

# The current state of electronic health records across Canada: an environmental scan and interoperability maturity assessment

Sunand Kannappan BHSoc, Stephanie Hastings MSc PhD, Alan Forster MD MSc, Stafford Dean PhD, Grant Hollett BSc, Simon Hagens MBA, Bobby Gheorghiu MHSc, Ewan Affleck CM MDCM, Claire Snyman BSc RD, Owen Adams PhD, Tyler Williamson PhD, Braden Manns MD MSc

■ Cite as: *CMAJ* 2026 May 4;198:E644-54. doi: 10.1503/cmaj.251640

## Abstract

**Background:** Canada has achieved near-universal adoption of electronic health records (EHRs) and yet interoperability, the secure exchange and use of health data across different systems and settings, remains limited. We aimed to describe the current state of EHRs in 10 provincial and 3 territorial jurisdictions in Canada and evaluate the maturity of their interoperability using a structured interoperability assessment model.

**Methods:** We conducted an environmental scan of EHR use and interoperability across all provinces and territories using Canada Health Infoway documents and structured interviews with 23 subject matter experts. Using a rigorously designed interoperability maturity model, we evaluated jurisdictions across 4 enabler dimensions

(governance, legislation and standards, incentives and capacity-building, and technical infrastructure) and 4 interoperability status dimensions (community EHRs, hospital EHRs, patient portals, and system analytics).

**Results:** We found that, although EHR adoption was high, maturity of EHR interoperability was low and uneven across Canada. Integrated EHR health data exchange was limited, and nearly all jurisdictions lacked EHR interoperability between hospitals, community specialists, and primary care. Data exchange between primary care and specialists, and between hospitals and community settings, was heavily dependent on fax (traditional or online) or mailed letters in every jurisdiction. Patient portal contents and system-level analytics using EHR data were

underdeveloped nationally. No jurisdiction was advanced in all dimensions. Although most jurisdictions showed strength in at least 1 area, they also exhibited many areas for growth. We identified 8 key barriers to interoperability, each of which can be overcome.

**Interpretation:** Canada has widespread EHR adoption, but maturity of EHR interoperability and the enabling conditions required for true interoperability are low and inconsistent across jurisdictions. Strengthening governance, legislation, standards, incentives, and technical infrastructure — supported by national legislation to mandate interoperability across different EHRs — will be essential to advancing connected care across Canada and realizing widespread benefits for patients, clinicians, and health systems.

In Canada, regular use of electronic health records (EHRs) — a comprehensive, digital version of a patient's entire medical history, including diagnoses, medications, treatments, allergies, and laboratory results — by physicians has risen from 36% in 2009<sup>1</sup> to 95% in 2024.<sup>2</sup> This increased adoption was driven by substantial public investment, including federal funding through Canada Health Infoway (Infoway) for EHR infrastructure development, implementation incentives, national standards, provincial support programs, and an expanding ecosystem of health information technology vendors.<sup>3</sup> This rapid growth emerged from a patchwork of decisions made at the clinic, hospital, and regional levels

in the absence of coordinated national, provincial, or territorial strategies. The result is a landscape of disparate EHR platforms that cannot reliably exchange health data, despite EHR interoperability being a stated objective of Infoway's original mandate.<sup>4,5</sup>

Interoperability refers to the secure, accurate, and meaningful exchange of clinical information across systems, care settings, and organizations. Fully realized, it unlocks a cascade of system-wide benefits.<sup>6-8</sup> It supports safer and higher quality patient care by fostering better communication, care coordination, and clinical decision support at the point of care. It enhances providers' experience by offering seamless access to appropriate patient information and

less duplicative documentation. It drives operational efficiency through streamlined workflows, fewer repeated tests, and better access to data. It supports patient digital access to their records, enabling better self-management, critical to improving health outcomes. Finally, it strengthens health system planning by supporting quality improvement, innovation, and population health management. However, advancing interoperability could threaten data privacy and raise security risk as it increases the movement and use of personal health information across systems. This underscores the need for alignment with more nuanced, updated privacy legislation.

In 2023, Infoway released the Shared Pan-Canadian Interoperability Roadmap, outlining common priorities to improve EHR interoperability.<sup>9,10</sup> In 2024, 4 national medical organizations convened the Digital Health Interoperability Task Force to call for a 5-year national health data interoperability plan.<sup>11</sup> Also in 2024, Canada's federal government introduced Bill C-72 (the *Connected Care for Canadians Act*) to foster health data interoperability by prohibiting vendor data blocking through federal or equivalent jurisdictional regulatory standards;<sup>12</sup> however, when federal parliament was prorogued in March 2025, Bill C-72 was terminated. On Feb. 4, 2026, the federal government reintroduced the *Connected Care for Canadians Act* as Bill S-5, which is substantively similar to its predecessor.<sup>13</sup>

Without a clear understanding of each jurisdiction's EHR interoperability,<sup>14</sup> national policy efforts risk misalignment with local realities, and collaboration across jurisdictions is difficult. We sought to describe the current state of EHRs across Canada, to develop and refine a standard maturity model for jurisdictional EHR interoperability, to enable a comparative evaluation of the maturity of interoperability across all provinces and territories, and to detail common barriers to EHR interoperability.

## Methods

### Setting

Canada has publicly funded health care, in so far as all eligible residents can access physician and hospital services funded through taxation.<sup>15</sup> Health system governance and care delivery are primarily the responsibility of provincial and territorial governments, which function as distinct jurisdictions. Care is delivered by hospitals and hospital-based specialists (often coordinated by health authorities) and community-based primary care and specialists, where most physicians practise as independent contractors. Infoway is a federally funded organization that was established in 2001 to support pan-Canadian coordination of digital health, but implementation and governance of EHRs remains the responsibility of jurisdictions.<sup>16</sup>

### Study design and participants

We conducted a national environmental scan of EHR interoperability status, focusing on primary use of health data for clinical care. We developed a model to assess the maturity of EHR interoperability and applied it to generate jurisdictional ratings. To inform the ratings, we combined a review of Infoway jurisdictional surveys with structured interviews of provincial or territorial subject matter experts.

We selected subject matter experts based on their expertise in government or ministry, health authority or hospital, or clinical leadership, identified through the researchers' networks and relevant organizational charts. The study lead (B.M.) invited potential participants via email. Where information gaps remained, we employed snowball sampling to recruit additional participants.

### Development of the model

We developed an EHR interoperability maturity model — defined as a structured and conceptual framework that organizes interoperability into dimensions, subdimensions, and maturity levels — through an iterative process.<sup>17–20</sup> Our model and process are reported in detail in Appendix 1, available at [www.cmaj.ca/lookup/doi/10.1503/cmaj.251640/tab-related-content](http://www.cmaj.ca/lookup/doi/10.1503/cmaj.251640/tab-related-content). Our goal was to develop a model to support jurisdictional and national health care policy-makers in assessing and advancing EHR interoperability.

First, we defined the intended purpose of the maturity model and conducted a focused literature review to identify existing models focused on EHR interoperability. We used a previously published systematic review by Liaw and Godinho<sup>21</sup> as a starting point and updated that search to identify new interoperability maturity models. We extended their original search strategy using the same databases and core concepts to identify relevant literature published through Dec. 31, 2023. Two reviewers (S.K., S.H.) independently screened titles, abstracts, and full texts using pre-defined inclusion and exclusion criteria, with discrepancies resolved by a third reviewer (B.M.). This search was supplemented by targeted grey literature identified by our study team. The full search strategy and screening process is described in Appendix 1.

We did not identify any models that were well suited for the Canadian context without substantial modification and sufficiently granular to allow scoring and comparisons at a provincial or territorial level. As a result, we combined elements of previous maturity models.<sup>7,22</sup> We adapted relevant concepts from existing models into logical dimensions and subdimensions, and added new concepts where they were missing (Appendix 1). Next, we drafted and refined the model iteratively through internal consultation with the research team to focus on key areas for inclusion and establish clear scoring criteria for each dimension. After this, we invited our jurisdictional study participants to review and provide feedback on the model; 14 provided feedback. After incorporating this feedback and additional input from the research team, we finalized the maturity model (Appendix 2, available at [www.cmaj.ca/lookup/doi/10.1503/cmaj.251640/tab-related-content](http://www.cmaj.ca/lookup/doi/10.1503/cmaj.251640/tab-related-content)).

### Environmental scan

We reviewed existing Infoway surveys as part of the environmental scan and then conducted structured interviews with participants. We conducted interviews via Zoom between September 2024 and June 2025; these were audio-recorded and transcribed. Most were individual interviews; however, some participants requested that additional contributors be included, so we held small-group interviews. We used a structured interview guide (Appendix 3, available at [www.cmaj.ca/lookup/doi/10.1503/cmaj.251640/tab-related-content](http://www.cmaj.ca/lookup/doi/10.1503/cmaj.251640/tab-related-content)), which we pilot

tested with 2 participants. It assessed the status of EHR infrastructure, data-sharing practices, and interoperability enablers within each jurisdiction. It included a mix of closed-ended items mapped to the maturity model and open-ended questions exploring perceived barriers.

### Data analysis

We used the results of the document review — primarily Info-way's National Survey of Canadian Physicians<sup>2</sup> and Canadian Digital Health Survey<sup>23</sup> — and interviews to populate and apply the maturity model. Two researchers (S.K., S.H.) independently generated preliminary maturity ratings based on these data sources and the defined maturity levels across each subdimension of the model, resolving discrepancies through discussion and, when needed, adjudication by a third reviewer (B.M.). These draft ratings were shared with interview participants and at least 1 participant per jurisdiction reviewed and validated their data and maturity assessment. When participants disagreed with ratings, they were asked to provide clarification or supporting information.

We also conducted thematic analysis of interview responses related to barriers to interoperability, with 2 researchers (S.K., S.H.) independently coding transcripts and resolving discrepancies through iterative discussion.

### Team composition and reflexivity

One experienced qualitative researcher (S.H.) conducted all interviews. She is a female senior research associate with a PhD in industrial and organizational psychology and 10 years' experience in conducting, analyzing, and reporting on qualitative interviews. The second researcher (S.K.) independently conducted data analysis and coding. He is a male medical student with prior experience as a digital health management consultant.

### Ethics approval

This study was approved by the University of Calgary Conjoint Health Research Ethics Board (REB23-1135).

### Results

We conducted interviews with 23 participants who had detailed knowledge about their province or territory's EHR system. All interviews were 1 hour in length, including 4 group interviews and 15 individual interviews. Further information on participant jurisdictions and roles can be found in Table 1.

### EHR landscape in Canada

Characteristics of the community and hospital EHR landscape, health data repositories, provincial patient portals, and data sharing across Canadian jurisdictions are shown in Table 2 and Table 3. Community EHR use exceeded 90% in all provinces.<sup>2</sup> Several jurisdictions — including Saskatchewan, Ontario, Quebec, New Brunswick, Newfoundland and Labrador, and Nova Scotia — have influenced their community EHR landscape by certifying or funding a limited set of approved EHR products. Prince Edward Island and each of the territories have a single, unified community EHR system, selected at the jurisdictional level. In contrast, British Columbia and Alberta remain highly fragmented, with around 40 and 15 distinct community EHR systems, respectively.<sup>2</sup>

We found that hospital EHR adoption exceeded 90% in most provinces, although adoption was closer to 80% in Quebec and the Atlantic provinces' hospitals, and Manitoba had only a few hospitals with full EHR functionality.<sup>2</sup> Nunavut used a single EHR for the entire territory; the Northwest Territories had a similar system for all community-based clinics but hospitals in the territory were paper-based. Only Yukon, Alberta, and Prince Edward

**Table 1: Interviewed subject matter experts by jurisdiction and role**

Region	Jurisdiction	No. of subject matter experts interviewed <i>n</i> = 23	Government or ministry <i>n</i> = 7	Health authority or hospital <i>n</i> = 9	Clinical leadership <i>n</i> = 7
Western	British Columbia	1			1
	Alberta	2		1	1
	Saskatchewan	2	1		1
Central	Manitoba	2		2	
	Ontario	3	2	1	
	Quebec	2		1	1
Atlantic	New Brunswick	3		3	
	Newfoundland and Labrador	1	1		
	Nova Scotia	1			1
	Prince Edward Island	2	1		1
Territories	Yukon	1		1	
	Northwest Territories	1			1
	Nunavut	2	2		

**Table 2: Characteristics of the community and hospital EHR landscape, health data repositories, provincial patient portals, and data sharing in western and central Canada**

Characteristic	Western			Central		
	BC	AB	SK	MB	ON	QC
<b>Community EHRs</b>						
Adoption rate by community physicians*	95%	98%	98%	97%	98%	94%
Community EHR landscape*	Around 40 EHRs, led by Telus Med Access and QHR Accuro	Around 15 EHRs, led by Telus Med Access and QHR Accuro	2 main EHRs: QHR Accuro and Telus Med Access	2 main EHRs: QHR Accuro, LibreMD	Around 12 EHRs led by QHR Accuro, Telus PS Suite and OSCAR	Around 6 EHRs, led by Medesync and MYLE
Jurisdictional controls and incentives†	–	–	Fully funded	Certification	Certification	Certification
<b>Hospital EHRs</b>						
Adoption rate by hospital physicians*	98%	100%	100%	98%	90%	82%
Hospital EHR landscape*	Cerner, Meditech	Unified Epic instance	Altera Allscripts instances	Altera Sunrise instances (few hospitals with full clinical suite; primarily ADT)	Epic, Cerner, Meditech	Several EHRs, including custom builds
Consolidation pattern	By region	Unified	By region	By site	By site	By site
Plans to unify	–	–	–	–	–	In process
<b>HDR</b>						
Name	Multiple systems	Alberta Netcare	eHealth Saskatchewan	eChart Manitoba	Clinical Viewer	Dossier Santé
Discharge summaries	Yes	Yes	Yes	ED only	Yes	No
Immunization records	Yes	Yes	Yes	Yes	No	No
Laboratory results or imaging	Some images	Yes	Yes	Yes	Yes	Some images
Medications	No	Yes	Yes	Yes	No	Yes
Specialist notes	Hospital only	Hospital only	Yes	Yes	Some visits	No
PCP notes	No	No	Some visits	Some visits	No	No
<b>Provincial patient portal</b>						
Name	Health Gateway	MyHealthAB, AHS Connect	MySaskHealth	–	–	Dossier Santé Quebec
Discharge summaries	Yes	Yes	Yes	–	–	No
Immunization records	Yes	Yes	Yes	–	–	No
Laboratory results or imaging	Yes	Yes	Yes	–	–	Yes
All medications	Yes	Yes	Yes	–	–	Yes
Specialist notes	Some visits	Yes	Yes	–	–	No
PCP notes	No	No	No	–	–	No
<b>Data sharing between primary care and specialists</b>						
Fax or letter	Yes	Yes	Yes	Yes	Yes	Yes
Provincial repository	No	Yes	Yes	Yes	Yes	Yes
Direct electronic connection	Consult letters only	No	Yes	Test results only	Consult letters only	No
<b>Data sharing between hospitals and community</b>						
Fax or letter	Yes	Yes	Yes	Yes	Yes	Yes
Provincial repository	No	Yes	Yes	Yes	Yes	No
Direct electronic connection	No	Discharge summaries only	Yes	Discharge summaries only	Yes	No

Note: ADT = admission, discharge, and transfer; ED = emergency department; EHR = electronic health record; HDR = health data repository; PCP = primary care provider.

\*Based on Canada Health Infoway survey.<sup>2</sup>

†Certification refers to the process by which EHR vendors are permitted to operate in a jurisdiction, provided they meet provincially defined technical, privacy, and interoperability standards. A unified model is where a jurisdiction has opted to procure and implement a single EHR for use across the province or territory.

**Table 3: Characteristics of the community and hospital EHR landscape, health data repositories, provincial patient portals, and data sharing in the Atlantic provinces and the territories of Canada**

Characteristic	Atlantic			Territories		
	PEI	NS	NL	Yukon	NWT	Nunavut
<b>Community EHRs</b>						
Adoption rate by community physicians*	91%	91%	91%	Insufficient data available	Insufficient data available	Insufficient data available
Community EHR landscape*	1 unified EHR: Telus CHR	2 main EHRs: QHR Accuro and Telus Med Access	1 main EHR: Telus Med Access	≥ 10 EHR instances, including Plexia	1 unified EHR: Telus Wolf	1 unified EHR: Meditech
Jurisdictional controls and incentives†	Unified	Certification	Fully funded	Unified	Unified	Unified
<b>Hospital EHRs</b>						
Adoption rate by hospital physicians*	81%	81%	81%	Insufficient sample	Insufficient sample	Insufficient sample
Hospital EHR landscape*	Unified Cerner instance	Meditech, McKesson	Meditech Expanse instances	Unified Meditech instance	Paper charts and unified Telus Wolf instance	Unified Meditech instance
Consolidation pattern	Unified	By site	By region	Unified	Unified	Unified
Plans to unify	–	In process	In process	–	–	–
<b>HDR</b>						
Name	HDR in development	SHARE	HEALTHe NL	–	HealthNet Viewer	–
Discharge summaries	No	Yes	Yes	–	Yes	–
Immunization records	No	No	Yes	–	Yes	–
Laboratory results or imaging	Yes	Yes	Yes	–	Yes	–
Provincial patient portal	No	No	Yes	–	Yes	–
Provincial patient portal	No	Yes	Yes	–	Yes	–
Provincial patient portal	No	No	Some visits	–	No	–
<b>Provincial patient portal</b>						
Name	MyHealthPEI	YourHealthNS	MyHealthNL	–	–	–
Discharge summaries	No	No	No	–	–	–
Immunization records	Yes	Yes	Yes	–	–	–
Laboratory results or imaging	Yes	Yes	Yes	–	–	–
All medications	No	Yes	No	–	–	–
Specialist notes	No	No	No	–	–	–
PCP notes	No	No	No	–	–	–
<b>Data sharing between primary care and specialists</b>						
Fax or letter	Yes	Yes	Yes	Yes	No	No
Provincial repository	No	Yes	Yes	No	Yes	No
Direct electronic connection	Yes	No	Tagged physicians only	No	‡	‡
<b>Data sharing between hospitals and community</b>						
Fax or letter	Yes	Yes	Yes	Yes	Yes	No
Provincial repository	No	Yes	Yes	No	Yes	No
Direct electronic connection	Yes	No	Tagged physicians only	Test results only	‡	‡

Note: EHR = electronic health record, HDR = health data repository, PCP = primary care provider.

\*Based on Canada Health Infoway survey.<sup>2</sup>

†Certification refers to the process by which EHR vendors are permitted to operate in a jurisdiction, provided they meet provincially defined technical, privacy, and interoperability standards. A unified model is where a jurisdiction has opted to procure and implement a single EHR for use across the province or territory.

‡Data sharing based on single territorial EHR.

Island have implemented a single jurisdiction-wide hospital EHR platform, while other jurisdictions' hospital systems were still managed at a site or regional level, resulting in multiple disconnected platforms within the same province.

Central health data repositories — secure electronic portals where clinicians can view health information — were in place across all jurisdictions except Yukon and Nunavut. These repositories typically captured discharge summaries, immunization records, laboratory and imaging results, and medication information (Table 2). However, specialist notes were available only in select jurisdictions, and documentation from primary care EHRs was nearly absent.

Province-wide patient portals were available in many jurisdictions but not in Manitoba, Ontario, and all 3 territories. Where province-wide portals existed, they generally provided access to immunization records, laboratory and imaging results, and medication information, but often omitted discharge summaries, specialist notes, and primary care provider documentation. Across Canada, patient portal use was limited; only 47% of people surveyed by Infoway in 2024 (ranging from 18% in the territories to 72% in Saskatchewan) said they had ever accessed their personal health information electronically.<sup>23</sup>

Data exchange between primary care and specialists, and between hospitals and community settings, was heavily dependent on fax (traditional or online) or mailed letters in all jurisdictions. Only Saskatchewan and Prince Edward Island reported widespread use of direct electronic connection (e.g., information pulled from hospital EHRs directly into the community EHR).

### Maturity of EHR interoperability across jurisdictions

In developing our model, we screened 5 articles that were relevant to interoperability, identified in the systematic review by Liaw and Godinho.<sup>21</sup> The extended search strategy through to Dec. 31, 2023, yielded 1233 additional papers. Finally, our study team identified 5 additional models. Of the 1243 total papers considered, we assessed 21 full-text articles describing 5 unique models. We ultimately included 2 models when developing our model. The flow diagram is shown in Figure 1.

After extensive feedback, including from our participants, our maturity model included 4 dimensions that enable interoperability (governance, legislation and standards, incentives and capacity building, and technical infrastructure) and 4 dimensions that capture the current state of interoperability (for community EHRs, hospital EHRs, patient portals, and health system planning). An overview of the model is provided in Figure 2, with full details in Appendix 2. For each dimension, we identified up to 3 relevant subdimensions.

We rated jurisdictions on each subdimension as having basic, emerging, or advanced capacity. Using this maturity framework and jurisdictional data, we created a comparative heatmap illustrating jurisdictional maturity across all dimensions (Figure 3). More detail on each jurisdiction's maturity ratings and justification is available in Appendix 4, available at [www.cmaj.ca/lookup/doi/10.1503/cmaj.251640/tab-related-content](http://www.cmaj.ca/lookup/doi/10.1503/cmaj.251640/tab-related-content).

The Atlantic provinces and the territories had advanced EHR governance, while most large jurisdictions remain at an emerging or basic level. Only Manitoba and Prince Edward Island had advanced legislation and standards, with the rest of Canada in

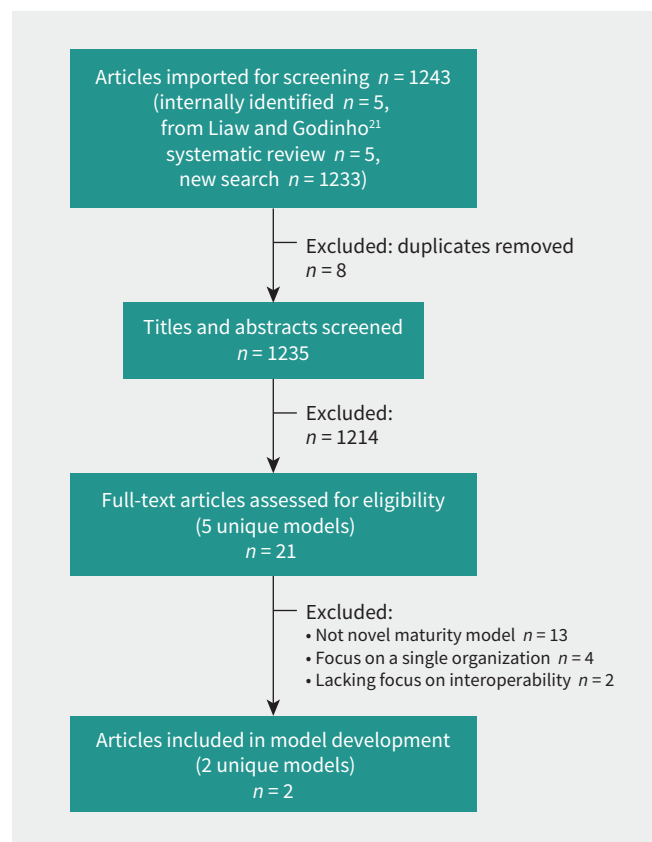


Figure 1: Flow diagram for maturity model search. See Related Content tab for accessible version.

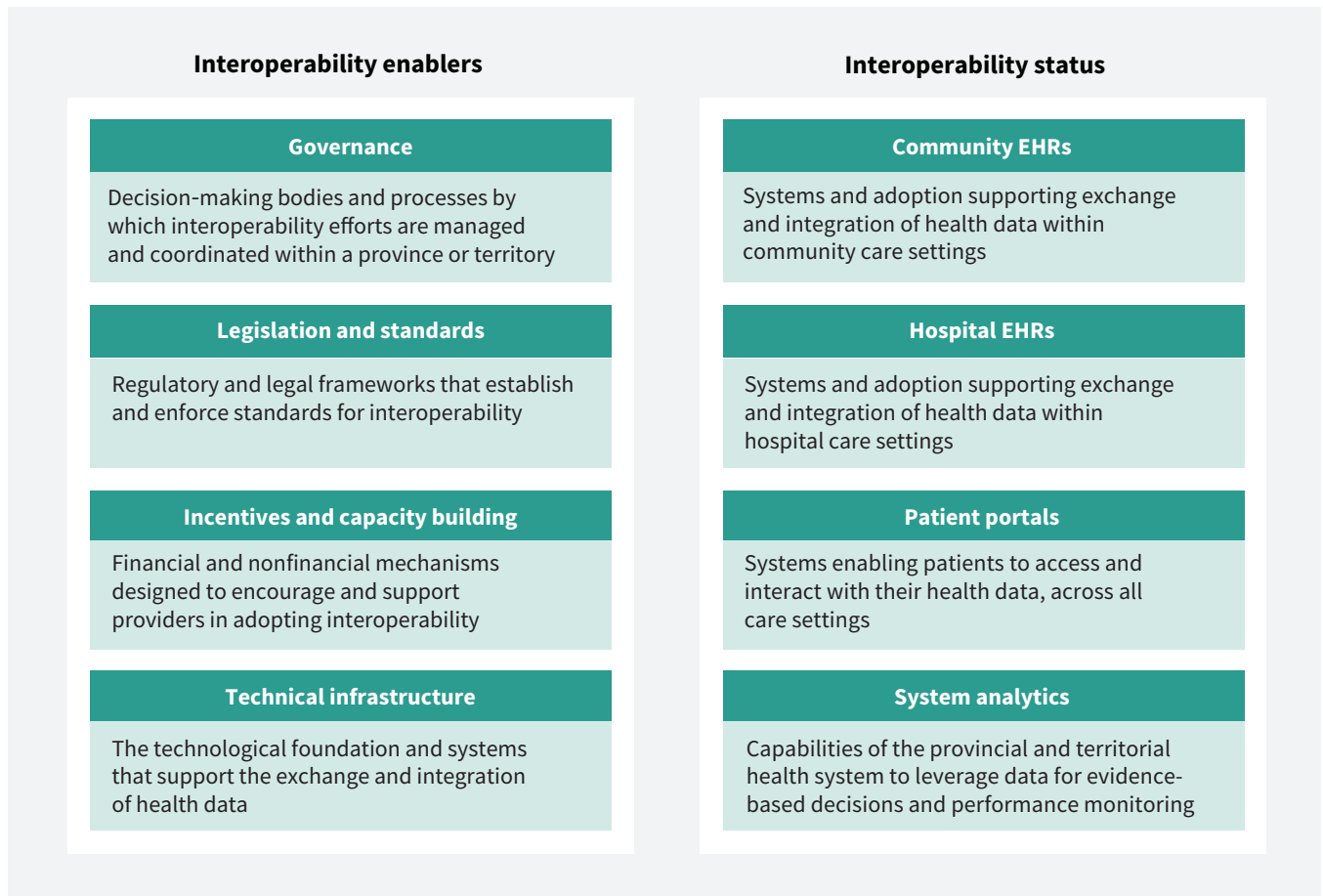
the basic-to-emerging range. Nunavut and Newfoundland and Labrador had advanced incentives and capacity building, as they covered costs and provided training even for community providers, but other provinces were at the basic level, lacking sustained financial or training programs. We considered technical infrastructure advanced when robust health data repositories were in place, yet several jurisdictions were still at a basic level, with limited information in their centralized repositories.

Community EHR adoption was advanced nationwide, but true interpractice and community–hospital data exchange was largely basic or emerging. Hospital EHR adoption was advanced in most provinces, but seamless interhospital exchange was at an emerging level outside of Alberta and Prince Edward Island. Patient portals were available in most provinces and territories yet were at a basic-to-emerging stage in terms of content, hampered by limited functionality. Use of EHR data for health-system planning was overwhelmingly basic across Canada, with sparse analytics capacity and minimal use of EHR data for performance management.

### Key barriers to interoperability

Participants described 8 recurring barriers to interoperability, the first 4 aligning with the previously described enabler dimensions of our maturity model (Table 4).

Weak health data governance with no single accountable oversight slowed decision-making. The lack of interoperability legislation and standards meant there was little obligation for



**Figure 2:** Dimensions and associated definitions from the interoperability maturity model, including both interoperability enabler dimensions and interoperability status dimensions. Note: EHR = electronic health record. See Related Content tab for accessible version.

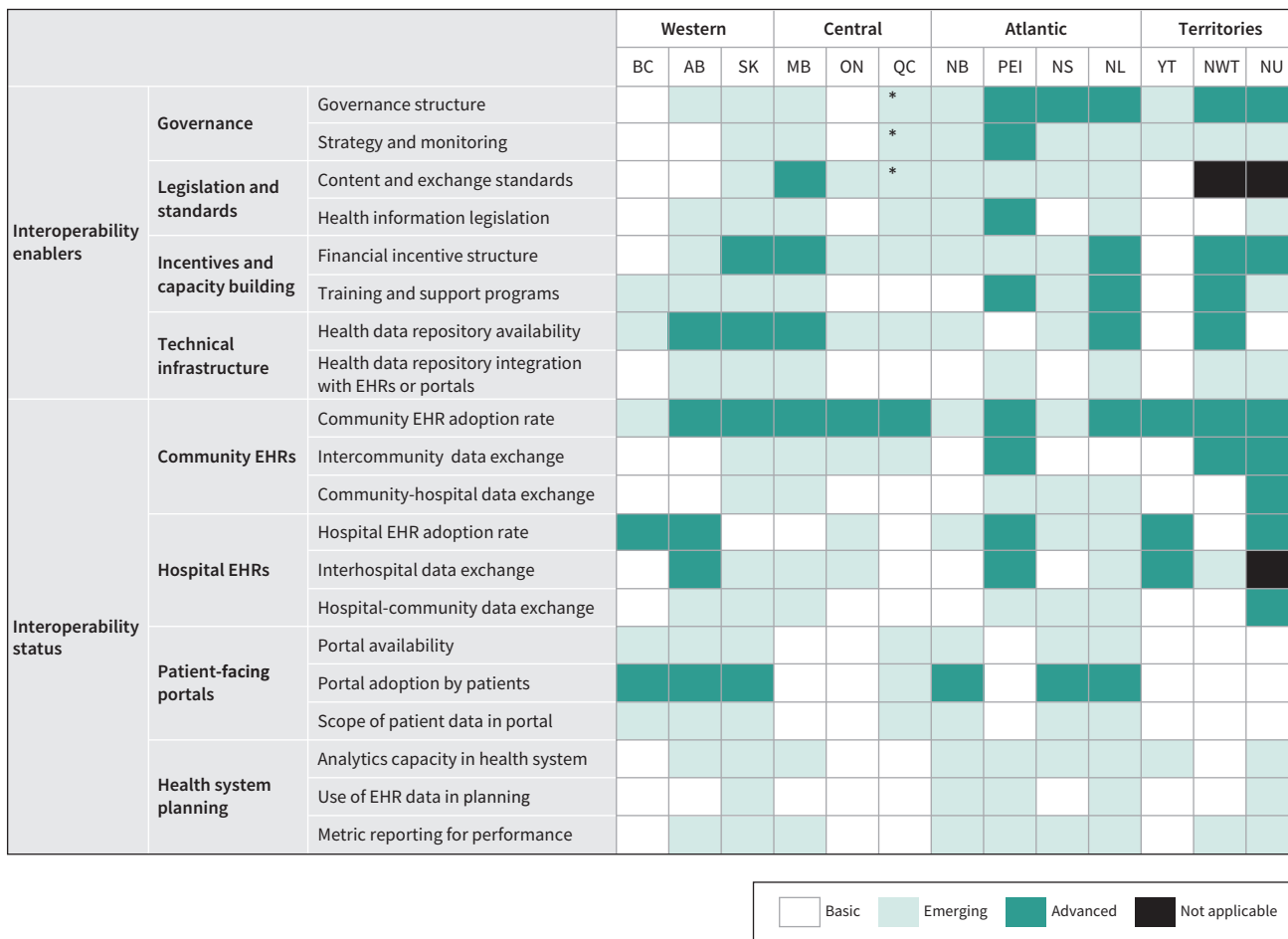
vendors and custodians to create the conditions for data sharing or conform to common data content or exchange protocols. Misaligned incentives, where providers were not compensated for meaningful use and exchange of clinical data, dampened adoption of interoperable workflows. Technical and funding challenges persisted, with many jurisdictions lacking the capacity to build and maintain unified platforms.

Participants identified 4 additional cross-cutting barriers that further impeded progress. Low physician digital literacy and resistance to workflow change led to low impetus for improvement and poor uptake of implemented solutions. Privacy and cybersecurity concerns often led organizations and clinics to default to restricting access to data, thereby sustaining reliance on traditional and monolithic data exchange. Limited vendor capacity for innovation and data-blocking behaviours — with proprietary interfaces, high fees, and slow timelines — constrained third-party connectivity. Finally, meaningful use of clinical data was deemed challenging because of inconsistent data and workflow standards, with heterogeneous clinical notes, billing and coding, and referral processes.

Although we asked interviewees about enablers and barriers, most focused exclusively on what they perceived as barriers to advancement. As such, we did not identify additional cross-cutting enabler themes in the interviews.

## Interpretation

We found substantial variation in EHR interoperability across jurisdictions, reflecting differences in governance and policy models, vendor landscapes, incentives, and technical capabilities. We identified that enabler dimensions — including governance, legislation and standards, incentives and capacity-building, and technical infrastructure — closely correlated with interoperability status across community and hospital EHR exchange, patient portals, and system-level analytics, except in Manitoba, where the enabling factors are emerging or advanced, but hospital EHR adoption is still low, hampering its interoperability status rating. Nearly all jurisdictions had major deficits in EHR interoperability, including in key areas like connectivity between hospital, specialist, and primary care EHRs and using EHR data for system planning capabilities. Although no jurisdiction was advanced across all interoperability dimensions, we found that smaller jurisdictions, particularly some Atlantic provinces and the territories, performed comparatively well across the dimensions of governance, incentives and capacity building, and community and hospital EHR interoperability status, in contrast to larger provinces (e.g., Ontario, BC, Quebec). Ultimately, our findings highlight the challenges preventing Canada's health systems from fully realizing the benefits of EHRs and reducing the harm associated with



**Figure 3:** Heatmap of electronic health record (EHR) interoperability maturity across interoperability dimensions and Canadian jurisdictions, where white indicates basic, light teal indicates emerging, dark teal indicates advanced, and black indicates not applicable. \*Substantial variation between community and hospital ratings.

disconnected data, a problem that has been estimated to cost taxpayers more than \$9.4 billion annually.<sup>24</sup>

Prior work by Gheorghiu and Hagens<sup>25</sup> described aspects of Canada’s digital health landscape in the mid-2010s, but lacked a holistic, jurisdiction-by-jurisdiction comparison. Infoway and the Canadian Institute for Health Information regularly report on connectivity rates but do not assess the maturity of governance, incentives, or architecture. We built on this existing work to establish a robust baseline and assessment framework; support provincial, territorial, and federal action; and offer an opportunity for collaborative learning.

Our interview data made it clear that achieving interoperability cannot rely on technical solutions alone but will require a holistic set of strong enabling conditions, including clear health information governance structures to align stakeholders, prioritize integration goals, and sustain long-term strategy.<sup>26</sup> Beyond governance, countries with strong health data systems have common foundations, including legislation and standards that mandate interoperability and provider training to use EHRs to their full scope to support patient care.<sup>27</sup> In contrast, Canada’s health systems have immature health data governance, and most provincial legislation relating to EHRs focuses narrowly on privacy without

compelling data exchange.<sup>14,28</sup> Furthermore, interview data highlighted the importance of incentives and capacity-building programs, including targeted incentives to partially cover the cost of interoperable EHRs. Technical infrastructure, namely strong health data repositories, was also identified as a key enabler.

Jurisdictions have pursued different paths to achieving interoperability. Some, like Alberta and Prince Edward Island, (and soon, Nova Scotia, Newfoundland and Labrador, and Quebec) have opted for unified platforms that create a single EHR for hospital care provincially. Others have chosen to emphasize robust integration standards and shared infrastructure to connect a diverse set of systems, as has been done in Denmark and Taiwan, where interoperability has been achieved through health information exchanges.<sup>29,30</sup> Although jurisdiction-specific approaches to interoperability are necessary, the absence of a pan-Canadian harmonization mechanism risks further entrenching 13 distinct jurisdictional data silos, undermining the portability of care envisioned in the *Canada Health Act*, and the ability to bring together measures that use EHR data at a national level for comparing health system performance.

In 2016, the United States passed national legislation, the *21st Century Cures Act*,<sup>31</sup> to combat information blocking and

**Table 4: Key barriers to interoperability across Canadian jurisdictions**

Barrier	Illustrative quote
<b>Barriers relevant to achieving greater interoperability</b>	
Weak governance structures	“Decision-making for EMRs is frequently fragmented, involving a combination of health authorities, government, and other entities.” — participant 5 (health authority or hospital) “So whether it’s a carrot or a stick, there’s no plan, there’s no strategy. There’s no enforcement of anything.” — participant 2 (clinical leadership)
Absent legislation and standards	“Because we can’t connect them. There’s no way. There’s no legislation for standards to require them to hit a certain bar. There’s no obligation. Docs get fed up. They create their own EMR. It’s not connected.” — participant 2 (clinical leadership) “Right now, you can take free notes, any way you want as a clinician, like there’s, there’s essentially zero requirements for it to adhere to any particular standard, you know, whereas in some jurisdictions, they might say ... you have to capture discrete data, according to this nomenclature in your primary care system. We don’t do that.” — participant 11 (government or ministry)
Misaligned incentives and lack of funding	“There is no financial incentive for physicians to actively share their clinical information or adopt interoperable practices.” — participant 2 (clinical leadership) “If no one is really pushing you, you’ll just do the bare minimum of what has to happen. And so, I think ultimately no one is pushing the hospitals or the family doctors to do a better job clinically for their patients, and therefore they’re not investing their money to make that happen.” — participant 10 (health authority or hospital)
Technical challenges	“Funding at the provincial level is a significant barrier to implementing data repositories and patient portals.” — participant 12 (government or ministry) “If you actually look at the data management practices of any given primary care provider ... they could be wildly different from the other primary care providers and ... communities and so on, to the point where you know, like, how free text notes are used, how different discrete data domains are used... it makes it very difficult to then reliably take data out of the EMR and use it for anything else.” — participant 11 (government or ministry)
<b>Other barriers</b>	
Low physician literacy and resistance to change	“Physicians may desire autonomy and control over their data and notes, and fear too much information.” — participant 8 (government or ministry) “[As we go forward on a unified EMR], we know that we’re going to have resistance and it’s physician-based, because they want to work with the solution that they want.” — participant 6 (health authority or hospital) “And they didn’t really think about, you know, the ... late-career physician practising on paper that probably doesn’t have any computer skills and can’t type ... with more than 2 fingers and how are they going to actually implement it, you know, an electronic health system within their practice, right?” — participant 9 (clinical leadership)
Privacy and cybersecurity risks	“If everyone gets access to the community EMR, they are definitely going to see charts of people they know.” — participant 14 (health authority or hospital) “But if you’re sharing data between systems, that’s a pretty scary proposition ... to publish that data to someone else that might change something.” — participant 19 (government or ministry)
Limited vendor innovation and data blocking	“We often find it difficult to influence the product roadmaps of EMR vendors because their customers are individual physicians, not us.” — participant 18 (clinical leadership) “The biggest barrier is the technical capability of the EMR vendor ... the vendor hasn’t been able to put together a workable data extraction solution for us.” — participant 8 (government or ministry)
Inconsistent data and workflow standards	“Standard workflows are not defined and set, so the data is not at all standardized on the back end despite the front end being unified.” — participant 1 (health authority or hospital) “I think some of the barriers currently are standardization and the learning curve of it all.” — participant 13 (clinical leadership)
Note: EMR = electronic medical record.	

mandate national interoperability standards, enforceable on both EHR vendors and care providers. Similarly, Canada’s Bill C-72 was meant to establish baseline data-sharing requirements, strengthen vendor accountability, and support provinces to achieve interoperability, but was lost during the government turnover in 2025. Reintroducing similar unifying federal legislation, paired with jurisdiction-specific follow-through, are essential building blocks to achieving meaningful pan-Canadian health data interoperability.

We did not focus on the use of emerging technologies like artificial intelligence (e.g., clinical documentation tools, clinical

decision support), but these applications increasingly depend on high-quality, connected clinical data.<sup>32</sup> At the system level, the need for advanced analytics (e.g., performance monitoring, proactive planning) has been well established, but remains constrained by weak data infrastructure. Strengthening interoperability will be foundational to realizing the potential of a data-driven and learning health care system.

### Limitations

Assessments were based on public sources, which may reflect incomplete or inconsistent reporting across jurisdictions,

although we supplemented our information with interviews. Maturity ratings involved subjective judgment and may have differed across evaluators, although we confirmed our ratings with jurisdictional participants. Our focus was on provincial or territorial infrastructure, not individual clinical workflows, use of clinical decision tools, or sector-specific challenges like long-term care. Given the nuances of federally managed health programs, involving funding rather than providing care, we also did not include federal health programs or federal health planning strategies that might affect EHR interoperability. This analysis reflected a single point in time (mid-2025), and some information presented may have changed or strategies may have shifted by the time of publication. There are important nuances to how health data for Indigenous people are collected and stored,<sup>33</sup> and the inherent right of Indigenous communities to data sovereignty, but these aspects were not the focus of our study. These are important areas for future research.

## Conclusion

We identified substantial gaps in EHR interoperability in Canadian jurisdictions, noting clear connections between interoperability enablers and status. As an important initial step, national legislation, the *Connected Care for Canadians Act* — recently reintroduced in the Senate on Feb. 4, 2026 — must be passed to prohibit vendors from data blocking and mandate interoperable data standards. Clarity of governance over health data within and across jurisdictions is required, with policy based on evidence weighing both privacy risks and the harms of siloed health data. Without the right incentives and necessary infrastructure, Canada risks building the next generation of disconnected systems, thereby undermining the potential for emerging technologies, obstructing clinical innovation and system-wide planning, and ultimately, driving unwarranted cost and harm to people in Canada.

## References

1. Rozenblum R, Jang Y, Zimlichman E, et al. A qualitative study of Canada's experience with the implementation of electronic health information technology. *CMAJ* 2011;183:E281-8.
2. 2024 National Survey of Canadian Physicians: physician practice in digital environment. Toronto: Canada Health Infoway; 2024. Available: <https://insights.infoway-inforoute.ca/2024-cma-physician-practice-in-digital-environment/> (accessed 2024 Oct. 10).
3. Zelmer J, Hagens S. Advancing primary care use of electronic medical records in Canada. *Health Reform Observer* 2014;2:2.
4. *Paths to better health: final report — Advisory Council on Health Infrastructure*. Ottawa: Health Canada; 1999.
5. *EHRs Blueprint: an interoperable HER framework — Version 2*. Toronto: Canada Health Infoway; 2006.
6. Chang F, Gupta N. Progress in electronic medical record adoption in Canada. *Can Fam Physician* 2015;61:1076-84.
7. Affleck E, Murphy T, Williamson T, et al. *Interoperability saves lives*. Alberta Virtual Care; 2023:1-67.
8. Li E, Clarke J, Ashrafian H, et al. The impact of electronic health record interoperability on safety and quality of care in high-income countries: systematic review. *J Med Internet Res* 2022;24:e38144.
9. *Shared Pan-Canadian interoperability roadmap*. Toronto: Canada Health Infoway; 2023.
10. *Budget 2023: a made-in-Canada plan — strong middle class affordable economy healthy future*. Ottawa: Government of Canada; 2023.
11. *Digital Health Interoperability Task Force report*. Toronto: Canada Health Infoway; 2024.
12. The Government of Canada introduces the *Connected Care for Canadians Act* [news release]. Ottawa: Health Canada; 2024 June 6. Available: <https://www.canada.ca/en/health-canada/news/2024/06/the-government-of-canada-introduces-the-connected-care-for-canadians-act-improving-patients-safety-and-access-to-their-health-information.html> (accessed 2025 July 31).
13. The Government of Canada introduces legislation to build a more connected health care system [news release]. Ottawa: Health Canada; 2026 Feb 4. Available: <https://www.canada.ca/en/health-canada/news/2026/02/the-government-of-canada-introduces-legislation-to-build-a-more-connected-health-care-system.html> (accessed 2026 Apr 8).
14. Affleck E, Tam S, Bucci S, et al. *Data disarray: a root cause analysis of health data dysfunction in Canada*. Alberta Virtual Care Coordinating Body; 2024.
15. About Canada's health care system. Ottawa: Health Canada; modified 2025 June 26. Available: <https://www.canada.ca/en/health-canada/services/canada-health-care-system.html> (accessed 2026 Jan. 27).
16. Manns BJ, Hastings S, Marchildon G, et al. Health system structure and its influence on outcomes: the Canadian experience. *Health Manage Forum* 2024;37:340-50.
17. Doctor E, Eymann T, Fürstenau D, et al. A maturity model for assessing the digitalization of public health agencies. *Bus Inf Syst Eng* 2023;65:539-54.
18. Woods L, Eden R, Duncan R, et al. Which one? A suggested approach for evaluating digital health maturity models. *Front Digit Health* 2022;4:1045685.
19. Becker J, Knackstedt R, Pöppelbuß J. Developing maturity models for IT management. *Bus Inf Syst Eng* 2009;1:213-22.
20. de Bruin T, Freeze R, Kulkarni U, et al. Understanding the main phases of developing a maturity assessment model. *ACIS 2005 Proceedings*; 2005 Nov. 29–Dec. 2. 16th Australasian Conference on Information Systems. Atlanta: Association for Information Systems.
21. Liaw S-T, Godinho MA. Digital health and capability maturity models—a critical thematic review and conceptual synthesis of the literature. *J Am Med Inform Assoc* 2023;30:393-406.
22. *Health Information Systems Interoperability Maturity Toolkit*. Chapel Hill (NC): MEASURE Evaluation Carolina Population Center; 2019.
23. 2024 Canadian Digital Health Survey: access to electronic PHI. Toronto: Canada Health Infoway. Available: <https://insights.infoway-inforoute.ca/2024-access-to-electronic-phi/> (accessed 2025 July 31).
24. Mullie T, Chuck A, Razak F. A health economic analysis of the potential in transforming Canada's health data systems. *Healthc Q* 2025;28:37-45.
25. Gheorghiu B, Hagens S. Measuring interoperable EHR adoption and maturity: a Canadian example. *BMC Med Inform Decis Mak* 2016;16:8.
26. Affleck E. Interoperability of electronic medical records requires more than just technical understanding. *CMAJ* 2019;191:E541.
27. *Personal health systems in OECD countries: insights into structures and solutions for public access and use*. OECD Health Working Papers no 187. Paris (FR): Organisation for Economic Co-operation and Development (OECD); 2025.
28. *Canada Health Act*, R.S.C., 1985, c. C-6. Ottawa: Department of Justice; modified 2026 Jan. 27. Available: <https://laws-lois.justice.gc.ca/eng/acts/c-6/page-1.html> (accessed 2026 Jan. 27).
29. Bernstein K, Bruun-Rasmussen M, Vingtoft S, et al. Modelling and implementing electronic health records in Denmark. *Int J Med Inform* 2005;74:213-20.
30. Wen H-C, Chang W-P, Hsu M-H, et al. An assessment of the interoperability of electronic health record exchanges among hospitals and clinics in Taiwan. *JMIR Med Inform* 2019;7:e12630.
31. *21st Century Cures Act*. Silver Spring (MD): Food and Drug Administration; 2020. Available: <https://www.fda.gov/regulatory-information/selected-amendments-fdc-act/21st-century-cures-act> (accessed 2025 Aug. 12).
32. Mandl KD, Gottlieb D, Mandel JC. Integration of AI in healthcare requires an interoperable digital data ecosystem. *Nat Med* 2024;30:631-4.
33. CARE principles for Indigenous data governance. The Global Indigenous Data Alliance; 2019.

**Competing interests:** Sunand Kannappan was a member of the Digital Health Interoperability Task Force, a partnership between the Canadian Medical Association and Canada Health Infoway, which completed its mandate and released its final report in November 2024. No other competing interests were declared.

This article has been peer reviewed.

**Affiliations:** Department of Medicine (Kannappan, Hastings, Manns), Cumming School of Medicine, University of Calgary, Calgary, Alta.; McGill University Health Centre (Forster); Department of Medicine (Forster), McGill University, Montréal, Que.; Alberta Health Services (Dean), Calgary, Alta.; Canadian Institute for Health Information (Hollett), Toronto, Ont.; Telfer School of Management (Hagens), University of Ottawa, Ottawa, Ont.; Hagens Consulting (Hagens), Toronto, Ont.; Canada Health Infoway (Gheorghiu), Toronto, Ont.; Networked Health (Affleck, Snyman); College of Physicians and Surgeons of Alberta (Affleck), Edmonton, Alta.; Canadian Medical Association (Adams), Ottawa, Ont.; Department of Community Health Sciences (Williamson, Manns), and O'Brien Institute of Public Health

(Williamson, Manns), and Libin Cardiovascular Institute (Williamson, Manns), and Alberta Children's Hospital Research Institute (Williamson), and Centre for Health Informatics (Williamson), Cumming School of Medicine, University of Calgary, Calgary, Alta.

**Contributors:** Sunand Kannappan and Braden Manns contributed to the conception of the work. Sunand Kannappan, Alan Forster, Stafford Dean, Grant Hollett, and Simon Hagens contributed to the design of the work. Stephanie Hastings contributed to data acquisition. Sunand Kannappan and Stephanie Hastings contributed to data analysis. All of the authors contributed to data interpretation. Sunand Kannappan, Stephanie Hastings, and Braden Manns drafted the manuscript. All of the authors revised it critically for important intellectual content, gave final approval of the version to be published, and agreed to be accountable for all aspects of the work.

**Content licence:** This is an Open Access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY-NC-ND 4.0) licence, which permits use, distribution and reproduction in any medium, provided

that the original publication is properly cited, the use is noncommercial (i.e., research or educational use), and no modifications or adaptations are made. See: <https://creativecommons.org/licenses/by-nc-nd/4.0/>

**Funding:** This work was supported by a Canadian Institutes of Health Research Foundation Award. The funder had no role in designing the study; collecting, analyzing, or interpreting data; or writing or submitting the manuscript.

**Data sharing:** Data will not be shared to protect the confidentiality of our participants.

**Disclaimer:** Owen Adams is an employee of the Canadian Medical Association, the owner of *CMAJ*. He was not involved in the editorial decision-making process for this article. The analyses, conclusions, opinions, and statements expressed herein do not necessarily reflect the views of the Canadian Medical Association and are solely those of the authors.

**Accepted:** Feb. 4, 2026

**Correspondence to:** Braden Manns, [bjmanns@ucalgary.ca](mailto:bjmanns@ucalgary.ca)