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ORIGINAL RESEARCH ARTICLE

Regulating in a Digital Age:

Insights from a
Mixed-methods Study



Abstract

Background: The rapid evolution of technology is reshaping professional practice and service delivery, creating challenges and opportunities for professional regulation.

Objective: This study examined the impact of technological change on regulatory activities, policies, and practices across Canadian regulators, as well as the challenges and concerns expressed by individuals actively involved in regulation.

Methods: We conducted a mixed-methods study including a pan-Canadian survey with 119 respondents and interviews with 12 participants. An advisory committee of regulatory experts provided guidance throughout the study.

Results: Technology is impacting most spheres of regulatory activities and regulators are implementing many changes to address the risks associated with technology in professional practice. Despite challenges, participants expressed optimism about technology's potential to enhance regulatory practices, including through artificial intelligence. While most regulators were proactively implementing changes to address technological risks, the adoption and use of new technologies varied across different regulatory bodies.

Conclusion: Collaborative efforts among regulators are important for developing evidence-based frameworks that balance technological innovation with risk management while retaining the essential human aspects of professional regulation. Medical profession regulators are well-positioned to lead these types of collaborative efforts across different jurisdictions.

Introduction

The digital age has generated new challenges for medical regulatory bodies as they incorporate technology to improve regulatory processes, and endeavor to ensure physicians and surgeons are practicing safely and competently amidst technological changes. In this article, we report findings from our mixed-methods research that aimed to enhance understanding of the impact of technology on professional regulation. We conducted a survey of professional regulators in Canada, followed by interviews with regulatory leaders. Our findings underscore how technological changes are altering regulatory practices and creating new challenges for regulators. We found that technological changes are impacting most spheres of regulators' activities and regulators are implementing many changes to address the risks associated with technology in professional practice. We highlight the implications of our findings for medical practice and regulation.

Background

A variety of technological changes are impacting medical practice, and the work of other health professionals.¹⁻⁴ In medicine, for example, artificial intelligence (AI) tools have been adopted in medical diagnostics with great promise, although studies are divided on whether they actually improve diagnostic speed and accuracy.^{5,6} There is a general agreement that regulation is needed to ensure the safe and ethical use of technology in medical

practice, especially in the realm of AI. However, such guidance is still under development in many sectors, and there is uncertainty about how best to guide decision-making in this area. The rapid evolution of technology in professional practice has created a regulatory lag where guidance, standards, and policies have not kept pace with changes in practice.^{7,8} At the same time, regulators are grappling with how best to incorporate technology into their own internal practices to improve efficiency and effectiveness, including in areas like data analytics and AI.^{9,10} These two intersecting areas—regulating technology use by practitioners and using technology in regulatory processes—are creating new challenges for medical and other health profession regulators.

Technology in Medical Practice

The impacts of technology on medical practice include the need for new technological skills and competencies, increased time spent on electronic record-keeping, more technology-mediated interactions with patients, and increased demands for digital literacy.^{1,11-14} While advocates are hopeful that technology will bring efficiency gains to help address systemic challenges with access and costs of services,^{6,15,16} research on the implications of technology has shown mixed findings. Some studies suggest technology can increase practice efficacy and improve health outcomes,^{3,6} yet researchers have raised concerns about work intensification, altered

work practices, bias, and risks of errors and safety issues.^{13,15,17}

Technology-mediated changes that have received scholarly attention include virtual practice, especially after its rapid expansion during the COVID-19 pandemic.^{9,18} There has also been some attention on how social media impacts professional workers and their relationships with the public.^{2,18} Moreover, there is currently an explosion of research on the impacts of AI, although this is a shifting area with many unresolved questions. Within health care, some research points to AI supporting more informed practitioner decision-making, improved interdisciplinary collaboration, enhanced safety, and more opportunities for client-practitioner interactions.^{3,4,6,19} Researchers have also raised concerns about the potential for AI to undermine patient-centered care and patient trust in medical practitioners^{8,21} and liability for AI-induced clinical errors.^{22,23}

Technology and Professional Regulation

The Professional Standards Authority for Health and Social Care (PSA) in the UK has argued that there is a lack of understanding about regulators' responsibilities when it comes to their internal use of AI or their regulation of practitioners' use of AI.²³ While several scholars and organizations have called for regulatory activity in this area,^{7,8} assessing the risks and ensuring that regulatory initiatives have the 'right touch' has been difficult. Regulators do not want to be heavy-handed in restricting practitioners' use of technology given its promises, and yet too little regulation could lead to public harm.²⁴ Some call for flexibility in regulation, arguing that regulation

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of AI use in medical practice "is best envisioned as an ongoing project" that will require changes with scientific developments and shifting political contexts.²⁰ Identified changes with regulating AI in medical practice include the rapid pace of technological change, the fact that health professions and regulators have little influence over AI development, and that it is difficult to understand implications of its use or how AI arrives at the solutions it provides.⁸ The challenges to regulating technology of AI are numerous and include risks related to bias, privacy,

liability, intellectual property, access to data and more.²⁵ Professional regulators must grapple with these challenges, while endeavoring to balance technological innovation with maintaining a 'human touch' in their interactions with professionals and members of the public when possible.²⁶

Overall, the literature underscores the need for regulation in this area and the current lack of frameworks and guidance for enhancing professional regulation.^{7,8} Because the impacts of technology appear variable, and at times unclear, it is difficult for regulators to know how to respond and ensure they fulfill their duty to regulate professions in the public interest. Previous regulatory research began to explore these topics, including a knowledge synthesis of existing literature on regulating virtual practice,²⁷ a review of regulatory guidance around virtual care,²⁸ and a case study on the impact of technology on regulation in three professions in a single Canadian province.²⁶ This foundational work underscored the need for more research, on a broader scale, to truly understand the impact of technological change on professional regulation and identify leading practices for regulators in this evolving area.

Methods

To address this research gap, we conducted a pan-Canadian survey of professional regulators, followed by in-depth semi-structured interviews with 12 regulatory leaders. Our goal was to explore the ways in which technology was impacting regulatory practices, and learn more about the attitudes, concerns, and practices of people active in the field of professional regulation (as regulator leaders, staff members, and members of regulatory boards).

In Canada, professional regulation occurs primarily at the provincial level, although a few professions are regulated at the national level. Many regulatory bodies—especially in the health profession sector—are called colleges. Anybody working at, with, or for a professional regulatory body was eligible to participate; however, our recruitment strategy targeted people in leadership roles. This included regulators in the health profession sector and outside of health (including, law, engineering, accounting, and other fields).

Data collection

Surveys

We developed our initial survey questions based on our previous research in the field, including a scoping review

and case study, as well as a review of the literature in this area. We also created an 18-member Advisory Committee of leaders in regulation who provided us with insight into their own questions and concerns in this area. We revised the survey iteratively based on committee members' feedback. Once finalized, the survey was translated into French, and both English and French versions were uploaded into Qualtrics.

Survey questions asked about recent changes in policies, standards, and guidance in response to technological changes; use of AI and data analytics, the impact of technology on entry-to-practice, fitness-to-practice, disciplinary policies and procedures; and other topics including virtual practice and social media activity by professionals. A range of attitudinal questions were also posed. Moreover, we asked for basic demographic information on respondents and the regulatory bodies they were affiliated with, including how long respondents had worked in regulation, their current role, how many registrants their body regulated, and their jurisdiction.

The study was funded by a grant from the Canadian Network of Agencies for Regulation (CNAR), and recruitment was done primarily through posts made on CNAR's discussion board. We also asked our Advisory Committee members to distribute the survey to their networks and approached some provincial networks of health regulators to circulate information about our study. The survey was open between January and March 2024.

Interviews

At the end of the survey, respondents could indicate their interest in participating in a follow-up interview by providing their contact details. These details were collected separately and disconnected from survey responses. We developed a semi-structured interview guide based on our preliminary analysis of the survey data and identification of topics we wanted to explore more deeply through qualitative data analysis. Interviews were conducted in March and April 2024, with both researchers attending all interviews. At the beginning of each interview, one researcher reiterated the study's purpose and objectives and asked for informed consent to participate and record. Interviews were conducted by videoconference software (Zoom) and lasted approximately 60 minutes. Each interview was audio-recorded and transcribed verbatim.

Sample characteristics

Table 1 provides an overview of basic survey participant characteristics. Almost one-half of survey respondents were associated with regulatory bodies that had

between 1,000 and 5,000 registrants. Another one-third of respondents were associated with bodies whose registrants numbered between 5,001 and 25,000. About one-half of survey respondents were based in Ontario and British Columbia (Canada's first and third most-populous provinces), with strong representation from Alberta and Nova Scotia. Nine survey takers were based in Quebec (Canada's second most-populous province)

TABLE 1: Survey respondents' regulatory body characteristics

Regulatory body characteristics	%	n
NUMBER OF REGISTRANTS GOVERNED		
<1,000	14	16
1,000-5,000	48	55
5,001-10,000	15	17
10,000-25,000	17	19
25,000 +	6	7
SECTOR OR FIELD		
Health, social care, and related	87	103
Other	13	16
JURISDICTION		
British Columbia	29	34
Ontario	21	25
Alberta	14	17
Nova Scotia	10	12
Saskatchewan / Manitoba	11	13
Quebec	8	9
Other provinces, territories, national	7	8
RESPONDENTS' ROLE IN REGULATION		
Regulatory leadership	35	41
Other regulatory body staff	41	48
Practitioner member of governing council/board	8	9
Public member of governing council/board	8	9
Other	9	11
WORK LOCATION		
In person	7	8
Remote	14	16
Hybrid	78	91
Other	1	1

The vast majority of respondents were engaged in the regulation of health professions. The rest of the respondents (grouped into an 'other' category for the analysis) were involved in the regulation of a diverse

array of professions including law, engineering, accounting, veterinary medicine and so on.

Our 12 interview participants worked for regulators based in six different provinces as well as nationally, with participants from coast to coast. Seven interview participants worked for health regulators while five worked for regulatory bodies in other sectors.

Data Analysis

Given the relatively small sample, and our research objective of gaining a deeper understanding of regulators' practices, policies, and opinions, we analyzed the quantitative data descriptively through frequency counts and specific bivariate analyses to compare findings across sectors and number of registrants. To augment these quantitative data, interview transcripts were deductively coded using our interview guide and survey topics as a framework. Illustrative quotes were selected to provide context and depth to survey data, and to help highlight areas of tension, new developments, and leading practices. Findings were validated and refined with our Advisory Committee.

Ethical Considerations

This research was approved by the Non-Medical Research Ethics Board (File #124217) of the University of Western Ontario. Informed consent was obtained from all survey and interview participants. The surveys were anonymous, and any identifying information provided in answers to open-ended questions was not reported or analyzed. The interviews were confidential and participants' identity, position title, and regulatory body are not reported. Quotes in the findings are attributed to a participant number.

Findings

In both the survey and interviews, study participants indicated that technological changes were impacting their practices and policies in myriad ways. Changes were felt in most areas of activity, including entry-to-practice, registration, continuing competence, data analytics, investigations, discipline, and registrant support. We first outline our findings about how regulators were changing policies and practices in response to technology, including significant differences across sectors and jurisdictions. We then review findings in three specific areas where most regulatory challenges and change were concentrated: virtual practice, AI, and social media.

In general, participants agreed that regulatory bodies were embracing technology to better meet their objectives and improve regulatory practices. For many, technology offers opportunities to improve existing practices. One participant went so far as to suggest that embracing technology was essential for good regulation: "If you're not using technology, you're doing something fundamentally wrong as a regulator" (Participant 2). Even this participant, however, ultimately viewed technologies as tools used by thoughtful regulators to improve practices:

Increasingly, we should be relying more on technology for things that previously either weren't being done or [that were] being done inefficiently. And we don't need to jump to each and every offering. It's the regulator who needs to identify the problems it's seeking to solve. And then using people, process, and technology—and I've always put it in that order—to figure out how to solve that problem. (Participant 2)

Here, technology does not take over the duties of regulatory body staff but rather supports them in their work. The approach recommended is a reflective one, that encourages regulators to assess when and whether technology can provide assistance in policy-making. Given the pace of technological change—especially with respect to generative AI—regulators may be uncertain about when and how to mobilize such technologies.

When technological changes alter professional practice, regulators may adapt by implementing new practice standards, practice guidance, or other related policies. Table 2 shows that over half of the survey respondents had revised standards of practice since 2020 in response to technological changes, while another quarter were planning or currently implementing such changes. In other findings, 86% anticipated that technological change would necessitate further changes to standards in the years to come (not shown here). A smaller percentage (28%) had revised ethical codes in response to technological change, but an additional 22% were considering making changes or in the process of implementing such changes. Although differences across provinces were not statistically significant, respondents from Western Canadian provinces were more likely to report making changes to standards due to technological change. Quebec regulator respondents were more likely to report they had implemented policy changes respecting ethics both as a result of technological change, and more generally, in response to legislative initiatives.

TABLE 2: Altered standards of practice and ethical guidance since 2020

Has your regulatory body altered standards of practice since 2020 to respond to changes in practice due to technology?		
	%	n
Yes	55.3	57
No	22.3	23
In process/Under consideration	22.3	23
Total	100	103
Has your regulatory body revised or amended guidance or codes of promoting ethical practice since 2020 in response to changes in practice due to technology?		
	%	n
Yes	28.0	23
No	31.7	26
In process/Under consideration	22.0	18
Codes updated but revisions were not related to technology	18.3	15
Total	100	82

It is clear, then, that for our survey respondents, technological changes have prompted policy changes for most in the last few years, with more change anticipated in the near future. We also asked survey respondents if keeping up with the pace of change was difficult, but less than one-third (31%) agreed this was the case. Still, in both the survey and the interviews, it was clear that some participants found it challenging to adapt policies in response to technological changes in a context of competing priorities. One interview participant explained:

It's always changing. Nothing stays the same when it comes to policy development and the development of new as well as revising current practice standards. So there's always something new that pops up...We definitely acknowledge that the college [regulatory body] needs to hone in on that, but just like every other aspect of our lives, people are incredibly overworked. You need to prioritize where you're going to focus your energies. (Participant 4)

Many regulators had other competing priorities that required sustained focus and resources. For example, at the time of our study, many health profession regulators in British Columbia were preparing for amalgamation and the implementation of the new *Health Professions and Occupations Act (2022)*.

Follow-up analyses revealed that regulators with fewer than 5,000 registrants were less likely than regulators with 5,001 to 10,000 registrants to have altered standards in response to technology. Regulators with more than 10,000 registrants were the least likely to have made such changes in the last few years (Table 3).

TABLE 3: Has your regulatory body altered standards of practice since 2020 to respond to changes in practice due to technology?

	<5,000	5,001-10,000	10,000+
Yes	54.8 (34)	70.6 (12)	38.1 (8)
No	19.4 (12)	11.8 (2)	42.9 (9)
In process/Under consideration	25.8 (16)	17.6 (3)	19.0 (4)
n	62	17	21

$p < .01$

In the survey, we also sought to enhance understanding of how regulators use technology in their work. As one example, we asked whether disciplinary or fitness-to-practice (capacity) hearings were usually held virtually or in person: 39% of participants said virtually and 24% held hearings in person. The rest indicated they might use one or the other depending on circumstances. We also asked if participants' regulatory bodies collected data for the purpose of using data analytics to assess performance and inform planning: 70% said they did, and an additional 10% said they were currently implementing data analytics. Almost all participants indicated they used an online registrant portal for annual renewal and/or other communication (99%).

These findings suggest that regulators are using technology in many spheres of activity, but there is still considerable opportunity for further digitalization. One interview participant discussed their regulatory body's "position statement on embracing innovation and the digital age" which also identified several principles guiding decision making. This regulator appeared to be unusual. Few regulators had developed an over-arching or systematic approach to regulating technology. Such an approach could be helpful in informing and guiding future regulatory activity in this area.

In the following sections, we take a closer look at three specific areas where regulatory activity has been concentrated in Canada over the last few years: virtual practice, social media, and AI.

Virtual Practice

Virtual practice by professionals increased dramatically during the early months of the COVID-19 pandemic, raising many concerns for regulators – especially those in the health field. The expansion of virtual practice was associated with additional challenges, including (illegal) practice beyond jurisdictional borders, privacy and confidentiality violations, and inadequate care and follow-up, to name a few. The expansion of virtual practice in many (but not all) fields has prompted changes in regulatory policies, standards, and guidance.

We asked several survey questions related to virtual practice (Table 4). Most respondents (94%) said their registrants practiced virtually at least sometimes. The vast majority had resources or standards to guide registrants in virtual practice. Indeed, most respondents had recently updated policies/guidance respecting virtual practice: this was particularly the case among health regulators, where 73% had recently updated virtual practice policies, compared to only 27% in other sectors.

TABLE 4: Virtual practice

Do your registrants engage in virtual practice?		
	%	n
Yes	53	45
Sometimes	41	35
No	6	5
Total	100	85
Do you have standards or resources to guide registrants engaged in virtual practice?		
	%	n
Yes	80	60
No	20	15
Total	100	75

These standards and resources aim to ensure that registrants practiced virtually in a responsible manner. For example:

Registered members have to consider the feasibility of providing the services based on their own competence and providing services in a

virtual environment, as well as the access, the stability and features, and the unique needs, environment, and technical abilities of the client. (Participant 11)

Survey questions also asked participants about the implications of virtual practice, including unlicensed practice, and practice from practitioners located outside their jurisdiction (especially elsewhere in Canada). There are differences across provinces and professions respecting whether someone needs to be registered in a province to practice; however, the majority indicated that registration in their province was mandatory to practice there (72%). Whether due to out-of-jurisdiction practice, or other factors, most respondents also agreed that unlicensed practice had increased because of technological changes (Table 5).

TABLE 5: Interjurisdictional practice

Do you believe that unlicensed practice has increased in the profession as a result of technological change and/or virtual practice?		
	%	n
Yes	56.1	23
No	43.9	18
Total	100	41

The expansion of virtual practice spurred collaboration among regulators to manage cross-border practice more effectively. One of our interview participants explained:

We have a really good relationship with our other jurisdictions across the country... What [we have] done is ...create sort of a national statement about ...practicing by telemedicine.... if they're going to be practicing virtually, to provide care to someone in another province, they would have to be licensed in that province. (Participant 6)

Collaboration not only encouraged common policies and understanding within professions across jurisdictional borders but could help to curtail illegal practice and improve public protection.

Social Media

Media headlines have drawn attention to high-profile cases over the last few years wherein professionals have used social media platforms, and their professional credentials, to promote misinformation, bias, or controversial opinions. In Canada, these have sometimes resulted in regulatory sanctions for unethical and

unprofessional behavior. We asked survey respondents if they had revised guidance or standards respecting practitioners' social media use over the last few years. Results are reported in Table 6. Over one-half of participants had implemented changes with an additional 21% either in the midst of making changes or considering making changes. Health profession regulators were slightly more likely than those in other sectors to have established policies respecting social media use.

TABLE 6: Has your regulatory body revised guidance or standards respecting practitioners' social media use?

	%	n
Yes	53.5	46
No	25.6	22
In process/Under consideration	20.9	18
Total	100	86

In interviews, some participants explained that while they did not have explicit guidance or standards respecting professionals' social media use, they had communicated expectations and advice through other means (eg, newsletters, communiqués). Overall, regulators were most concerned about practitioners not sufficiently separating their professional identity from their personal opinions:

But social media is always an issue, in terms of access to private information and drawing that line between your professional identity and your personal identity. (Participant 3)

The things we've seen are people just not being smart about separating their personal social media profiles from their professional social media profiles. And not even being smart, like some of them don't even get why there would be a separation. (Participant 5).

Whether the communications and guidance go far enough, however, is unclear. Practitioners (and regulators) use social media for a variety of purposes: advertising, information sharing, and connecting with clients and colleagues. Advice to separate personal statements from professional identity leaves considerable room for uncertainty.

In interviews, some regulators indicated that their social media guidance was more extensive:

We do have a guidance document on the use of social media...It's really about maintaining professionalism, maintaining confidentiality of clients and patients... and advertising. (Participant 6)

These broader statements may be more useful for practitioners, as policies that address only advertising or the sharing of opinions may lead to uncertainty and foster misuse.

Artificial Intelligence

There is an emerging literature on the impact of AI on professional practice, ethical implications associated with AI use, and professional disciplinary cases due to the misuse of AI.^{6,16,29,30} The emergence of generative AI appears particularly impactful, as programs like ChatGPT could be used in many ways to assist regulators and professional practitioners alike. At the time we conducted our survey and interviews, most regulators were still somewhat unsure about the uses of AI, and precisely how to regulate professionals' usage; although policies were emerging.^{31,32} One interview participant described looking to other regulators' policies to help guide their own response:

We have no policies around AI at all yet. Or thoughts. Like it's not even on the list of something that we're tending to right now ... which might be a problem. I'm keeping my eye on what's going on and what other regulators are doing. (Participant 10)

The survey asked regulators a few general questions about AI and its impact on regulation. Respondents were invited to indicate whether they agreed or disagreed with specific statements. Notably, only 16% of respondents agreed or strongly agreed that the use of AI will make it easier for regulators to govern practice. We also asked whether AI would be of greater immediate use for larger regulators (those who regulated more registrants), but less than a third of participants agreed this would be the case (31%).

We asked what benefits respondents anticipated with the use of AI and related technologies by regulators: respondents indicated which aspects they agreed with and ranked their importance. The top three responses were consistent across both measures, with most respondents emphasizing the following benefits: greater efficiencies ($n=65$), freeing up resources to improve other processes ($n=59$), and redirecting limited resources ($n=56$). All of these elements are related,

emphasizing efficient use of resources. One of our interview participants elaborated on these benefits:

AI is ... a tool that can make your work life much more efficient and do things for you that really artificial means or technology or software could do for you, so that you can get more involved with what's important in your day-to-day work. (Participant 4)

When we asked survey respondents about the “potential negative consequences” of using AI, five concerns received considerable agreement: questions about reliability and accuracy ($n=63$), uncertainty about how to use AI ($n=58$), risk of privacy violations ($n=55$), concerns about discrimination or bias potential ($n=51$), and lack of human touch ($n=46$). These specific concerns were also mentioned in the interviews:

I don't fully understand in all honesty where AI is going, but anytime we have a new technology that we still don't fully understand, I think there should be concerns about privacy. (Participant 1)

I'm just so wary of, you know, this thing being maybe 80% of the time correct, and then 20% of the time it just throws something out there. (Participant 12)

I think the biggest risk really, for both registrants and regulators, is using it without understanding the risks and the potential for unintended consequences. (Participant 3)

I don't think anybody enjoys talking to AI over a person, and while we do move towards digital communications for everything, I think it's important to maintain some kind of personal relationship as well. (Participant 12)

Concerns related to human touch, uncertainty, risks, privacy, and reliability will likely linger for some time. Regulatory policy is only beginning to emerge in this area.

In follow-up analyses we explored whether concerns about AI varied by respondent role in regulation. While no statistically significant differences were identified, the data hint that members of the public involved in regulation may have more concerns than practitioners on regulatory councils, and in some cases, regulatory staff and leadership. This may be worthy of more investigation in future research.

Discussion

Our research examined the impact of technological change on regulatory activities, policies, and practices, identifying both opportunities and challenges for professional regulators. In general, participants expressed optimism about technological innovations and a proactive attitude toward adapting standards, guidance, and policies. However, the rapid pace of change, coupled with uncertainties surrounding technological implications and resource limitations, complicates the development of effective regulatory frameworks in this complex landscape where the potential benefits of technological advancements must be weighed against the risks they may introduce.

This is particularly true in medicine, where technological changes are significantly altering clinical practice, shifting tasks and requiring new skills for competent practice.^{4,8} Researchers have previously identified regulatory gaps and concerns respecting technological change,^{7,15,18,26} as well as ambivalence on the part of regulators concerning regulation in this area.^{10,26}

In our study, we found regulators were grappling with technological changes to professional practice in various ways, including updating standards and guidelines for registrants. While revising standards and creating guidelines should help practitioners understand their professional and ethical obligations—particularly in the fundamental areas of virtual practice, social media use, and AI—there will likely continue to be a regulatory lag as regulators react to new changes in professional practice. Our previous research found that most regulatory frameworks for physicians providing virtual care did not adequately address equity, access, and practitioner competence and did not sufficiently allow for flexible, nuanced, and risk-based virtual care provision.²⁸ We also found that some registrants thought social media guidance from regulators was out of touch with the complexity of the technologies and their use.³³ As others have noted, it may also be important to regulators to consider appropriate social media use for board and committee members as well as registrants.³⁴

One area of considerable discussion among our participants was the best way to regulate AI use in professional practice. In this area, recent guidelines on AI use from the Australian Health Practitioner Regulation Agency (Ahpra) may provide a valuable model for other regulators. These guidelines emphasize accountability for AI-driven decisions, the importance of human oversight, and ethical use.³⁵ In other countries, including Canada, some health regulatory bodies have created their own guidance surrounding AI usage, with many

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adopting similar principles.^{36,37} As Ooi⁸ has noted, however, it can be difficult to hold individuals responsible for AI output when it is impossible to know how it arrived at that output, or when technology makes decisions largely autonomously.²⁵ There is also emerging case law on AI and other technologies in professional practice that is shaping the landscape both in Canada and internationally^{29,38} and may impact future regulatory policies.

At the time of our study, regulators were also grappling with their own use of technology and concerned about risks that were not entirely clear. The use of AI and other technologies is expected to bring efficiencies to allow regulators to meet rising demands placed on them.¹⁰ At the same time, AI and other new technologies have been associated with ethical and legal risks.^{8,23} Participants in our study shared such concerns. They highlighted the promise of AI in achieving greater efficiency and consistency in regulatory processes but also emphasized risks related to privacy, bias, accountability, and maintaining trust in regulatory systems. Enhanced education and training for practitioners and regulatory staff are needed to ensure the safe, skillful, and ethical use of this technology.³⁵ Some interview participants identified as older and wondered if younger people might have a different perspective on these issues. This may be a topic to explore more in future research.

Our study participants emphasized that intentional, thoughtful, and effective regulatory collaboration is more crucial than ever. Technology crosses borders, necessitating collaboration across borders as well. This collaboration is important to address specific regulatory challenges, including the need to respond to the complex realities of cross-jurisdictional virtual practice and requests from government and other system partners for more harmonized workforce data. Efficient responses to these challenges will require improved regulatory coordination, data sharing capabilities, and standardized data platforms. This is particularly true in jurisdictions like Canada, where provincial legislation often complicates inter-jurisdictional practice in the absence of US-style licensure compacts, though pressure continues to escalate for regulators to reduce barriers to interjurisdictional mobility for physicians.³⁹ Recent collaborative efforts around data and information sharing in Canada, however, demonstrate that collaboration is possible even when regulatory frameworks differ. These efforts include Nursys Canada (involving four Canadian jurisdictions as of June 2025),⁴⁰ the Atlantic Physician Registry (launched in 2023 for the four Atlantic Canadian provinces, with an impact evaluation published in 2025⁴¹ by the Federation of Medical Regulatory Authorities of Canada [FMRAC]), and the National Registry of Physicians project by the Medical Council of Canada.⁴²

Looking ahead, regulatory bodies should work together on ways to accommodate and embrace technological innovations that are in the public interest. This approach could offer more efficient and evidence-based frameworks to balance technological progress—both in regulating professional practice and improving regulatory processes—with risk management and preserving the ‘human touch’ in certain regulatory activities. Because the medical profession is regulated across jurisdictions, medical regulators are well-positioned to lead this collaborative work to develop guidance and policy that can be applied across different jurisdictions, without undermining local traditions and regulatory frameworks.

Similar to the work done by FMRAC around virtual care and AI applications in medicine in 2022^{43,44} and by the International Association of Medical Regulatory Authorities on virtual health care in 2021,⁴⁵ national and international regulatory consortiums could provide medical regulators with model standards to enable more harmonized language and prevent duplication of regulatory efforts. Another example outside of medicine is the model guidance on technological competence provided by the Federation of Law Societies of Canada, requiring lawyers to be able to understand and use technology relevant to the lawyer’s practice, as well as understand the risks and benefits associated with relevant technology.⁴⁶ Many legal regulators across Canada have since adopted this duty of technological competence into their own standards of practice.⁴⁷ Similarly, in the US, 40 state legal regulators have adopted model language from the American Bar Association around technological competence.⁴⁸ Regulators should also consider establishing a strategy regarding technological change more generally to be able to provide timely guidance (for both regulators and practitioners) in responding to technological innovation.

Limitations

Our research has several limitations that should be noted. The survey covered many different topics, and some survey takers did not complete every question, resulting in a lower sample size for some questions than for others. The survey was open to anyone working at or with professional regulatory bodies, and hence more than one person affiliated with a specific regulator may have completed the survey. Importantly, as with most online surveys, it is difficult to determine how representative the sample is, and hence the findings are not generalizable to all professional regulators, and other regulators may have had unique perspectives and challenges that we were not able to capture. Further, while our research provides a snapshot of regulators’

perspectives in early 2024, technological developments have continued to evolve in the months since we completed our research and specific areas such as AI should be the subject of further study.

Conclusion

The rapid evolution of technology is reshaping professional practice and service delivery, prompting new discussions about how professional regulation needs to adapt in response. Our study investigated the impact of technological change on regulatory activities, policies, and practices in Canada. This mixed-methods research involved a pan-Canadian survey and follow-up interviews. The study was guided by an advisory committee of experts in professional regulation, providing valuable insights and shaping the research process. Our research highlights the complex landscape regulators face when adapting to rapid technological changes. We found that technological changes are impacting most spheres of regulators' activity. While most regulators are proactively implementing changes to address technological risks, the adoption and use of new technologies vary across different regulatory bodies. As a result, there may be few 'one-size-fits-all' policy solutions; however, medical regulators can focus on leading collaborative efforts in this space, including through education and training focused on responsible technology use (including AI) for both regulatory staff and registrants. As others have noted, the challenges of regulating technology transcend national (and subnational) borders, and regulatory solutions will have to do so as well.^{25,49,50} Collaboration can be challenging, especially on an international level, but it may be essential to create effective, evidence-based, and future-focused regulations that balance technological progress with risk management while preserving the essential human elements in regulatory activities.

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