healthcare services to patients.

Executive Summary

Background

Clinical information systems (CIS) support the collection, access, use, and sharing of information for the delivery of health services (1). CIS can enhance the performance of healthcare organizations and enable integrated care, but incompatible systems can silo information and fragment care (5,6). Maturity models (MMs) describe the stages through which organizations and processes evolve towards greater maturity (3,7). Existing MMs for CIS primarily focus on the adoption and use of technology within an organization, rather than how technology impacts clinical care or patient outcomes across organizations (3). Ontario Health Teams (OHTs) are designed to integrate the delivery of care across institutions for patients in their local communities (4), but there is no model that captures how OHTs use information systems to support patient care and clinical outcomes. A clinical information system maturity model (CISMM) that is applicable to integrated care organizations has the potential to help OHTs improve care delivery at a regional level.

Objectives

The purpose of the project was to develop a CISMM for OHTs, focusing on four key health sectors (primary care, acute care, home care, and community services), by:

- 1) Identifying existing CISMMs
- 2) Describing the assessment(s) used to measure how health system organizations and clinical teams evaluate their overall performance using a maturity model
- 3) Co-developing a provincial maturity model alongside a knowledge translation and implementation guide for primary care, acute care, home care, and community services

Methods

The Centre for Digital Health Evaluation (CDHE) conducted a global environmental scan of 41 CISMMs; 16 interviews with health sector stakeholders; four co-design workshops involving 32 healthcare practitioners, health system leaders, and patient partners from the four key health sectors; and 2 focus group discussions with 20 participants from two OHTs.

Key Findings

BEST PRACTICE ELEMENTS OF EXISTING CISMMS

- Successful CISMMS are supported by conceptual simplicity; clearly defined domains and levels of maturity; a clear user guide and implementation plan; supportive organizational leadership; and incentives and supports for achieving and maintaining maturity.
- Critical gaps in existing CISMMS include a lack of patient-centeredness, low emphasis on interoperability, few cross-sectoral features, and minimal focus on patient and clinical outcomes.
- Patient access to and ownership of data, patient input in maturity model development, and health equity (e.g., equal access to quality care across the province) are essential.
- While some key informants agreed that a CISMMS relevant for OHTs would be useful, without clear objectives and ownership, the model may encounter barriers to adoption.

KEY FEATURES OF A PROVINCIAL CROSS-SECTORAL CISMMS

- Care should be equitable, interdisciplinary, comprehensive, accessible, timely and transparent. Care design should also be collaborative, with patients having ownership and autonomy over their health information.
- A CISMMS relevant for OHTs should be driven by the needs of the people, not just the possibilities of technology, and should align with the Quintuple Aim (patient experience, cost of care, population health, provider experience, and equity).
- There is value in having a single patient portal within an integrated system, shared care plans, and balance between data privacy and channels for meaningful patient-practitioner communication. High value was also placed on interoperability within and between OHTs.
- For a MM to be applicable to OHTs, it should capture inter-organizational collaboration and integration – features that are integral to the success of OHTs.
- User experience and usability of a CIS was perceived to be an important driver of good patient and provider experience and satisfaction. The value of patient and family involvement in the design of CIS interface was emphasized.
- Co-design sessions also revealed that more investments are needed to formalize OHTs as unified entities, and that given the current state, a sector-level CISMMS may be more relevant.

Recommendations

Socializing the CISMM	Implementing the CISMM
<ul style="list-style-type: none">• MOH/OH to provide a clear vision for ongoing OHT maturity work and how the objectives and use of the draft CISMM aligns with the overall OHT strategy (8)• Establish funding mechanism(s) including incentives and supports to increase organizations' capacity and capability to move along the maturity continuum• Strengthened governance of OHTs that informs how OHTs are accountable in advancing digital health maturity• Clear commitments on the roles of various actors, including MOH, OH, and CIS vendors in supporting OHT-wide CIS maturity	<ul style="list-style-type: none">• Create and validate baseline assessment tools to understand where more intensive investments may be needed at onset• Organizational leaders must be champions of CIS development and implementation• MOH/OH to clearly articulate resource, governance, and operational support that OHTs will receive to support their advancement in CIS maturity• Engage patients as partners in the development and validation of assessment tools and evolution of the CISMM

Next Steps for MOH/OH

In its current state, the CISMM is a draft and does not contain baseline or progress assessment tools and requires further testing to be validated. Next steps include:

1. Determining how the CISMM aligns with the overall OHT strategy and communicate relevance and expectations to OHTs
2. Developing a governance, funding, and implementation structure for the CISMM
3. Prior to implementation, leveraging elements of the draft CISMM to inform broader OHT maturity mapping and further pilot-testing and validating of the draft CISMM domains and indicators with OHTs
4. In the interim, a baseline maturity assessment for CIS should be conducted using the Heat Map (see Implementation guide) as a starting point

1.0 Introduction

1.1 Context

In February 2019, the Ontario Ministry of Health (MOH) introduced a new model of integrated healthcare delivery. This practice model, called Ontario Health Teams (OHTs), aims to improve the coordination of care and services for patients and their families/caregivers across multiple care settings (4). The vision is to better connect different parts of the healthcare system by bringing together patients, families/caregivers, communities, practitioners, and system leaders to deliver coordinated care in a defined geographic area (4).

Digital health services and tools, such as clinical information systems (CIS) and harmonized health information plans, are key enablers for a more connected and integrated health system (5,6). CIS (e.g., health information systems and electronic medical records (EMRs)) are widely used by healthcare practitioners to inform the delivery of care. In Ontario, CIS have been purchased, implemented, and maintained by individual healthcare organizations and entities with limited oversight from the province regarding meaningful use or interoperability. Assessing and promoting the continuous advancement of clinical information systems and related digital health tools is in alignment with the Digital Health Playbook (2), and can help address the different patient population needs and levels of digital maturity of OHTs.

Maturity models (MMs) are conceptual frameworks that can be used to evaluate and facilitate the development of healthcare practices, operations, and infrastructures (3,7). They are valuable tools for informing infrastructure investments and policies, and are based on the premise that people, organizations, and functional areas evolve through a process of development and growth towards greater maturity over several stages (3,7). There are several MMs that have been developed and used in the field of information systems, for either evaluation and/or growth and development. In addition, several MMs in healthcare have been developed to evaluate CIS and/or aspects of healthcare and health systems more broadly (3). However, studies have shown that unlike the application of MM in other sectors, healthcare MMs are not comprehensive enough to capture maturity across different settings and service models, lack detail, and do not provide sufficient tools for determining maturity (3,9,10). Previous work in this field suggests that there is no model in the health field that is sufficiently comprehensive and detailed to assess the key components of health information system maturity (9,10). For example, the Healthcare Information and Management System Society

(HIMSS) is a global leader in MM development and implementation and has developed a number of validated measurement models that are used throughout Ontario, including the EMR Adoption Model (EMRAM) (11) and the Continuity of Care Maturity Model (C-COMM) (12). In addition, OntarioMD created an EMR Maturity Model (13) to assess effective EMR use and value. However, these models primarily focus on the adoption and use of the technology rather than on clinical outcomes and patient/provider experience. A clinical information system maturity model (CISMM) relevant for OHTs can help with understanding how clinical information systems vary in their use and how they impact patient care and clinical outcomes.

1.2 Purpose and Objectives

The purpose of this project was to identify best practice elements of existing CISMMs to inform the development of a provincially endorsed maturity model alongside a knowledge translation and implementation guide with a focus on four key health sectors (i.e., Primary Care, Acute Care, Home Care, and Community Services). The objectives of the project are:

- 1) Identify existing CISMMs, with a focus on:
 - a. Models which are associated with patient care and clinical outcomes.
 - b. Models that include the latest and best practices for clinical and data sharing standards.
 - c. Models that have been implemented and embedded across Ontario, and any relevant context on their usage and effectiveness.
- 2) Drawing from existing CISMMs, describe the assessment(s) used to measure how health system organizations and clinical care teams (e.g., physicians, nurse practitioners, and specialists) can evaluate their overall performance using a maturity model, including:
 - a. The degree to which an organization has adopted technology and clinical information systems to reduce the need for paper-based communication and documentation.
 - b. The degree to which an organization has been able to share information within the clinical care teams, patients, and broadly within OHTs.
 - c. The degree to which clinical care teams can access clinical information system standards and best practices.
 - d. The degree to which organizations' clinical information systems can indirectly impact patient care, clinical outcomes, and clinical care team workflow.

- 3) Co-design a maturity model that can be provincially endorsed accompanied by a knowledge translation and implementation guide.

2.0 Methodology

2.1 Data Collection and Participant Recruitment

To address the objectives described above, the Centre for Digital Health Evaluation (CDHE) conducted the following activities:

- An environmental scan supplemented with key informant interviews (Objectives 1 & 2)
- Co-design workshops with healthcare practitioners, organizational leaders, and health system leaders from Primary Care, Acute Care, Home Care, and Community Services; Patient Partners; and other relevant stakeholders (Objective 3)
- Focus groups with Ontario Health Teams (OHTs) (Objective 3)

Further details about each activity are provided below.

2.2 Environmental Scan and Key Informant Interviews (Objectives 1 & 2)

ACADEMIC LITERATURE SEARCH APPROACH

Arskey and O'Malley's (14) methodologically rigorous scoping review approach was used. The following electronic databases were searched from 2006 to November 22, 2021 (i.e., last 15 years) for existing MMs or frameworks related to measuring the maturity of health information systems and patient care and clinical outcomes: MEDLINE, SCOPUS, and Library and Information Science Abstracts (LISA). The search strategy was developed in consultation with an experienced librarian. Search terms included subject headings and free text. Covidence, a systematic review software, was used to remove duplicate references. Supplemental searches were conducted through reference lists of included studies and related systematic reviews. A two-level screening process (titles/abstracts, full-text screening) was used to select eligible studies. Information on the search strategy, study eligibility, and flow diagram is provided in Appendix A.

GREY LITERATURE SEARCH APPROACH

A broad and rapid review of grey literature on existing MMs was also conducted. A keyword search of concepts related to “maturity model*” and “healthcare” was undertaken in 1) Google and 2) the websites of agencies or organizations that are involved in healthcare delivery or information systems. See Appendix A for details on the grey literature search.

KEY INFORMANT INTERVIEWS

Key informant interviews were conducted to supplement the environmental scan and to identify 1) gaps in existing MMs; 2) potential barriers faced with MM implementation and uptake; 3) the need for new and/or improved MMs; and 4) patient-centric issues related both to understanding what patients value and challenges patients experience with clinical information systems. A targeted sampling strategy that leveraged existing CDHE and MOH relationships and networks was used to recruit key informants. Additionally, a snowball sampling strategy, wherein key informants helped identify additional experts and sector leaders for inclusion, was also adopted. Key informants included 1) patients embedded within OHTs and 2) subject matter experts in MM development and use and/or health system performance measurement. See Appendix A for details on the key informant interview guide.

2.3 Co-Design Workshops and Focus Group Feedback

(Objective 3)

CO-DESIGN APPROACH

A total of 4 co-design workshops were conducted to develop a draft CISMM. To ensure data saturation was reached, the 4 workshops were organized into two sets with 2 workshops each. Each workshop included a series of activities to achieve workshop objectives. The HIMSS Community Outcomes Maturity Model (C-COMM) (12), identified in Phase 1, served as the reference model for participants to iterate from.

The objectives of the first set of workshops were to: 1) describe the ideal experience of care for patients and caregivers; 2) map outputs from activity 1 to existing HIMSS C-COMM indicators to understand alignments/gaps; and 3) reach consensus on an organizing framework for the draft CISMM (i.e., key focus areas, dimensions, indicators). The objectives of the second set of workshops were to: 1) to evaluate key indicators of the HIMSS C-COMM to establish relevance for an OHT CISMM, and 2) to develop key indicators for the OHT CISMM (Appendix B).

In preparation for the co-design workshops, environmental scan and key informant interviews findings (e.g., established models, gaps to be addressed in existing MMs, etc.) were used to develop workshop materials such as presentations and Miro boards for virtual collaboration. Co-design workshop participants were identified by key informants, the MOH, and the CDHE. Recruited participants included healthcare practitioners, organizational leaders, health system leaders, and patient partners with involvement with or membership in an OHT. Co-design workshops were hosted on Zoom and facilitated by two expert facilitators from [Healthcare Human Factors](#) (HHF), an organization embedded within the healthcare system that works to transform healthcare products, services, and systems by combining design and engineering with an in-depth understanding of humans and healthcare. Workshops were recorded and affinity mapping (15) was used to analyze data to identify key elicited themes. Following the conclusion of all co-design workshops, a draft CISMM was developed.

FOCUS GROUP APPROACH

Two focus groups were conducted with two different OHTs to: 1) gather feedback on the co-designed draft CISMM and, 2) gain insights on what supports are needed to implement the CISMM within and across organizations, health sectors, and OHTs. Eligibility criteria for focus group participation were as follows:

- Each OHT must comprise of practitioners and organizations from the health sectors of interest (Primary Care, Acute Care, Home Care, and Community Services)
- 1 of the 2 OHTs should be from the first cohort of 24 approved OHTs announced in Fall 2019 to facilitate diversity in feedback on maturity model utility
- 1 of the 2 OHTs should serve a rural and/or remote community

A targeted sampling strategy that leveraged existing CDHE and MOH relationships and networks was used to recruit OHTs. For each focus group, 10-15 participants were recruited and at least two participants from each health sector of interest were present. Where possible, individuals from the same health sector within the same OHT were from different member organizations/institutions (e.g., if there were 2 individuals from Home Care, 1 is from Nursing and 1 is from Social Work). Focus groups were facilitated by two expert facilitators from HHF and audio-recorded to support subsequent analysis. Data analysis informed revision of the draft CISMM and identification of key themes related to implementation and knowledge translation.

3.0 Results

3.1 Phase 1: Environmental Scan and Key Informant Interviews

ENVIRONMENTAL SCAN CHARACTERISTICS

A total of 41 MMs (3 academic literature articles and 38 grey literature sources) focused on clinical information systems, healthcare, and/or health systems (e.g., continuity of care) were identified (Figure A1). In Canada, the development of MMs has been most active in Ontario (n=4) (13,16–18) and British Columbia (n=1) (19). National entities, including Canada Health Infoway and Digital Health Canada, have also developed MMs (20,21). Several countries and global organizations that have developed MMs to assess aspects of healthcare and health systems were identified (Figure 1). The United States (n=12), Canada (n=11), and Europe (n=8) have the largest number of established MMs.

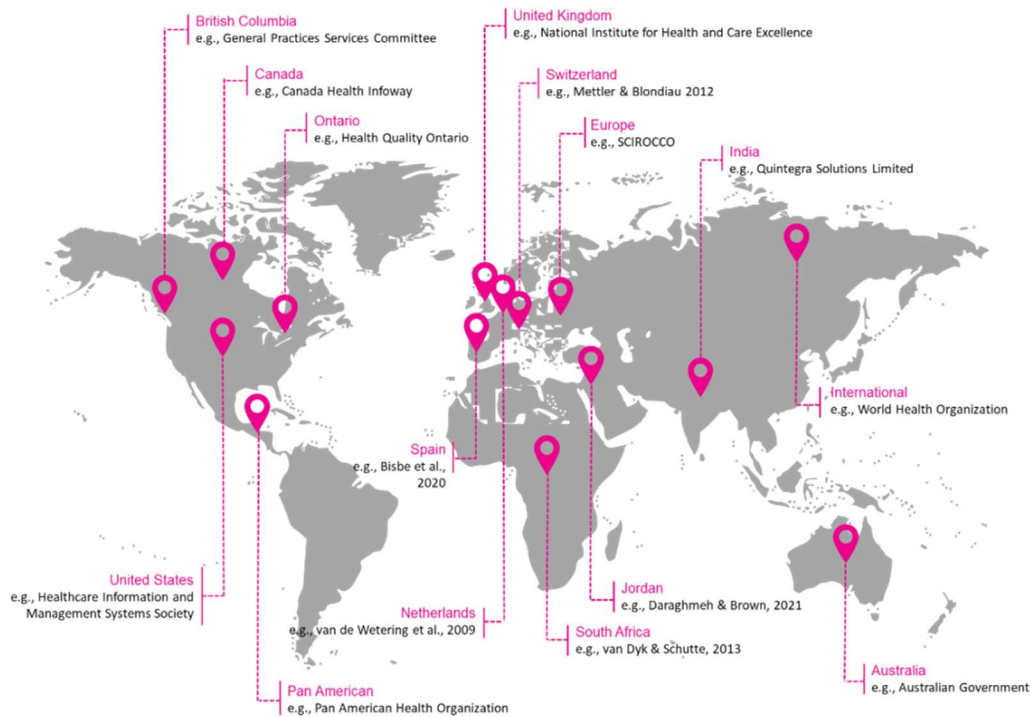


Figure 1. Regions that developed maturity models for clinical information systems, healthcare, and/or health systems

KEY INFORMANT CHARACTERISTICS

A total of 16 interviews were conducted with 14 subject matter experts in CIS and/or maturity models and 2 patient partners (response rate: 64.0%). Table 1 provides an overview of the characteristics of key informants.

Table 1. Key Informant Interview Characteristics

Key Informant [†]	Positions	N=16
Healthcare Practitioners	3 Primary Care Physicians; 1 Emergency Room Physician	4
Organizational Leaders	Vice President of Hospital System; Chief Information Officer of Hospital; Chief Executive Officer of Home and Community Care Organization	3
Health System Leaders	Chief Information Officer of Provincial Ministry of Health; Chief Medical Information Officer of Provincial Health Authority	2
Academics/Scholars	4 Professors, 2 of which are Canada Research Chairs with expertise in implementation, evaluation, and performance measurement and 2 of which are Scientists at Research Institutions	4
Industry Leaders	Senior Scientist at Consulting Firm	1
Patient Partners		2

[†]Key informants were classified based on their primary affiliation/position. In some instances, these categorizations may not be mutually exclusive (e.g., key informant is both a provider and organizational leader but was classified as an organizational leader only as that is where they dedicate majority of their time).

OVERVIEW OF EXISTING MATURITY MODELS

HEALTHCARE SECTOR(S)

Many MMs have been developed to measure and evaluate CIS or more broadly, aspects of healthcare (e.g., virtual care, interoperability) and the health system (e.g., integrated care). Based on the intended aim and/or application of the MM and the four health sectors of interest, MMs were most often developed for Primary Care (25%) and Acute Care (21%) settings, whereas there were very few MMs were developed for Home Care (8%) and Community Services (4%). Notably, none of the MMs identified in the scan were applicable across different health sectors (e.g., a maturity model built for Primary Care could not be applied in an Acute Care setting) without extensive adaptation and validation. The remaining 42% of MMs were developed for aspects of healthcare (e.g., virtual care, interoperability) and the health system (e.g., integrated care).

MATURITY MODEL THEMES

In general, MMs assessed maturity in only 1 of 3 themes: process/structures (i.e., extent to which a specific process is defined, managed, measured, controlled, and effective), object/technology (i.e., extent to which an object, software, or technology reached a pre-defined level of sophistication), or people/culture (i.e., extent to which practitioners, organizational leaders, and/or decision makers can enhance proficiency) (7,22). A single MM that assessed both CIS alongside clinical and patient outcomes was not published until earlier this year. In January 2022, HIMSS released a revised version of the EMRAM (11). However, the extent to which the revised EMRAM captures and measures both CIS and clinical and patient outcomes is unknown as it is still in its infancy and requires further validation.

USERS OF MATURITY MODELS

Majority (n=25, 61%) of the identified MMs were intended to be used by healthcare practitioners within the same sector or individual organizations (e.g., hospital). Of the MMs identified, 63% of MMs expected that healthcare practitioners and/or organizational leaders would lead and complete the MM assessment. For example, the expectation may be that a Physician who is a Digital Health Lead or a Chief Medical Information Officer of a hospital system will champion the MM and complete the assessment of the existing MMs. Only a few MMs require collaboration across practitioners in different healthcare sectors to complete. For example, the SCIROCCO MM for Integrated Care assesses a regions readiness for integrated care and requires multiple healthcare practitioners and organizations from different healthcare settings to collaborate (23). In this case, the expectation was that leads from each organization within a region would come together to collaborate and complete the MM assessment.

MATURITY MODEL ASSESSMENT

Maturity was often self-assessed or determined by completing a checklist or questionnaire. Many MMs provided a corresponding user guide or implementation plan that broadly described the key terms and outcomes for each maturity level by domain. User guides or implementation plans were presented as a handbook with textual descriptions or as a software assessment tool (e.g., Excel sheet with embedded macros). However, none of the MMs provided a roadmap of actionable steps for achieving the next level of maturity.

Of the identified MMs, very few discussed reporting guidelines or requirements. In fact, there were only limited instances where the outcome of a maturity assessment was reported back to a governing body for standardization or performance purposes. Notably, we found no publications that disclosed the outcome or impact of conducting a maturity assessment. However, many

indicated that organizations benefit from the findings of a maturity assessment when maturity is assessed by a central governing or oversight body and/or at a management-level, and if there are routine, systemic, and structured improvement initiatives inspired by the outcomes of the maturity assessments.

PERCEIVED VALUE OF A CISMM IN ONTARIO

In general, key informants felt that a CISMM for Ontario would be a valuable tool for benchmarking, growth, and strategic planning for OHTs. However, they opined that it would be of great benefit only if 1) the purpose of the CISMM is clearly defined, and 2) end-user input is considered in the development and implementation of the CISMM. Key informants indicated that without a clear purpose of the CISMM and user input, CISMMs run the risk of being bureaucratic tools with limited added value. Key informants also advised that the developed CISMM would need to undergo periodic review and adaptations as a result of dynamic health systems with unclear and changing workflows.

“Maturity models aren't everything [...] they are a way of signposting where you're at in the process, but again they aren't the be all and end all and they shouldn't be used as the only hook in terms of how we're driving success here. I view maturity models as an educational tool, not really as an accountability tool. And if you're going to use them as an accountability tool, they need to be very narrow and very specific and defined...”

– Physician and Health System Leader

KEY CONSIDERATIONS WHEN DEVELOPING A CISMM FOR OHTS

Key informants expressed that for the developed CISMM to be of value and benefit in Ontario, the model should incorporate several design elements and implementation considerations:

DESIGN ELEMENTS: FOUNDATIONAL ELEMENTS

- The CISMM should be patient-centered, patient-informed, and patient co-designed
- The CISMM should consider integrated care and/or cross-sectorial applicability
- Emphasis should be on the importance of patients tools and supports so patients can view, access, and manage their own personal health information

DESIGN ELEMENTS: KEY DOMAINS AND CRITERIA

The following domains and/or criteria within a domain should be present in the developed CISMM:

- Patient experience/satisfaction

- Standardized care and best practices
- Interoperability (and semantic interoperability)
- Population health management
- Collaboration within and across healthcare sectors for integrated care

IMPLEMENTATION: CONSIDERATIONS, FACILITATORS, AND BARRIERS

For a CISMM to be successfully adopted and implemented, findings showed that the CISMM should:

- Consider the workflows of all stakeholders involved in conducting the assessment and implementing changes for continuous improvement (e.g., who is responsible for leading the maturity model assessment, who is responsible for learning about and adjusting to a CIS undergoing continuous improvement?)
- Have operational funding and support from the government/governance bodies

Table 2 presents an overview of facilitators and barriers to CISMM adoption in Ontario as identified by key informants.

Table 2. Facilitators and Barriers to CISMM Adoption

Facilitators to CISMM Adoption	
Considerations	What does it look like?
CISMM Characteristics	<ul style="list-style-type: none"> • The developed CISMM is practical, simple, and easy to use • e.g., the CISMM is integrated within existing systems and processes and uses a standard lexicon
Incentives and Supports	<ul style="list-style-type: none"> • External incentives and supports are provided to increase the capacity and capability of OHTs to move along the maturity continuum • e.g., Operational funding is available to reach the next level of maturity
Leadership and Organizational Culture	<ul style="list-style-type: none"> • Organizational leaders champion a strong culture of CIS improvement • e.g., Communities of practice exist to facilitate OHTs to share lessons learned
Barriers to CISMM Adoption	
Considerations	What does this look like?
Complex Design	<ul style="list-style-type: none"> • Overly complex MMs are cumbersome to use <p><i>“An assessment with 700 questions is crazy and nobody has the time to do it, and nobody has the time to do it thoughtfully.”</i> – Senior Health Systems Specialist</p>
Capability within and across organizations of an OHT	<ul style="list-style-type: none"> • Differences in technological capabilities within and across single organizations are not taken into consideration <p><i>“One unit within a hospital might be more advanced than another, or some members of a team may use their system more effectively, which would make</i></p>

	<p><i>grading a single organization's maturity difficult to operationalize.”</i> – Professor, Health Systems</p>
Lack of Justification for CISMM Use	<ul style="list-style-type: none"> • Benefits of using a CISMM to guide improvement activities are unclear to decision makers and users <p><i>“Please clearly articulate what benefits you believe will be achieved through these models. Only then could one weigh the value of implementing a maturity model vs the cost and effort needed. The maturity model itself should not be an incentive but rather a tool to accomplish something meaningful.”</i> – Physician, Health System Leader</p>
Unclear Roadmap	<ul style="list-style-type: none"> • CISMM provides no guidance on how to close the gap between one level of maturity and another <p><i>“Maturity models also don't always come with a road map to help individuals and organizations navigate how they would be able to move up in their level of maturity.”</i> – Professor, Health Systems</p>

A CLINICAL INFORMATION SYSTEMS MATURITY MODEL FOR ONTARIO HEALTH TEAMS

As noted earlier, existing MMs were not sufficiently broad in scope to be applicable to different organizations within and across multiple healthcare sectors while considering CIS in addition to clinical and patient outcomes. In this sense, a MM that contains a comprehensive yet meaningful set of domains that encompass processes/structures, objects/technologies, and people/culture specific to OHTs is needed. Phase 2 of this project addressed this gap by developing a CISMM that was informed by Phase 1 findings.

3.2 Phase 2: Co-design Workshops & Focus Groups

CO-DESIGN WORKSHOP PARTICIPANT CHARACTERISTICS

Four co-design workshops were conducted between April to May 2022. Each workshop was attended by 7–15 participants. There were 32 unique participants across the two sets of workshops (each set having 2 workshops for a total of 4 workshops), 12 participants (27%) attended one workshop from each set. Participants were healthcare practitioners, organizational leaders, health system leaders, and patients/caregivers who work in or engage with at least one of the health sectors of interest (Primary Care, Acute Care, Home Care, and Community Services). Table 3 provides an overview of the characteristics of co-design workshop participants and the health sectors represented in each workshop.

Table 3. Characteristics of Co-design Workshop Participants†

Workshop 1 April 27, 2022 N=7	Workshop 2 April 29, 2022 N=11	Workshop 3 May 26, 2022 N=11	Workshop 4 June 1, 2022 N=15
<ul style="list-style-type: none"> • 1 Healthcare Practitioner (Primary Care) • 3 Organizational Leaders (Home Care, Community Services) • 1 Health System Leader (all sectors) • 2 Patients and/or Caregivers (all sectors) 	<ul style="list-style-type: none"> • 2 Healthcare Practitioners (Acute Care, Primary Care) • 1 Organizational Leader (Acute Care) • 3 Health System Leaders (all sectors) • 5 Patients and/or Caregivers (all sectors) 	<ul style="list-style-type: none"> • 3 Healthcare Practitioners (Acute Care, Primary Care) • 2 Organizational Leaders (Home Care, Community Services) • 1 Health System Leader (all sectors) • 5 Patients and/or Caregivers (all sectors) 	<ul style="list-style-type: none"> • 4 Healthcare Practitioners (Acute Care, Primary Care) • 7 Organizational Leaders (all sectors) • 2 Health System Leaders (all sectors) • 2 Patients and/or Caregivers (all sectors)

CO-DESIGN WORKSHOP FINDINGS

Following Phase 1 data collection and analysis involving extensive consultation and interviews with subject matter experts in the field of MMs and CIS, an expert from HIMSS was brought on to the project to provide guidance on the applicability of existing HIMSS models that align with project aims and objectives. The HIMSS Community Care Outcomes Maturity Model (C-COMM), an existing model with validated focus areas and indicators on interoperability, population health, and patient centered information flow, was shortlisted as a reference model for the developed draft CISMM. Following consultation with the HIMSS expert, elements of the C-COMM served as starting points for initiating conversations and ideation within the co-design workshops. Other reference MMs that informed aspects of the co-design workshop materials included the SCIROCCO Maturity Model (23), COACH Maturity Model (24), Health Links Maturity Model (16), Virtual Care Maturity Model (21), and the EMR Maturity Model by OntarioMD (13).

The objectives of the first set of workshops were to describe the ideal experience of care for patients and caregivers, define what is required of an OHT's information systems to deliver that experience, and create consensus on the organizing framework for what the maturity model measures. During the first set of workshops, participants discussed focus areas that mapped back to the C-COMM focus areas, including patient engagement, interoperability, communication, information governance, and population health. Participants also provided Ontario-specific context and recommended avoiding siloed focus areas. Table 4 provides a summary of the feedback received during the first set of workshops. For more detailed

feedback, see Appendix B which shows curated results from the Miro board used to document key points raised in the workshops.

Table 4. Summary of Co-design Workshops 1 and 2 Findings

In a mature OHT...		
Care Outcome	What does it look like?	How do information systems support this?
Care should be equitable	Data and analytics will help us understand how to make care more equitable. Care will be accessible regardless of access to digital tools.	<ol style="list-style-type: none"> 1) Multi-channel access including ultra-low-tech. 2) Social determinants of health data gathered, understood, and used to drive care.
Care should be integrated	A patient's circle of care (which includes more team- and community-based care) can access a shared care plan, so transitions are seamless. Patient navigation is supported, digitally or otherwise.	<ol style="list-style-type: none"> 1) Easy and seamless communication channels amongst practitioners. 2) Single sign-on for clinical teams and interface allows teams to easily 'talk' and collaborate. 3) Patient should have access and the ability/right to add or remove care members from their digital record and partners can become part of a patient's circle of care. 4) Technology needs to be integrated, interoperable, and facilitate referrals to activate care so that information can flow across the continuum and be easily accessible.
Care should be accessible	Referrals will be timely. Patients will easily navigate the system and see the status of referrals and schedule care appointments. Care is not limited by geography.	<ol style="list-style-type: none"> 1) Ability to easily schedule care. 2) Clinicians have easy access to referral systems.
Care should be proactive	Data and analytics will allow patients and practitioners to respond to trends with preventative care. Digital tools will enable meaningful outreach.	<ol style="list-style-type: none"> 1) The capability to gather data, have sophisticated analytics, reporting and the ability to respond to data trends.
Care design is collaborative	Patients and caregivers are engaged in the design of care delivery models. The patient experience is measured, and drives change efforts.	<ol style="list-style-type: none"> 1) Robust methods to measure the patient experience of care and satisfaction that activate improvement plans.
Care is holistic and compassionate	Patients are seen as a whole person and technology allows provider to understand personal preferences.	<ol style="list-style-type: none"> 1) Technology gathers and shares personal preference data that informs care

Patients have ownership and autonomy over their own health record	Health information will be in its own place and patients will be able to control the privacy of their information.	<ol style="list-style-type: none"> 1) Data governance strategies are consistent across organizations. 2) Technology is customized to ensure timeliness of information delivery that is safe, compassionate, and person-centered. 3) Seamless data information exchange.
Positive provider experiences	Technology supports clinical workflows. Interoperable systems allow practitioners to work together, and the quality of information is prioritized over quantity.	<ol style="list-style-type: none"> 1) Patients and practitioners can use technology easily. 2) Technology supports clinical workflows; clinical workflows do not need to adapt to technology. 3) Integration of information is not compromised when it is transferred or exchanged. 4) Information is of high quality and salient.

Overall, the key focus areas within the C-COMM align with objectives of an OHT, and participants agreed that it could serve as a foundation for an OHT relevant CISMM. Participants also expressed that CISMM relevant for OHTs needs to be driven by the needs of the people, not just the possibilities of technology, and that an OHT relevant CISMM should equally drive each of the objectives of the Quintuple Aim (see Appendix B for how the co-design focus areas map to the Quintuple Aim).

The objective of the second set of workshops was to develop and evaluate key indicators of the maturity model and establish their relevance for a CISMM applicable for OHTs. During the workshop, six key focus areas (access to care, communication, interoperability, patient engagement, population health, and analytics + outcomes) were discussed, highlighting what is unique about OHTs to ensure that the indicators capture what maturity looks like for a network of collaborating practitioners. As part of this exercise, participants were asked to think critically about the HIMSS focus areas and take into consideration what was important, what was missing and what was irrelevant. Table 5 provides a summary of the feedback received during the second set of workshops. For more detailed feedback, see Appendix B which shows curated results from the Miro board used to document key points raised in the workshops.

Table 5. Summary of Co-design Workshops 3 and 4 Findings

In a mature OHT...	
Focus Area	What does it look like?
Access to Care	<ul style="list-style-type: none"> As an integrated system, patients are accessing health information through one portal, not multiple. Patient preference for digital vs non-digital access is prioritized. Appropriate/equitable access is measured.
Communication	<ul style="list-style-type: none"> Real-time shared care plans and schedules are accessible by all practitioners to ensure that communication among practitioners and with patients is meaningful. A system is created to support non-event driven communication (e.g., touch base on care plan) and digital tools to facilitate collaboration amongst care teams.
Interoperability	<ul style="list-style-type: none"> Interoperability exists not just within, but also between OHTs and indicators are specific to Ontario's information system architecture. Urgent reports (referrals, discharge summaries, labs) are easily flagged. Patients have dynamic control over what data is shared and when.
Patient Engagement	<ul style="list-style-type: none"> A balance exists between indicators focused on data privacy and creating value. <p style="text-align: center;"><i>"Many patients would accept privacy risk to easily communicate with practitioners."</i></p> <ul style="list-style-type: none"> Incorporation of inclusive language for caregivers. Patients correct errors in their health information. Preferred communication is prioritized, not digital communication.
Population Health	<ul style="list-style-type: none"> Using population health frameworks as a guide, indicators focus equally on understanding data and on interventions (e.g., education, prevention, chronic disease management) to act on the data.
Analytics + Outcomes	<ul style="list-style-type: none"> OHTs measure how care transitions are experienced. Common platforms for organizations to share and analyze information are critical. OHTs act on analytics in real-time. Concerns around the denominator of some indicators (e.g., rate of use of digital tools) are addressed.

Overall, participants expressed concern about the organization-centric nature of C-COMM and whether it would be applicable to OHTs comprised of several member organizations. Because C-COMM was designed for an organization, the use of this model in the absence of indicators that address the inter-organizational collaboration that is paramount to the success of an OHT to deliver integrated care may be missed. Across all focus areas, participants wanted to ensure that the usability of the systems was measured, as this was identified as an important driver of good patient and provider experience. Participants also noted the importance of patient and family involvement in the design of services and technologies.

FOCUS GROUP PARTICIPANT CHARACTERISTICS

Two focus groups were conducted, one with the Mid-West Toronto OHT on July 21, 2022 (n=8), and one with Southlake Community OHT on August 2, 2022 (n=12). Participants included practitioners (n=3), organizational leaders (n=16), and patients (n=1) from Primary Care, Acute Care, Home Care and Community Services. Mid-West Toronto is part of the second cohort of approved OHTs and Southlake Community OHT is part of the first cohort of approved OHTs and serves rural and remote communities.

FOCUS GROUP FINDINGS

FEEDBACK ON THE DRAFT CISMM

A draft CISMM was developed following the feedback from the co-design sessions in consultation with the HIMSS expert advisor and contained 7 key focus areas: Population Health Management, Patient-Centered Care and Patient Engagement, Communication and Coordination, Interoperability, Outcomes, System Self-Management, and Governance. For each focus area, there were several criteria, with each criterion referring to indicators of similar theme. The draft maturity model had 4 maturity levels: level 0 (baseline) not shown in the model, level 1 intermediate, level 2 advanced, and level 3 mature (Appendix B). Focus groups elicited feedback from OHT members on first impressions and reactions to the draft CISMM and recommendations on what conditions and supports would need to be in place for a developed CISMM to be adopted and implemented.

Focus group participants identified several processes that would need to be considered in addition to features of the draft CISMM to be revised for a CISMM to be actionable across sectors.

- The draft model had too many criteria and indicators per domain. Participants felt that **reducing the number of criteria per domain would feel a lot more achievable for organizations**. A suggestion was made that additional indicators could be added after initial implementation.
- The need for **clear definitions** to clarify the scope of domains was emphasized
- The draft maturity levels labeling of Level 1: Intermediate, Level 2: Advanced, Level 3: Mature didn't resonate with several participants. It was recommended to **relabel the maturity levels to illustrate continual progression** versus a stable state of achieving "maturity".

- Participants appreciated the inclusion of equity within the population health management domain and pushed for **equity to be considered throughout the model in every domain**. Participants also acknowledged the difficulty of integrating equity within clinical information systems and the emerging field of digital equity (25,26).
- Participants expressed how there was an assumption embedded in the model that there are similar resources available across sectors. **Assessing existing technological capabilities and resources available in each sector will enable maturity to be benchmarked relative to each sector's baseline.**
- Participants highlighted the **differences in nomenclature across sectors** and suggested that to increase uptake and applicable across sectors, language in the model should be modified to reflect the specific priorities of each sector.
- Participants felt that the draft model was a multi-layered maturity model rather than just a maturity model applicable for OHTs because **maturity on several indicators would require investment and action on the part of the MOH and OH.**
- Participants expressed concerns about the inclusion of several indicators on the draft related to interoperability and data sharing, which is often driven by a lack of collaboration among vendors and not something they felt was achievable at the OHT level alone.
- Concerns and questions were raised on the relevance of an OHT wide maturity model given that in the present state, there are only few instances where sectors and member organizations within the OHTs collaborate as unified entities.

Based on feedback from OHT participants, our team explored participants' views on which aspects of a CISMM relevant for OHTs they would find valuable now versus in the future.

IMMEDIATE VALUE

- **Developing a CISMM applicable for OHTs with a view of what's happening in each sector** to align with the present reality of OHTs as comprised of individual member organizations versus a unified entity. A sector level CISMM would also consider the differences in CIS capabilities and governance across sectors.
- **Developing a concise CISMM with more focused domains and criteria to highlight priorities of OHTs.**
- **Conduct baseline assessments of each sectors' CIS capabilities** to understand the differences in technological capability and resources within and across sectors, keeping

in mind that differences in capability and resources would make it difficult to measure maturity using the same criteria.

FUTURE VALUE

- **A cross sectoral OHT-wide CISMM** would be feasible in the future if major investments are made to formalize OHTs into entities.
- **Developing a CISMM that can be internationally benchmarked** will be valuable after OHTs have been formalized into unified entities and functioning for enough time to develop standards that warrant international comparison.

"So there's an assumption even within the model that there's currently resources that are appropriate in the different sectors that are not there. And the model itself has a hospital-centric focus. And if primary care or primary-level care, where I would include community services in that language, is supposed to be emphasized in the OHTs, then you have to have a model that uses the language and highlights the issues that are relevant in that sector, from that sector's viewpoint."

– Southlake OHT member

"What I see in level two and level three is the future – is a future state. So that's – for me and for people who are involved with quality improvement language, that's an easier framework to sort of visualize on this. I'd also say, you know, don't call level three mature; it's a maturity model. I would use words more like advanced and intermediate. So in the future state there's an intermediate stage and then there's an advanced stage. And that's always changing because as we then achieve things the current state also looks – becomes what the future state was."

– Mid-West Toronto OHT member

IMPLEMENTATION RECOMMENDATIONS

In its current stage, the CISMM is a draft that requires further testing to be validated.

Nonetheless, participants expressed several conditions and considerations that would need to be met and clarified in order for a tested and validated CISMM to be adopted and utilized by OHTs.

- **Clarity on how the CISMM** aligns with existing strategies and goals of the OHTs and member organizations.
- **Clarity on implications of maturity assessment** and whether it will be tied to or guide how funding decisions are made by the Ministry.

- **Clear governance structures** related to how the use and reporting of CISMM assessment will be mandated and regulated.
- **Clarity on how the Ministry will support OHTs** who are lower in CIS maturity to reach higher levels of CIS maturity indicated on the CISMM.
- **Support and collaboration with the Ministry and Ontario Health (OH)** to advance on indicators which may require negotiation with vendors.
- **Further investment to formalize OHTs into entities** prior to the application of an OHT wide maturity model is required as most OHTs do not exist as entities with only a few instances where OHT members formally work together.
- **Funding to increase capacity of OHTs** and member organizations to conduct the maturity assessment. Specifically, funding to hire administrative and IT staff to implement the model, conduct the assessment, and advance on the indicators.

"You know, OHTs are not really institutions in a traditional sense at this point. And personally, I think that the province at some point has to decide whether they're going to be institutions and put the resourcing in to turn the whole local healthcare system into an institutional structure that we can all work within."

– Mid-West Toronto OHT member

For more detailed feedback, see Appendix B which shows curated results from the Miro board used to document key points raised in the discussions. Following feedback from OHT members, the draft CISMM underwent further revisions to implement OHT members' feedback.

4.0 Discussion

4.1 Maturity Model and Implementation Recommendations

The draft CISMM developed for OHTs outlines three levels of maturity (basic, evolving, and advanced) across four domains: Patient-Centered Care, Care Coordination, Population Health Management, and System Management. The domains, criteria within each domain, and number of maturity levels were informed by the gaps identified in the environmental scan as well as input from key informants, co-design workshop participants, focus group participants, patient partners, and other key stakeholders. A brief description for each domain is included below.

CISMM DOMAIN AND CRITERIA DEFINITIONS

PATIENT-CENTERED CARE

This domain focuses on the use of clinical information systems and related digital technologies to strengthen equitable access to care, taking into account patient preferences and choices of care delivery and services. Equity is a foundational criterion that acknowledges and accounts for differences in access and digital capabilities. In the ideal state, clinical information systems are leveraged to build capacity to offer meaningful connections between practitioners and patients and their families/caregivers that considers the needs, values, and preferences of the patient.

CARE COORDINATION

This domain examines the use of clinical information systems and related digital technologies to support coordinated care delivery for patients. In the ideal state, patients are receiving informed, high-quality care because practitioners have a timely and complete picture of the patients' health status. In addition, patients experience smooth transitions between care settings.

POPULATION HEALTH MANAGEMENT

This domain assesses the use of clinical information systems and related digital technologies that track population health outcomes using a data-driven approach to inform care programs, such as prevention strategies and surveillance and screening programs. In the ideal state, clinical information systems capture social determinants of health and are leveraged to advance population health and assess the effectiveness of care programs for continuous improvement. Operational data are also captured to track outcomes and progress towards strategic goals and priorities and to generate insights to design programs and inform decisions about the allocation of resources.

SYSTEM MANAGEMENT

This domain focuses on health information exchange, data privacy, data integrity and accuracy, and the ability of clinical information systems and related digital technologies to support care and health service delivery during disruptions (e.g., unexpected interruptions, cybersecurity threats, or events). In the ideal state, information governance – how data is managed, the integrity of data, quality of data, and how it is validated to reduce risk of bias and improve data accuracy – strengthens precision and quality of care delivery.

SUMMARY OF KEY FINDINGS AND CISMM DEVELOPMENT

Phase 1 literature review and expert consultation highlighted the following gaps in existing maturity models when considering the needs of OHTs:

- 1) not sufficiently broad in scope to apply to different entities within and across multiple healthcare sectors;
- 2) overly focused on the technocratic features of CIS in lieu of impacts to clinical outcomes, patient, and provider experience;
- 3) lack of patient-centeredness;
- 4) limited focus on interoperability; and
- 5) few-cross sectoral features. Experts also highlighted the need for conceptual simplicity with clearly defined domains and levels of maturity.

Phase 2 engagement with patients, sectoral and organizational leaders, OHT members and other relevant stakeholders found that a CISMM relevant for OHTs should support the following:

- 1) Equitable, collaborative, and seamless care;
- 2) Strong interoperability within and between OHTs;
- 3) Patient ownership and autonomy of health data;
- 4) Positive patient experiences during care transitions;
- 5) Insights from population health data that inform programs, and
- 6) A system that is driven by the needs of people, not just the possibilities of technology.

In consultation with a HIMSS expert, elements from HIMSS C-COMM were used as a starting point to see how identified focus areas mapped to C-COMM indicators on interoperability, population health, and patient centered information flow. Phase 2 findings suggested that successful implementation of a CISMM relevant for OHTs requires: 1) clarity of the aims and purpose of the CISMM and alignment with existing OHT strategies, and 2) clarity on the roles, investment, and action from the MOH and OH to support OHT CIS maturity.

Overall, participants agreed that the key focus areas within the C-COMM aligned with the objectives of an OHT and that it could serve as a suitable reference model to inform the development of a CISMM relevant for OHTs. However, participants also expressed concern about the organization-centric nature of the model and the absence of indicators that address inter-organizational collaboration. While elements of the C-COMM informed the draft CISMM, during the focus groups OHT members expressed several concerns related to the relevance of the model for the OHT context. Specifically, participants felt the model was overly complex and contained redundancies. Participants emphasized that the model could benefit from simplified

domains and more concise indicators to provide clarity on what OHTs should prioritize. Significantly, OHT members also felt that while validated and international benchmarks are important, they are not of high value for OHTs in their current state of maturity as member organizations. The developed draft CISMM relevant for OHTs therefore differs from the C-COMM in the following ways: 1) the simplification of domains and reduction of indicators from 7 to 4; 2) the removal of the governance domain which was determined to be out of scope and irrelevant for OHTs; and finally, 3) the addition of indicators that are dependent on inter-organizational collaboration to increase maturity.

The final draft CISMM addresses the gaps identified in Phase 1 and incorporates the feedback received in Phase 2. Clinical outcomes, patient and provider experience are prioritized through indicators that show how an increase in CIS maturity will help patients access care that is patient-centered (i.e., based on patient preferences and health goals). Patients are also supported to be active participants in their own health management by being custodians of their health data. Gaps in cross-sectoral features are addressed in the Care Coordination domain through indicators that describe how exchange of health information across institutions and shared care plans support continuity of care as patients transition between practitioners. Interoperability is integrated throughout the model and across the domains as a central function to support sharing of health information from health sector to patients, from patients to practitioners, and from practitioners to practitioners within and across sectors. Equity is also a core component of the model and is included as a foundational criterion in the Patient-Centered Care Domain to account for differences in digital capability and access. This criterion acknowledges how progression in CIS maturity may inherently exclude certain populations with limited access or capability to use digital tools. This equitable care criterion serves as a necessary balance measure within CIS maturity.

4.2 Limitations of the Developed CISMM and Implementation Recommendations

There are several limitations of the developed draft model and implementation recommendations that should be taken into consideration. Although the CISMM was developed following extensive stakeholder engagement, consultation with a HIMSS expert advisor, and focus groups with OHTs, a limitation of the draft model is that it was not able to be validated through pilot testing with OHTs. Our findings from the focus groups suggest that given the

current level of collaboration and unification of OHTs, pilot testing the draft model at the OHT level may only be feasible after further investment is made by the MOH and OH to formalize OHTs into entities. While the draft model was developed with feedback from two OHTs, these two OHTs only represent the Toronto and Central region. It would be beneficial to engage all six regions in Ontario (i.e., Northwest, Northeast, East, and West regions). Furthermore, a key suggestion that came from the focus groups was that it would be more feasible for the final CISMM, once it has undergone further pilot testing and validation, to be implemented at the sector level. However, as this feedback came at the end of the project, there was no opportunity to meaningfully engage sectors separately to understand sectoral priorities and to identify resources available at the sector level. As OHT participants posed several foundational questions related to needing clarity on the aims and purpose of the draft model and how the model would be governed, feedback on what would be required for the model to be implemented remained at a high level (i.e., clarity on aims, governance, funding, and implications of the maturity assessment, etc.). Moving forward, it would be beneficial for the implementation plan to be tailored at a more granular level.

4.3 Recommendations and Next Steps

RECOMMENDATIONS TO THE MINISTRY FOR SOCIALIZING THE CISMM

For MOH to sensitize and socialize a finalized version of the CISMM to practitioners, organizational leaders, patients, and other member organizations within and across OHTs, the following are needed:

- MOH/OH to create, share, and socialize ongoing OHT maturity work to provide a clear vision for the long-term goals and how the objectives and purpose of CISMM align with the overall OHT strategy (8).
- Clear operational funding mechanism(s) are needed, including incentives and supports to increase organizations' capacity and capability to move along the maturity continuum (e.g., funding to increase staff capacity to implement the model, conduct the assessment, and advance on the indicators).
- Well-defined and strengthened governance of OHTs to ensure the following: common alignment of shared purposes and goals in the application of an OHT-wide maturity model; OHTs are accountable in progressing along digital health maturity; and all member organizations have the capacity for continuous improvement.

- Clear commitments on roles of various actors including MOH, OH, and CIS vendors in supporting OHT-wide CIS maturity.

RECOMMENDATIONS FOR SUCCESSFUL CISMM IMPLEMENTATION

For OHTs to adopt and successfully implement a finalized version of the CISMM as a tool for measurement and continuous improvement, the following are needed:

- Creation and validation of baseline assessment tools through pilot testing with OHTs to understand where more intensive investments may be needed at onset.
- Organizational leaders as champions of CIS development and implementation, and encourage a strong culture of improvement
- Engagement of patient partners in the development and validation of assessment tools and the evolution of the CISMM.
- MOH/OH to clearly articulate resource, governance, and operational support that OHTs can expect to receive to enable continuous improvement in each domain of the CISMM

IMMEDIATE NEXT STEPS FOR MOH/OH

Given the recommendations outlined above and to ensure immediate applicability and implementation of a finalized version of the CISMM, we recommend:

1. Determining how the draft CISMM aligns with the overall OHT strategy and communicate relevance and expectations to OHTs
2. Developing a governance, funding, and implementation structure for the draft CISMM
3. Pilot-testing and validating the draft CISMM with OHTs prior to implementation
4. Interim action in the form of a CIS baseline assessment using the Heat Map (see Implementation guide) as a starting point

5.0 Conclusion

Existing MMs developed for CIS primarily focus on the use and adoption of technology, rather than how the technology impacts clinical care or patient outcomes. A CISMM relevant for OHTs can help with understanding how CIS can be enhanced to inform and improve care delivery.

This project aimed to identify best practice elements of existing CISMMs to inform the development of a OHT relevant, cross-sectoral maturity model and knowledge translation/implementation plan with a focus on clinical and patient outcomes. Findings showed

that existing CISMMs lack patient-centeredness, had limited interoperability, few cross-sectoral features, and little focus on clinical outcomes. In collaboration with key informants, patient partners, health system leaders, practitioners, and OHT members, a draft CISMM was developed to address these gaps and include other key findings such as the need for patient access to and ownership of health data, clear objectives, conceptual simplicity, user buy-in, and health equity. The draft CISMM developed for OHTs outlines three levels of maturity across four domains: Patient-Centered Care, Care Coordination, Population Health Management, and System Management. It provides users with a clear plan to leverage technology to optimize workflow, advance interoperable information exchange, and improve care delivery. In its current stage, however, the draft CISMM does not contain baseline or progress assessment tools, is not yet validated, and requires pilot testing for indicators to be validated. Therefore, adoption and utilization of the draft CISMM can be optimized by having the MOH align the CISMM with the overall OHT strategy, establish clear expectations, governance, and funding structures to provide users with an understanding of the available supports, and strengthen the governance of OHTs to ensure common alignment for shared purpose and goals.

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Appendix A

Environmental Scan

SEARCH STRATEGY BY SEARCH ENGINE

- 1) **MEDLINE** (n=1,364)
exp Electronic Health Records/ and exp Models, Organizational/
OR
(framework and information system).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]
- 2) **SCOPUS** (n=489)
TITLE-ABS-KEY ("maturity" AND "model") AND ("healthcare" OR "health care")
- 3) **Library and Information Science Abstracts (LISA)** (n=1,718)
noft(("maturity model" OR "model" OR "framework")) AND noft(("healthcare" OR "health care"))

ELIGIBILITY CRITERIA

Table A1. Environmental Scan Inclusion and Exclusion Criteria

INCLUSION	EXCLUSION
<ul style="list-style-type: none">• English language full-text publications• Published in the last 15 years (2006-2021)• Development or description of a maturity model or measurement framework related to clinical information systems, healthcare, and/or health systems	<ul style="list-style-type: none">• Maturity models or measurement frameworks that did not discuss clinical information systems, healthcare, and/or health systems

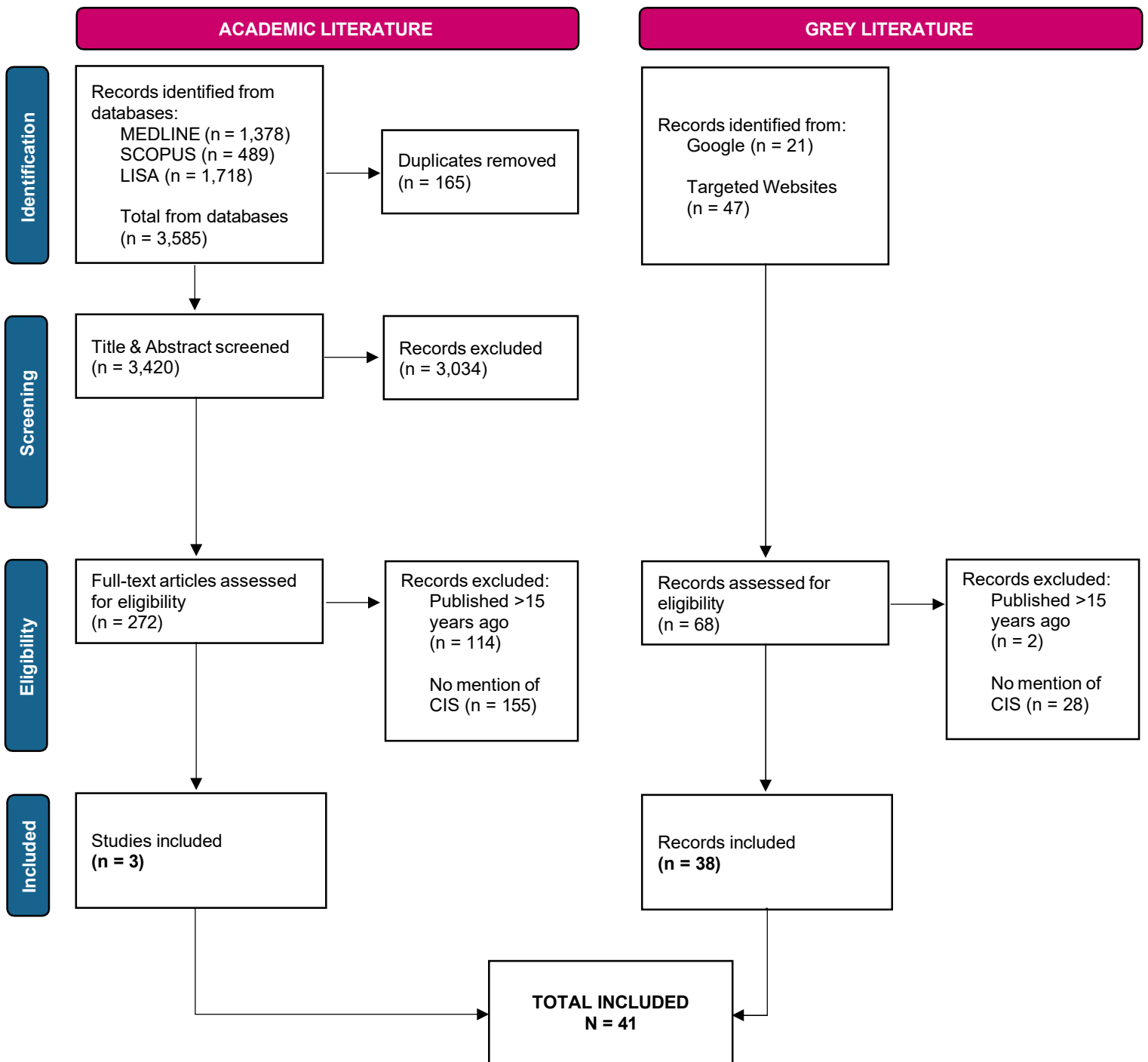


Figure A1. Flow chart of included academic and grey literature in the environmental scan

Key Informant Interviews

KEY INFORMANT INTERVIEW GUIDE

Setting the Stage

- Thank respondent for their time
- Introduce yourself (Interviewer) + observer/note taker
- Request if meeting can be recorded
- Emphasize confidentiality

Project Background

- Give background of the project and key takeaways
 - Introduce the problem statement
 - Describe the expectations of the project and possible use cases of a CISMM: Descriptive, quality improvement or comparative tool to be used by decision makers, healthcare organizations and (possibly) industry. To achieve more mature, interoperable, and high-quality systems that improve the patient experience and clinical outcomes.
 - Describe the project plan (i.e., where we are headed)

Questions:

- 1) Please name any clinical information system maturity models or frameworks that you are aware of.
 - a. Which of these do you have experience testing or using?
 - b. For EACH of the above listed, can you highlight some of its major merits/advantages? (**Probe cues:** Easy to understand and implement, already socialized/incentivized/validated)
 - c. For EACH of the above listed, can you highlight some of its gaps/areas that require improvement? (**Probe cues:** No patient-centric indicators. Not developed collaboratively; sector specific; cost/time intensive; requires 3rd party implementation, adjudication, or input; difficult to measure; poor operationalization/definition of constructs, etc.)
 - d. *Optional:* Would you recommend any of these models as being relevant/applicable for integrated care (i.e., cross-sectoral)

- 2) In your opinion, what are the challenges maturity models pose/face that limit their effectiveness/use:
 - a. Institutional/organizational factors
 - b. Technology related factors
 - c. Person factors (practitioners/administration or leadership)
 - d. Instrumental or metrics related (including usability of the MM)

- 3) Looking at the landscape of Clinical information systems that we use and the future of healthcare in Canada, in your opinion, what are the non-negotiable constructs that a CISMM must include/measure? (Probe cues: Patient safety, interoperability, governance, clinical outcomes)

- 4) In your opinion would there be value in developing and implementing a (new/adapted) clinical information system maturity model at a provincial level? (Probe cues: Imagine an EMRAM++)
 - a. Why or why not?
 - b. What factors/systems would need to be in place to enable rapid uptake and use of such a model?

- 5) *If time permits:* One gap we have identified in the literature and from our conversations with patient partner evaluators is related to the maturity models not being patient-centric. What processes or indicators do you believe are necessary to bridge this gap?

Wrap up:

- 6) Is there anything I didn't yet ask which you would like to speak to and help inform this process?

Conclude, thank the participant again and confirm next steps (e.g., validation/cross-checking; follow-up for additional information and sources, follow up with a recommended key informant).

Appendix B

Co-Design Workshops

CO-DESIGN WORKSHOP 1 & 2 AGENDA

Objectives:

- To create consensus on the key focus areas of the maturity model
- This will help us to establish the organizing framework for what we measure

Welcome + Opening Remarks

- Project History + Purpose
- Today's Objective

Agenda Overview

- HIMSS C-COMM
- Brief Overview of the C-COMM
- Introductions + Icebreaker
- Getting to Know Each Other

Group Activity #1:

- How would you describe the ideal experience of care?
- What must be true for health organizations to deliver on that experience?
- What must be true for information systems to support that experience?
- What outcomes should OHTs be striving for?

Group Activity #2:

- Mapping the outcomes from activity #1 to the C-COMM
- What is most important? What is least important? What difference are there?

Group Activity #3:

- Synthesizing our work into an organizing framework
- Key Focus Areas
- Dimensions
- Example indicators

Closing Remarks + Next Steps

CO-DESIGN WORKSHOP 3 & 4 AGENDA

Objectives:

- To evaluate key indicators in six focus areas of the HIMSS C-COMM model
- To establish their relevance for an OHT CISMM

Welcome + Opening Remarks

Workshop Set #1 Summary

- Key insights from previous workshops

Introductions + Icebreaker

- Getting to Know Each Other

Focus Area Deep Dives

- Review key indicators
- What is important? Missing? Irrelevant?

Share back + Closing Remarks + Next Steps

CO-DESIGN WORKSHOP MATERIALS

To facilitate discussion, Miro boards, also known as virtual whiteboards, were used. To view the Miro boards for all of the co-design workshops, please use the links below:

- Miro boards for co-design workshops 1 & 2: [Miro boards from Workshops 1 & 2](#)
- Miro boards for co-design workshops 3 & 4: [Miro boards from Workshops 3 & 4](#)

QUINTUPLE AIM MAPPING TO C-COMM FOCUS AREAS

During co-design workshops 1 and 2, participants expressed that the developed CISMM should be driven by the needs of people, and not the possibilities of technology. Therefore, participants suggested that the Quintuple Aim could be used as a guiding framework for the developed CISMM. Figure 1B provides a schematic outlining each domain of the C-COMM relates to each part of the Quintuple Aim.













































Key Focus Areas					
	Patient	Provider	Population	Equity	Costs
population health tracking outcomes					
patient engagement providing patient choice					
access to care strengthen access					
communication support relationships					
interoperability capture + exchange data					
analytics + outcomes analyze data + track outcomes					
resilience management if systems are disrupted					
info. governance + organization strategy data to guide decisions					

Figure 1B. Alignment of the Quintuple Aim with the focus areas of the C-COMM by HIMSS

Focus Groups

The following sections (8.2.1 and 8.2.2) present the material that was used during the focus groups to gather feedback on the draft CISMM and implementation plan and facilitate discussion related to the implementation of a CISMM for OHTs.

CISMM DRAFT #1

The following draft maturity model was presented to focus group participants.

Clinical Information Systems Maturity Model (CISMM)*

This document presents a draft of the Clinical Information Systems Maturity Model (CISMM) developed for OHTs.

Version 1.0: July 19, 2022

*This is a draft document. Input from OHTs and other stakeholders will lead to a revised draft version that will require testing before being considered a finalised maturity model.

- There are **7 focus areas**: Population Health Management, Patient-Centered Care and Patient Engagement, Communication and Coordination, Interoperability, Outcomes, System Self-Management, and Governance
- For each focus area, there are several **criteria** (also called indicator types or components). Each criterion refers to indicators that have a similar theme. For example, in the “Governance” focus area, “Privacy” is a criterion with several indicators related to how OHTs can assess their maturity in Privacy.
- The Maturity Model has **4 maturity levels**: Level 0 is a baseline assessment (not shown in the CISMM). Levels 1 (Intermediate), 2 (Advanced), and 3 (Mature) are described in this document. Each maturity level may have more than one indicator that is measured.

Domain: Population Health Management

Criteria (Indicator type/component)	Level 3 (Mature) *in addition to components described in Levels 1 and 2	Level 2 (Advanced) *in addition to components described in Level 1	Level 1 (Intermediate)
Understanding Outcomes Achieved for Unique Patient Populations	Defined patient population segments are tracked relative to program outcomes to identify variations in outcomes across unique patient population groups.	Patient volumes are segmented into unique patient populations and identified for each program to understand the unique needs of patient population segments.	Patient volumes are reported for each program (e.g., surgery, medicine, pediatrics, women's health).
Tailored Care According to Need	Needs and outcomes are tracked across segments to tailor and evaluate effectiveness of care delivery.	Care delivery is tailored to meet the unique needs of segments.	Standardized care plans (pathways) are used to guide and inform care delivery for patients based on diagnosis.
Equity Informed by SDOH Measurement	Outcomes are examined in each population segment by SDOH to evaluate equity and disparities which inform care delivery strategies that aim to reduce, minimize, and/or eliminate inequities.	Social Determinants of Health are examined by organizational leaders to inform care delivery priorities for the organization.	Social Determinants of Health are reported at the program level (e.g., surgical program, medicine program, ED, etc.).
Quality and Safety	Quality and safety outcomes are tracked in real time for each population segment to inform decisions to personalize care and proactively mitigate risks to support/sustain patient's health.	Quality and safety outcomes are reported for each population segment and is used to evaluate quality, safety and effectiveness of each care program.	Quality and safety priorities are defined by senior leaders within the OHT with defined targets.
Population Health Outcomes	Public Health data is seamlessly exchanged and mobilized to track patients at greatest risk (e.g., disease surveillance, vaccination status) relevant to in population health outcomes.	Program teams consider epidemiological profiles of the community to inform and tailor care program goals and priorities.	Identify or develop epidemiological profiles of the community to inform care program goals and priorities

Domain: Patient-Centered Care and Patient Engagement

Criteria (Indicator type/component)	Level 3 (Mature) *in addition to components described in Levels 1 and 2	Level 2 (Advanced) *in addition to components described in Level 1	Level 1 (Intermediate)
Patient Education and Health Literacy	Patient education materials are co-designed and/or evaluated by patients to ensure educational materials meet the health literacy and health needs of populations receiving care	Patient education and information materials are evidence based and developed by program teams to advance health literacy	Standard health information, education tools and materials are available to patients online (e.g., organization website, patient portals) to support health literacy.
Patient Access to Health Data	A portal or digital platform exists with capabilities for patients to have ownership and autonomy over their own health data and record to verify demographic information, key diagnoses, long term conditions, allergies, test results, and to obtain educational materials and interact with care teams.	Patients have access to their health data (e.g., PDF copies of results) using online portals or secure applications.	Patients are given patient data (e.g., lab results, imaging results, copies of their chart) upon request.
Personalization of Care Enabled by Digital Tools and Technologies	A) Patient's personal preferences are identified and shared through digitally enabled communication tools (e.g., secure text messages, online tools), with patient's permission, to inform staff/provider teams of the patient's unique health goals, values, life circumstances, and needs to inform care decisions (e.g., personal pronouns [e.g., He/Him/She/Her/etc.] are captured and used by staff/provider teams). B) Technology-enabled self-management tools enable patients to report outcomes, establish personal goals, preferences, and needs which are tracked and documented in the personalized care plan.	A) Patient's personal preferences are documented in the electronic health record and shared with the patient's circle of care, with patient's permission, to ensure care decisions are informed by patient needs, values, and life circumstances. B) Digital technologies are evaluated to determine the capacity of these tools to personalize care and support meaningful communication between staff and patients.	A) Patients work with their provider teams to define personal health and wellness goals and needs to inform care planning decisions. B) Patient preferences may or may not be documented digitally.

Digitally-Enabled Self-Management	<p>A) Patients are supported to use a variety of online and digital tools of their choosing (e.g., health applications, tablets, smart phone tools, wearables) that enable them to set their health goals, track and report progress to care providers.</p> <p>B) Care teams have access to patient generated data (e.g., wearables, digital tools) to inform care management and decisions.</p>	<p>A) Patients are supported to use a variety of online or digital tools to support tracking progress along their health and wellness journey (e.g., weigh scales that track daily weights for patients with heart failure, apps that track diet and exercise goals).</p> <p>B) Patients have access to their care documentation and communicate digitally with care team.</p>	A & B) Patients do not have access to digital tools for monitoring health status and do not communicate digitally with care team.
Medication Management	Medication Reconciliation is digitally-enabled and completed in real time or near real time to support the medication safety of all care transitions.	Medication reconciliation is supported by electronic prescribing to reduce discrepancy and errors is supported by Clinical Decision Support/alerts and warnings (e.g., duplicate orders, med/med alerts, dose guideline alerts).	Medication reconciliation at the point of care is recorded on paper using standardized forms.
Lab Results	Critical Lab results are followed up by patients digitally, using a mode of their choice (e.g., secure SMS text, email, secure email, patient portal, other).	All lab results are electronically stored in patient record (EMR/EHR/PHR).	Critical lab results are available electronically and communicated by telephone.
Clinician Team Best Practices	<p>A) Patients have access to personal health records, educational tools and health navigation tools to support health decisions and navigation of access to care and services from their own homes. This includes fully integrated virtual care and remote patient monitoring interventions.</p> <p>B) The care provider uses personalised care plans with integrated alerts accessible by care team members from different care settings.</p> <p>C) The care provider uses documented results to trigger Clinical Decision Support (CDS) driving dynamic workflows to support coordinated care across settings.</p>	<p>A) Vital signs and other clinical assessment values are collected electronically at the point of care.</p> <p>B) Health data is accessible to clinicians across the patient's care journey.</p> <p>C) The care provider uses evidence-based coordinated care plans that are personalised for the patient. Electronic clinical orders that trigger Clinical Decision Support (CDS) are implemented across care settings to assist with integrated care.</p>	A, B & C) Hand written records are scanned and stored electronically.

<p>Patient Access to Digital Tools</p>	<p>Organization connects patients with community partners from digital ecosystems to equip them with devices, broadband connections, and basic digital skills (e.g., discount mobile phone, discount mobile plan, local library for internet access, etc.).</p>	<p>Organization actively and routinely addresses operational barriers to patient access (e.g., address provider shortages, offers telehealth and virtual care options).</p>	<p>Organization documents barriers to patient access to healthcare (e.g., language-related barriers, disabilities, inability to take time off work to attend appointments).</p>
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Domain: Communication and Coordination

Criteria (Indicator type/component)	Level 3 (Mature) *in addition to components described in Levels 1 and 2	Level 2 (Advanced) *in addition to components described in Level 1	Level 1 (Intermediate)
Patient's Circle of Care Preferences	The role of a patient's social and care network are meaningfully integrated into care planning and decisions where appropriate. Patients are able to identify and/or remove members of their circle of care.	Patients are able to update and validate changes in preferences and needs such as, next of kin, power of attorney, diet preferences, and circle of care.	Patients can identify members of their caregiver network or family.
Timeliness of Communication	Patient reported health concerns or challenges are responded to quickly, with rapid intervention protocols in place (e.g., phone or video conference with a provider within 24-hours, telemonitoring system for patients on remote patient monitoring devices, etc.)	Organization has on-call system staffed by clinical team who address and attempt to resolve health concerns reported after hours.	To ensure patient safety an automated phone system redirects calls outside of normal business hours.
Patient and provider communication	Digital tools and strategies are used to support easy wayfinding, and navigation of care delivery services and access to care (e.g., text or email appointment reminders with a link to the appointment location, etc.).	Organization offers multiple communication tools (e.g., text, audio, video, etc.) to support communication with providers. Providers tailor communication to patient preference.	Telephone or email is the main method for communication between care team and patients.
Communication Among and Across Providers – Transitions in Care	Providers are digitally connected where decisions are informed by integrated data across the journey of care. Care is coordinated digitally across transitions (across agency/organizational teams) to create a fully integrated care delivery system tailored to each individual.	Actionable alerts are sent to care team and are prioritized, based on severity and risk of harm. Care team identifies what is immediately actionable and responds accordingly.	Telephone or email is the main method for ad-hoc communication among and across care teams and providers.

<p>Shared Care Plans – Transitions in care</p>	<p>A) The care provider uses shared care plans to support the agreement on and definition of <u>personal targets</u> for patients based on their individual needs and abilities. B) The care provider can detect conflicts, duplicates and dependencies between multiple pathways/protocols for patients with multiple chronic conditions.</p>	<p>A) The care provider uses <u>alerts and warnings</u> to track and coordinate the completion of tasks in shared care plans across multiple care settings. B) The care provider uses shared care plans that can include multiple care pathways/protocols for multiple chronic conditions.</p>	<p>A & B) The care provider is responsible for driving and tracking care delivery across all care settings. The care provider <u>shares</u> electronic care plans within multi-disciplinary teams.</p>
<p>Coordinated Provider Access to Patient Records</p>	<p>The care provider can electronically manage referrals across providers from different care settings.</p>	<p>The care provider has online access to electronic patient records within and across care settings.</p>	<p>Organization asks patients to 'opt in' to the sharing of personal health data between clinical teams where appropriate.</p>

Domain: Interoperability

Criteria (Indicator type/component)	Level 3 (Mature) *in addition to components described in Levels 1 and 2	Level 2 (Advanced) *in addition to components described in Level 1	Level 1 (Intermediate)
Interoperability Among Providers	Health data from different systems/software, medical devices, and external entities/organizations are integrated with the HIS, which enables data to be accessed and shared appropriately and securely within and across organizational, regional, national boundaries.	Clinicians have access to external data sources and can exchange patient data across the OHT.	Clinicians have online access only to health organization's (internal) clinical information and information can only be sharing within the organization.
Interoperability that Enables Patient Engagement	Bi-directional information exchange with patients who can access their personal health data, report outcomes, access care plans, and access digital tools to support self-management of care where available.	Dynamic two-way exchange of information between provide and patient, including clinical documentation among providers, electronic patient reported outcomes, wearable data, etc.	Clinicians share results and provide patients with their data when requested
Health Information Exchange and Data Privacy	Health data exchange is flexible and enables clinicians and organizations to strip out private data (e.g. data deemed private by the patient, or private based on legislation/regulatory) that should not be shared to protect privacy and respect patient decisions to share data within and across organizations.	Data privacy policies and standards are embedded in every workflows and deployed in some areas. Plans for widespread implementation are in progress.	Data privacy policies or standards are in development.
Data Integrity and Accuracy	Processes and standards are embedded in information systems to validate accuracy and integrity of the Clinical Data Repository. These standards will also provide the ability for patients to validate accuracy of their health information.	Patient data and documents from external sources are uploaded electronically into the Clinical Data Repository and clinicians have remote access to CDR to review results, vital signs, and other clinical parameters.	Patient data are uploaded into Clinical Data Repository/data platforms manually.
Provider Workflows	Information systems and processes are designed with patients and providers and optimized to provider workflows.	Access to data or use of information system is evaluated for ease of use to optimize workflows for providers.	Clinical information from the laboratory, radiology, and pharmacy is communicated on paper forms and by telephone.

Domain: Outcomes

Criteria (Indicator type/component)	Level 3 (Mature) *in addition to components described in Levels 1 and 2	Level 2 (Advanced) *in addition to components described in Level 1	Level 1 (Intermediate)
Patient Outcomes	A) Advanced analytics to track patient progress and outcomes relevant to personalized health goals. B) Digital tools enable patients to report outcomes along the journey of care, linking outcome data to personal health records accessed by provider teams to inform care decisions, track outcomes, support quality and safety of integrated care across the journey of care.	The organization is able to monitor personal health record activity, patient access to care, and rates of utilization of personal health data.	Care program reports on standard outcomes annually (e.g., patient visits, rates of falls, infection rates, wound care visits).
Patient Satisfaction	Patient satisfaction and feedback on information systems is collected, analyzed, and openly communicated with relevant stakeholders.	Patient satisfaction is measured using automated digital tools to assess the patient's care journey.	Routine patient satisfaction surveys are mailed or sent digitally to patients annually.
Quality and Safety Outcomes	A) The organization benchmarks and reports all quality and safety outcomes for each program. B) Prevalence rates and type of patient reported side effects or adverse outcomes are tracked for each care program.	Frequency and type of outcomes, side effects, or adverse events are assessed at each care encounter and recorded in the patient record.	Patient volumes are reported and reviewed across the organization.
Workforce Outcomes	A) Organization has a strategy for routinely reviewing and addressing staff burnout, retention rates, staff turnover, injury rates, and sick time rates to ensure care is provided for the staff serving the population. Information systems workflow concerns. B) Access to data or use of information system is evaluated for ease of use to optimize workflows for clinician teams.	Accountability frameworks, including performance evaluation for staff, are linked to the strategic goals for the organization and informed by outcomes data.	Workforce retention and recruitment strategies are reported annually to Executive team.

Domain: System Self-Management

Criteria (Indicator type/component)	Level 3 (Mature) *in addition to components described in Levels 1 and 2	Level 2 (Advanced) *in addition to components described in Level 1	Level 1 (Intermediate)
Information Interruptions	<p>A) OHTs evaluate the impact of interruptions on staff workflows and care provider teams (e.g., impact analysis report where the organization evaluates or audits how care interruptions impacted staff workflows, how the staff was able to access information during interruptions, and the impact on care delivery processes).</p> <p>B) Demonstrated plan for long-term information interruptions (e.g., Power failures). Processes for managing information system interruptions, how the processes are implemented during recovery, and how interruptions are documented are in place.</p> <p>C) Guidelines for how comprehensive information is managed and documented during information interruptions are in place.</p>	Planned and unplanned downtime events are supported by a robust communication plan and aligned with the major incident plan.	Interruptions in IT systems are investigated and reported to Senior team.
Disaster Recovery	Simulated Disaster Recovery events are conducted and lessons learned are performed. For example, the organization routinely/annually conducts simulation training exercises (e.g., fire drill exercises) which simulate interruptions in information system events to support preparedness and learning. The simulation must include processes in place for the creation of business continuity plans for all levels of criticality, clinical documentation in downtime and the recovery of data created during the downtime.	Business continuity plans are in place for all critical/high priority systems.	Applications are prioritized by criticality - high, medium, low or similar (e.g., prioritize which systems are restored first, payroll, EMR, etc.).
IT Security	<p>A) IT Security is proactively managed with across the enterprise. An assessment is performed annually to identify risks to the infrastructure. The risk assessment and any issues identified by monitoring are escalated to leadership.</p> <p>B) Organization has a process for identity management for appropriateness of access to information systems (multi-factor identification processes).</p>	<p>A) All staff receive IT security training every 12 months (e.g., appropriate use policy, protection of personal health information, cybersecurity threats - phishing attacks, malware attacks, ransomware, weak passwords, insider threats, etc.).</p> <p>B) Role-Based Access Controls (RBAC) are in place.</p>	A & B) Formalized process to report issues identified by monitoring to leadership.

<p>IT Change Management</p>	<p>A) IT Change Management ensures a risk assessment is performed on new devices or software requests.</p> <p>B) Changes are coordinated and communicated to all end users of the type of change and expected impact.</p> <p>C) Appropriate education for end users is in place.</p>	<p>IT Change Management - All requested changes are reviewed for purpose and intent. Risk assessments are performed on some new devices but not all.</p>	<p>IT Change control is offered as an online service.</p>
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Domain: Governance

Criteria (Indicator type/component)	Level 3 (Mature) *in addition to components described in Levels 1 and 2	Level 2 (Advanced) *in addition to components described in Level 1	Level 1 (Intermediate)
Data Standards	Established policies require the use of agreed upon data standards across the organization, including the definition of each standard and how the standard is required to be used (e.g., organization has a well-established data dictionary, well-defined data elements and data definition).	Planning for implementation of data standards is in progress.	Data standard policies across the organization are in development.
Data Sharing	Established policies are used and evaluated related to the governance of data sharing across organizations the compose OHTs.	Planning for implementation of data sharing governance policies across organizations that compose OHTs is in progress.	Data sharing policies across organizations composing OHTs are in development.
Privacy	A) Individual-level data is owned by the patient who determines and consents to access to personal health data. (e.g., Who has permission to access data and under what circumstances data can be accessed). B) The organization has an established policy to manage individual-level data privacy. Data is managed using encryption (at rest or in motion) using current standards (TLS) to ensure the privacy of patient data at all times.	Policy is in place to ensure patient privacy, security, and data management is reviewed annually.	Guidelines for staff access to patient data are communicated to all staff during employment process.
Data Management Strategy	Data management processes include strategies to strengthen validity (e.g., normalized data (List the standards, tool(s), and model(s) in use) and a high level of trust in data integrity.	There is an organizational strategy to review data for quality, accuracy, and potential bias.	Quality assurance process reviews quality of data regularly.
Accountability	A) The use of accountability frameworks across the organization assesses compliance with information policies and procedures. Information governance includes accountability/oversight. B) Staff complete document care processes, individual visits/encounters, and assessments within 24 hrs following interaction with patient.	A) Clinical outcome targets are prioritized by the senior management team and communicated effectively. B) The organization is able to track the timeliness of nursing care/tasks (e.g., timed medication orders) to examine workflow efficiency and productivity.	A) Program outcomes are reviewed by senior team regularly to assess performance. B) Staff are accountable for completing care documentation within a timely manner.

MIRO BOARDS

To glean feedback on the draft CISMM for OHTs and to define the success criteria for the implementation of the CISMM, Miro boards were used. Please use the links below to access the Miro boards for each focus group.

- Miro board for Mid-West Toronto OHT: [Mid-West Toronto OHT](#)
- Miro board for Southlake OHT: [Southlake OHT](#)