

Spotlight on the Canadian Specialty Pharmaceutical Market



# Artificial Intelligence

## and Specialty Healthcare in Canada

**AI and the  
opportunities  
for specialty  
healthcare**

**4 projects that  
could predict  
AI's future  
in healthcare**

**Dr. Muhammad  
Mamdani on AI  
as a bridge  
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# The *Language* of AI

Not sure how to define AI? No problem: AI will be happy to define itself. According to ChatGPT, the AI darling of 2023, "AI, or Artificial Intelligence, refers to computer systems that simulate human intelligence by learning from data, recognizing patterns, and making decisions. It encompasses machine learning, where algorithms evolve with experience. AI aims to perform tasks that typically require human intelligence, fostering innovation across diverse fields."<sup>1</sup>

**Traditional AI** uses patterns to make predictions, while **generative AI** refers to AI that can create new content (such as text or images) using the data it was trained on.<sup>2</sup> The content created by generative AI looks and sounds the same as what humans produce, blurring the boundaries between nature and artifice.

Not surprisingly, a rich lexicon of terms has sprung up around AI. Here are some AI terms that are rocking the healthcare world<sup>2</sup>

## CHATBOT

Defined as a computer program that simulates human conversation, a chatbot often acts as a virtual assistant to answer user questions. But that's only the beginning. ChatGPT (Chat Generative Pre-Trained Transformer), a chatbot released by OpenAI in November 2022, has the ability to give detailed, natural responses to a wide range of prompts, leading to its explosive growth throughout 2023.

## MACHINE LEARNING (ML)

This subfield of AI teaches computers to perform new tasks without requiring explicit programming. Thanks to machine learning, chatbots can self-improve without constant human maintenance and identify additional tasks to automate on their own.

## DEEP LEARNING

This subset of ML harnesses multiple layers of networks to train algorithms using large data sets. Deep learning can understand unstructured data more effectively than traditional ML, often leading to higher-quality results.

## NATURAL LANGUAGE PROCESSING (NLP)

Based on a software program's ability to interpret written and spoken human language, NLP enables computers to understand what people are saying, including their tone and intent.

## PREDICTIVE ANALYTICS

Predictive analytics is the application of AI to collect and use data to predict future trends and events. An example of predictive analytics in business is Netflix's algorithm, which can recommend additional shows and movies to watch based on a person's viewing history.

## ALGORITHM

In the software world, "algorithm" means a set of rules followed by a computer while executing operations, enabling it to perform more sophisticated tasks without human intervention – for example, adapting responses to the user's previous behaviour patterns.

## BIG DATA

The term refers to data sets that are too large to process using traditional computing.

## DATA MINING

This means analyzing large databases to generate new information. Through data mining, powerful AI software can analyze big data to identify patterns and extract insights.

# AI By the *Numbers*

Wondering where it all started with AI?  
The figures below highlight the AI evolution,  
and its potential impact on healthcare.

## THEN AND NOW

### ALMOST 7 DECADES

The Dartmouth Workshop, a summer gathering of scholars in 1956, is widely regarded as the birthplace of AI.

It took more than 4 decades for Deep Blue, a chess-playing AI system designed by IBM, to defeat world champion Gary Kasparov in 1997. 2015 marks the foundation of Open AI, the group that released ChatGPT in 2022.<sup>3</sup>

### 50 YEARS

AI in medicine goes back about five decades. In a shining example of early use, in the 1970s AI helped doctors select the right antibiotics for hospitalized patients.<sup>4</sup>

### 30%

Of the world's total volume of data, approximate percentage that is generated by the healthcare industry.<sup>5</sup>

### 31%

Proportion of respondents to a Nature survey of postdoctoral researchers who regularly use chatbots as part of their work.<sup>6</sup>

### 10 MILLION

Number of queries received by ChatGPT every day.<sup>7</sup>

## AI IN CANADA

### \$125M

Public funding provided to the Pan-Canadian Artificial Intelligence Strategy, launched in 2017.<sup>8</sup> The initiative made Canada the first country to launch a national AI strategy.

### 312

Canadian AI projects that have received government funding over the past 5 years and for which data have been made public.<sup>9</sup>

### OVER 50

Innovations launched since 2017 by the Data Science and Advanced Analytics team at Unity Health, the first healthcare network in Canada with a dedicated applied AI team.<sup>10</sup>

## HEALTHCARE CHALLENGES THAT AI COULD HELP SOLVE

### 31%

Proportion of clinical trials that meet their patient enrolment goals.<sup>11</sup>

### 25-40%

Estimated proportion of patients who receive ineffective or potentially harmful treatments.

For example, about a third of patients diagnosed and managed for asthma don't actually have the condition.<sup>12</sup>

### 1.8 BILLION

Potential hours freed up every year by using AI in healthcare, equivalent to 500,000 additional full time health care professionals (HCPs).<sup>13</sup> These enormous savings would allow HCPs to dedicate considerably more time to high-value, patient-focused activities.

# AI and the Specialty Healthcare Opportunity

An abstract digital network graphic featuring a dense web of interconnected nodes and lines. The nodes are represented by small, colorful spheres in shades of blue, purple, pink, and white, set against a dark background. A prominent vertical beam of bright blue light descends from the top right corner, illuminating the network and creating a sense of depth and connectivity.

The sky's the limit for AI in Canadian specialty medicine, though we need to build it from the ground up

**All of a sudden, AI is everywhere.** It's on our desktops, in our apps, on our lips at cocktail parties. It lurks inside our social media feeds, ready to mine and modify our habits. Not surprisingly, AI is also infiltrating the healthcare world, promising to transform medical decision-making and data analysis from the inside out.

For all the buzz around the technology, it bears noting that AI in healthcare actually dates back to the 1970s, when it helped doctors make decisions about which antibiotics to use for individual patients in hospital<sup>3</sup> – an important consideration in the context of rising antibiotic resistance. Since that time, the use of AI in healthcare has done nothing but grow, with a rocket-fueled spurt in recent years.

Maxime Cohen, chief AI officer at the Montreal-based ELNA Medical Group, affirms that “there has been a huge explosion in AI activity recently.”<sup>14</sup> While the mainstream media has focused its attention on ChatGPT, Cohen maintains that Hippocratic AI, the healthcare AI application underpinning an ambitious US project involving ELNA as the sole Canadian partner, “has outperformed ChatGPT on the majority of medical exams and certifications.” In the coming months, ELNA will also be piloting generative AI that “listens” to doctor-patient encounters and creates medical summaries, which “saves a lot of time for the doctor and can ultimately increase access to more patients.”

At the same time, AI is still in its infancy, much like the Internet in the 1990s. The World Wide Web of that time, while dazzling us with its novelty, was a little clunky and cumbersome – nothing like the lightning-speed, image-saturated cyberspace we take for granted today. The same applies to AI. ChatGPT, the world's newest toy, has put AI into the hands of the “person on the street.” We're having a great time playing with it, and forward-looking tech companies are heavily investing in its development, but – like the proverbial boulder rolling toward the edge of a cliff – it has yet to unleash its full kinetic energy.

We don't quite know how AI will transform specialty healthcare, but by all indications

## Within healthcare, AI presents almost *limitless opportunities* for all tasks that involve prediction, from diagnosis and treatment to administration and operations.

[Brookings Institute article on AI in healthcare](#)

we can expect a wild ride. Should we be excited, cautious – or perhaps a bit of both?

### AI IN HEALTHCARE

To understand how AI can revolutionize healthcare, we first need to define it. Under the circumstances, it seems appropriate to give the job to ChatGPT, which defines AI as “computer systems that simulate human intelligence by learning from data, recognizing patterns, and making decisions.”<sup>1</sup> AI performs tasks that have previously required human brain function and its algorithms evolve with experience, much as a human might learn from trial and error.

Belying the cartoonish perception of AI as a humanoid made of wires, ready to take over the world, “AI does not automate thinking,” says Cassie Kozyrkov, CEO at Data Scientific and Google's first Chief Decision Scientist.<sup>15</sup> Rather, it automates tasks that “don't require a high level of cognitive engagement, creativity, or critical thinking.” This may change over the years, of course. But for the time being, AI is best understood as a tool that removes the “complex drudgery” from your life, rather than a cognitive competitor intent on stealing your mind. By taking laborious tasks off your plate, AI frees you up to do the cognitive heavy lifting.

Canada is emerging as a world player in the AI arena, starting with the launch of the Pan-Canadian Artificial Intelligence Strategy in 2017. The first initiative of its kind in the world, the Strategy received

\$125 million in funding, with the vision of developing a Canadian AI community.<sup>8</sup> The effort has supported the launch of over 900 Canadian AI startups and over 50 multinational companies with AI R&D facilities in Canada, along with an annual crop of over 200 Master's and PhD students graduating from Canada's three national AI institutes.<sup>8</sup>

Within healthcare, AI presents almost limitless opportunities. “Several aspects of the healthcare system involve prediction, including diagnosis, treatment, administration and operations,” note the authors of a Brookings Institute article about AI adoption in healthcare.<sup>16</sup> And that's exactly where AI excels: making predictions on the basis of data.

By sidestepping the trial-and-error approach that still prevails in much of modern medicine, especially with complex diseases, AI can save valuable time and resources. For example, nearly half of patients don't respond to the first antidepressant they are prescribed, and a quarter of those can't tolerate their side effects.<sup>17</sup> Based on the ever-growing dataset of antidepressant trials, AI could develop algorithms to predict an individual patient's suitability for specific antidepressants – more than 35 are available in Canada at the moment – thus enabling a higher probability of prescribers selecting the right drug the first time around. In a similar vein, AI could help predict which drugs would work best based on a patient's genetic profile and other characteristics.

**Opportunity for AI in healthcare**



*Adapted from Spatharou A et al, McKinsey & Co.<sup>18</sup>*

It's not a stretch to imagine a version of ChatGPT for diagnosis, another for assessing patients' laboratory and imaging tests, and a third one for guiding treatment decisions. The capacity of AI to create and update algorithms for drug regimens could prove especially valuable in the world of specialty pharmaceuticals, where practice standards evolve with an ever-moving drug pipeline.

Back to reality: many healthcare facilities continue to use fax machines. There's clearly a lot of catching up to do. So what needs to happen to make AI work in healthcare?

**IS CANADIAN HEALTHCARE READY FOR AI?**

Critical to harnessing the full power of AI in healthcare is an infrastructure of data assets and technical expertise, along with the vision to translate big AI ideas into healthcare realities. Let's start with the data. In terms of raw material, there's a lot to go around: the healthcare industry generates about 30% of the world's total

volume.<sup>5</sup> The compound annual growth rate of healthcare data is expected to reach 36% by 2025, exceeding the expectations for manufacturing by 6% and for financial services by 10%.<sup>5</sup>

Canada exemplifies this abundance. "Across the country, practically every province and region has pretty nice data sets that many other countries would love to have," says Muhammad Mamdani, Vice President of Data Science and Advanced Analytics at Unity Health Toronto.<sup>10</sup> At the same time, the quality and completeness of the data still varies widely among clinics, hospitals, and jurisdictions. This lack of consistency makes it difficult to use the data for a common purpose, such as an AI-driven analysis and algorithm development.

The fact is, high-quality medical data is difficult to collect. As noted in the above-mentioned Brookings Institute article, "medical professionals often resent the data collection process when it interrupts their workflow, and the collected data is often incomplete."<sup>16</sup> This results in "data collection that is localized rather than integrated to document a patient's medical history across his health care providers," placing limits on useful AI applications.

Sean McBride, National Director of Commercial Operations at Bayshore Specialty Rx, agrees. "It all starts with data collection and refinement," he says. This involves "upfront work to ensure the data has the appropriate rigour and to eliminate biases," along with "KPIs to evaluate the data as you go along." The next step is to "feed the data into AI-type systems and conduct pilot projects to see if the information adds value." In other words, "just adding technology isn't enough. It needs to be thoughtful and targeted toward delivering value to the patient."

That's where technical expertise comes in. To Canada's credit, the country boasts three leading AI institutes: the Vector in Toronto, AMII in Alberta, and MILA in Montreal. Researchers at these institutes develop the processes that enable AI to work with raw data. In parallel with these efforts, companies like Bluedot and Signal 1 are working to translate basic AI research into practice, keeping their eye on the goal of improving patient care. While only a handful of initiatives have reached this "translation and application" stage to date, the future looks bright.

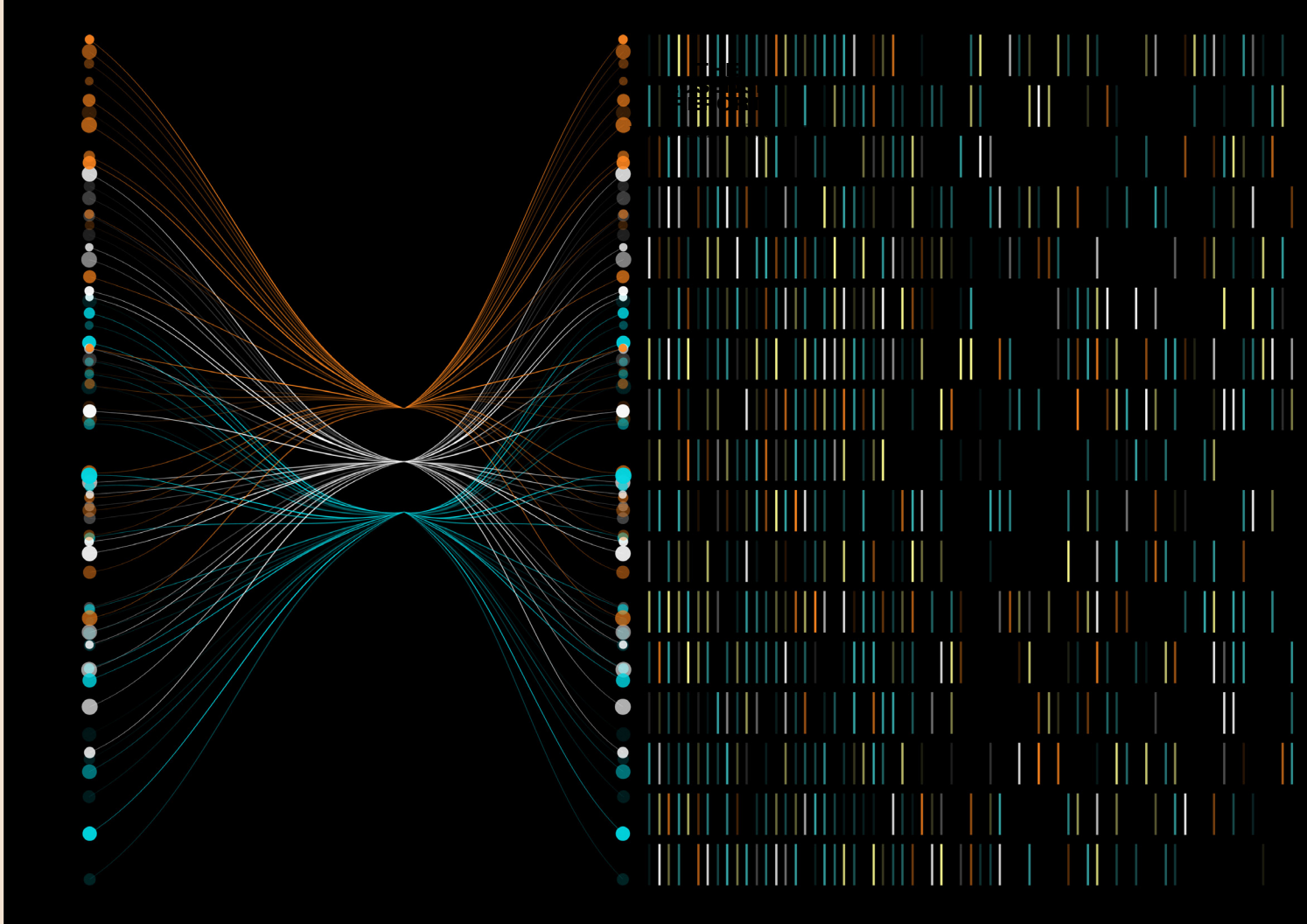
**PUTTING IT ALL TOGETHER**

A few visionary Canadian pharmaceutical companies are putting the key building blocks of healthcare AI together: data, expertise, and application. Leading the charge, **Roche Canada** has launched a centre of excellence called AIR [AI with Roche], devoted to improving healthcare through the discovery and application of AI research.<sup>19</sup> With a mission to accelerate data insights to bring tangible benefits to patients, AIR covers all the bases in the AI lifecycle: conducting leading-edge research, facilitating partnerships, and mobilizing AI into practice, while prioritizing safety and ethics throughout the journey.

**Pfizer Canada**, for its part, has partnered with Communitech, a Canadian technology supercharger that brings industry together with a national network of startups and scale-ups.<sup>20</sup> In October 2023, the partners announced the three winners of a competition for startups working on technological innovations. Selected from an open call for proposals to address key challenges in healthcare, the winners included an Ontario-based company called PharmaGuide, whose patient portal will use AI to streamline drug coverage processes.<sup>20</sup> The technology's eventual goal is to help users predict coverage by insurers, thereby promoting transparency, informed decision-making, and better patient care.

Just adding technology isn't enough. It needs to be *thoughtful and targeted* toward delivering value to the patient.

Sean McBride, Bayshore Specialty Rx



### LET'S NOT FORGET THE HUMANS

Healthcare AI holds promise on several fronts. It can improve individual health outcomes and the efficiency of healthcare delivery. It can lift much of the administrative burden from physicians and their staff – an especially important benefit for clinics that manage complex treatments like specialty pharmaceuticals – freeing up more time for patient care and reducing staff burnout. But it can't do any of this on its own, especially in the complex and high-stakes area of healthcare: real humans must "hold AI's hand" at every step of the way.

For those concerned about AI taking over healthcare, Dr. Winson Cheung, a Professor of Medicine at the University of Calgary and Principal Director of the Oncology Outcomes (O2) research program, offers a dose of reassurance. "AI is not going to solve every healthcare problem or replace the human side of medicine," he says. "It's another tool in the toolbox. AI algorithms facilitate decisions, but don't make them. We need interpretations by a human. As an example, informed treatment decision-making by human experts that integrate patient preferences and input will continue to stay relevant."

Zachary Stauber, chief strategy officer at ELNA Medical, concurs. "There's always a human in the loop," he says.<sup>17</sup> "Nothing happens without being reviewed by a nurse or doctor." AI systems have been known to make errors, and human oversight ensures they meet high accuracy standards.

There's also the ethics component. Responsible AI requires balancing innovation with privacy protection, scrutiny of potential biases, and attention to health equity. For example, Canada does not systematically collect data on marginalized populations, leading to under-representation in national datasets,<sup>21</sup> which could tilt AI algorithms toward majority populations. Like any disruptive technology, healthcare AI could also find a more receptive audience in younger and more tech-savvy patients. Could this put the grandmother in a nursing home or the elderly neighbours down the street at a healthcare disadvantage?

*AI algorithms facilitate decisions,  
but don't make them. We need  
interpretations by a human.*

Dr. Winson Cheung, University of Calgary

To mitigate against such biases, health experts across the country are having conversations what ethical AI should look like. In 2020, with funding from the Canadian Institute for Health Information (CIHI), a multidisciplinary team of Canadian scientists launched a pan-Canadian institute to explore the impact of AI on health equity and to train emerging public health and computer science researchers in ethical AI.<sup>21</sup> Called Equitable AI for Public Health, the institute holds a conference every summer and invites applications from all over the country.

#### TAKING THE PULSE

With an aging population, changing patient expectations, and relentless innovation, demand for AI can only keep growing. On the flip side, end-users' unfamiliarity and ethical concerns with the technology, paired with a shortage of qualified personnel, may put some brakes on uptake. To get a read on Canadian physicians' awareness and use of AI, MD Analytics recently conducted a survey of 300 physicians, which found that<sup>22</sup>:

- 93% are familiar with AI
- Only 21% currently use AI in their practices
- 60% are not comfortable using AI platforms
- 56% say they need to learn more about the platforms before using them.

As for patients, almost two-thirds of respondents to a recent GlobalData patient survey said they felt comfortable using AI in healthcare settings – but only if the technology was familiar to them.<sup>23</sup> Absent this familiarity, their comfort level dropped to a mere 7%. Patients' top hesitation about using AI in the clinic? The potential to reduce interaction with real humans.

Needless to say, regulating the technology will require juggling several priorities. With this challenge in view, the Canadian government has been working to fold AI legislation into its existing regulations. Enter Bill C-27, intended to modernize Canada's Personal Information Protection and Electronic Documents Act and introduce new legislation to regulate the use of AI in Canada.<sup>24</sup> Part 3 of the Bill, called the Artificial Intelligence and Data Act, sets out new measures to regulate interprovincial and international commerce in AI systems. If passed into law, the Act will place boundaries on AI development and prohibit the use of AI systems that could cause harm to individual Canadians.

By the same token, we need to understand where AI can achieve the greatest good in healthcare. As noted in a 2023 article for HIT Consultant Media, an award-winning digital platform covering healthcare innovation, the true value of AI lies in automating "the tasks that do not need a human touch, allowing clinicians and staff to focus on high-value interactions with patients."<sup>25</sup> Used appropriately, then, AI can actually improve the human element in healthcare delivery – which is what all of us ultimately want.

#### SO WHERE DO WE GO FROM HERE?

Let's not get ahead of ourselves: to implement high-value healthcare AI in Canada, we first need to build a solid foundation of data, technology, and training. No less importantly, stakeholders in healthcare AI need to earn patients' trust: a 2021 survey looking at patient apprehensions about healthcare AI identified concerns related to safety, treatment choice, data bias and security, and potential increases in healthcare costs.<sup>23</sup> The authors of the survey report, published in *Nature's Digital Medicine*, concluded that "patient acceptance of AI is contingent on mitigating these possible harms."

To help healthcare organizations implement AI successfully, the Canada Health Infoway has created a Toolkit for Implementers of Artificial Intelligence in Health Care.<sup>26</sup> The six-module toolkit offers best practices, tips and recommendations, case studies, and checklists to help organizations plan their activities and stay on track. Along similar lines, Alberta has launched a program called Enabling Better Health through Artificial Intelligence (AI-Better Health) to explore and break down the barriers to deploying AI in the province's healthcare system.<sup>27</sup>

If all this seems daunting, we would do well to remember that every journey starts with one step. For healthcare AI, that step is data. So, let's start by getting the data we need. High-quality data. Data that leaves no-one behind. Data that will enable AI to facilitate earlier and better diagnosis and treatment, thus fulfilling its greatest promise to patients: better health.

Every journey starts  
with one step.  
For healthcare AI,  
*that step is data.*



# AI-Enabled Specialty Healthcare Projects

AI innovation in specialty healthcare is ramping up every day, in Canada and elsewhere. The four projects described here give a taste of what's happening and what's on the horizon.

## #1

### IQVIA USES AI TO IMPROVE CLINICAL TRIAL RECRUITMENT

Global investment in AI for clinical trials is growing, with pharmaceutical companies taking the lead. AstraZeneca has announced a new health tech unit called Evinova, dedicated to bringing AI to clinical trials,<sup>28</sup> while Roche's Genentech unit has partnered with computing giant Nvidia to fold AI into the drug discovery and development process that culminates in human trials.<sup>29</sup>

Clinical trial recruitment poses a particular challenge for diseases that affect a

small number of affected patients. To recruit enough subjects in a reasonable timeframe, rare disease trials need to include patients with undiagnosed disease. IQVIA, a world leader in the use of data to drive healthcare, has just made the process easier with an AI algorithm that combs through medical databases and identifies diagnostic patterns suggestive of an undiagnosed rare disease.<sup>30</sup> If genetic evaluation confirms the disease, interested patients can move onto a clinical trial.

As an example, an estimated 150,000 people in the US have or are at risk of spinocerebellar ataxia (SCA), a disease characterized by progressive loss of motor control. IQVIA used its AI algorithm to analyze the characteristics of SCA patients and, on that basis, create a shortlist of SCA predictors. In essence, they used AI as a screening tool, simplifying and accelerating the search for SCA patients suitable for clinical trials by finding potential undiagnosed patients.

## #2

### **PENTAVERE'S AI ENGINE IDENTIFIES DISEASES FROM PHYSICIANS' CLINICAL NOTES**

Real-world data (RWD) can identify disease patterns and treatment outcomes that clinical trials lack the power to uncover. One problem: the information needed to understand and treat a patient often lies buried in a large, unstructured dataset within electronic health record systems.

Take plaque psoriasis, for example – a common skin problem that can have a profound impact on quality of life. To meet patients' needs, clinicians need fast and reliable ways to identify disease that may require more intensive treatment. Pentavere, a Canadian-based healthcare AI company, has given the job to their AI engine called DARWEN™, which can quickly and economically extract RWE “trapped” in unstructured data repositories and transform it into reports that clinicians can easily interpret to improve patient care.<sup>31</sup>

In a feasibility study, DARWEN analyzed the electronic medical records (unstructured data) of over 10,000 patients to identify those with plaque psoriasis and describe the disease characteristics in each case. Of the 663 psoriasis patients flagged through this process, 259 had features indicating severe disease, while 135 fell into the moderate category.<sup>31</sup> According to the study investigators, such a “seamless and comprehensive assessment approach could allow the dermatologist to self-audit their management of patients with moderate to severe [psoriasis] and determine if adjustments are required to reach treatment goals.”

## #3

### **AUXITA'S MACHINE LEARNING TOOL DIGITIZES PATIENT ENROLMENT**

Automating administrative tasks may not be AI's sexiest application, but – when you consider that AI could free up 1.8 billion healthcare hours per year, which healthcare providers can devote to their patients – it ranks among the most important.<sup>13</sup>

The administrative burden is especially heavy for the patient support programs (PSPs) that help patients navigate treatment with specialty medications. Indeed, some clinics have to hire extra staff just to manage the paperwork – hardly the best use of healthcare resources, when the time could be spent with patients. Mindful of this, Ontario-based software company Auxita, as part of their agnostic digital PSP platform, has leveraged their AI tool to digitize PSP enrolment forms, with a focus on improving efficiency. The system can interface with fax machines – an antiquated technology that the healthcare sector has shown a curious reluctance to give up – recognizing the form type and converting handwritten and typed faxes into data that populates a digital enrollment webservice fully available to the PSP's CRM.

Illegible handwriting? Not to worry: the AI tool feeds it into a large handwriting database to make sense of the scrawl, which it then converts to structured data. Not only does Auxita's system leave PSP staff with more hours to allot to patient care, but it requires no procedural change from physicians: they can continue to scribble notes and send faxes, and the system takes care of the rest. It's no surprise that Auxita cites “care over data entry” as one of its foundational pillars.<sup>33</sup>

## #4

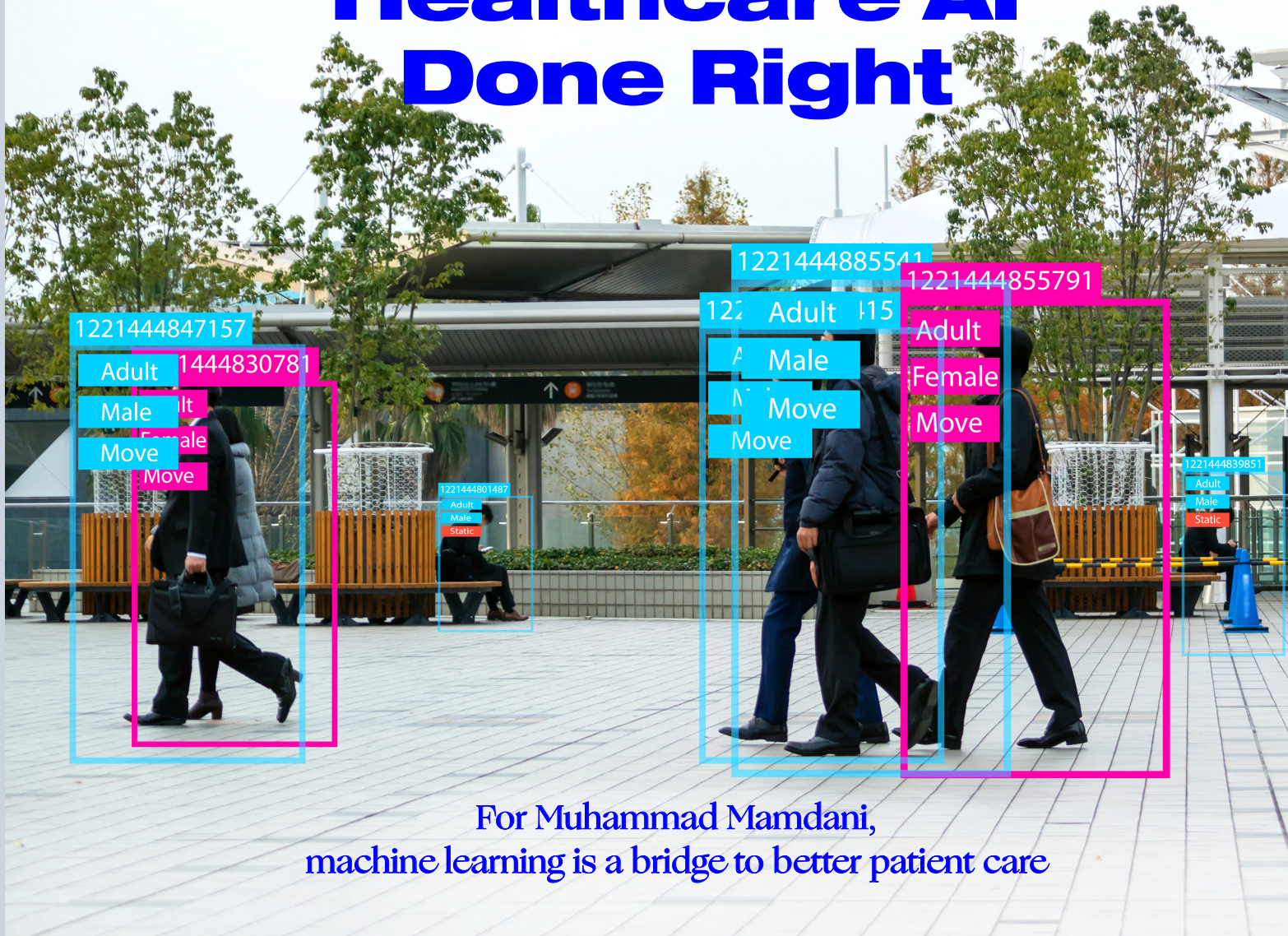
### **AI AND SYNTHETIC CONTROL ARMS FOR PATIENT POPULATIONS IN NEED**

Synthetic control arms work like this: instead of recruiting a control group for a clinical trial, investigators can model a control arm by collecting real-world data from existing sources, such as electronic health records and disease registries. In brief, the control group lives in the data.

Along with saving a lot of time and money, synthetic control arms make it possible to run comparison trials when ethical concerns (for example, offering a placebo instead of a highly promising treatment) preclude recruitment of an actual control group.<sup>34</sup> In a recent Canadian example, a trial with a synthetic control arm created from real-world Alberta databases determined that the novel drug lurbinectedin offers better survival odds to patients with small cell lung cancer than the historical standard of care.<sup>35</sup>

This is where AI comes into its own: sifting through vast datasets, using analytic techniques such as machine learning and natural language processing to extract relevant information. While the use of AI to create synthetic control arms is still in its early days, you can expect to see a lot of more of it in the years to come.

# Healthcare AI Done Right



For Muhammad Mamdani,  
machine learning is a bridge to better patient care

As the Vice President of Data Science and Advanced Analytics at Unity Health Toronto, **Dr. Muhammad Mamdani** applies advanced analytics and machine learning to healthcare decision making, with the ultimate goal of improving patient outcomes and hospital efficiency. Currently the Director of the University of Toronto Temerty Faculty of Medicine Centre for Artificial Intelligence Research and Education in Medicine (T-CAIREM), Mamdani has previously been named among Canada's Top 40 under 40. His rock-star publishing career includes over 500 peer-reviewed papers in the areas of drug safety, pharmacoconomics, and the application of machine learning to clinical and policy issues. In this conversation, Mamdani talks about where he sees healthcare AI going – and how to push it along – in Canada.

## Tell us a bit about Unity Health Toronto.

Unity Health Toronto is a healthcare organization with services spanning the City of Toronto and three main sites: St. Michael's Hospital, Providence Healthcare and St. Joseph's Health Centre. Since 2017, our Data Science and Advanced Analytics team has put more than 50 innovations into practice. We're already seeing what a positive impact AI can have on hospital operations and patient care, and we're just getting started.

## What is generative AI?

The term refers to algorithms that enable computers to 'learn' from existing data, such as text, images, voice, or videos, and

apply this learning to generate new content. For example, it can create new texts or images – content that never existed before – from simple prompts. It can also answer questions and concisely summarize complex information.

**What are some of the challenges in developing generative AI in healthcare?**

A model is only as good as the data you feed it and often applications of generative AI are developed to give answers to questions that may not be ‘answerable’ with the existing data. That’s why ChatGPT sometimes generates things that don’t make much sense – what we call ‘hallucinating.’ It’s often sifting through incomplete or unreliable data from the Internet. As the saying goes, garbage in, garbage out. For AI to have value in healthcare, the data sources need to be a lot more credible, such as data from trusted peer-reviewed publications. Big tech companies are already working on training AI algorithms with better-quality data, which will result in much more reliable and accurate healthcare tools.

**What changes need to happen for AI to transform healthcare?**

As a society, education plays a big role as we need to become more literate and comfortable with data and AI. At the health systems level, we need to “axe the fax” and fully embrace the digital world. We’re already doing this at Unity Health: it’s digital and data all the way. The more data we have, the more powerful it becomes. For example, our

You have to be very disciplined and develop AI from *high-quality datasets* – otherwise your AI algorithms become useless as real-world tools.

hospital may only see a couple of cases of a rare condition every year, but if we multiply that by a hundred hospitals, we now have enough data to create an algorithm around that condition. This consolidation and aggregation is where we need a lot of work. Another piece is data quality. We need alignment on data standards across jurisdictions so we can create high-quality, nationwide data sets to feed into AI.

**Are there any myths about AI that need to be put to rest?**

A prevailing myth is that you can apply AI to just about any challenge. In reality, you have to be very disciplined and only develop AI from high-quality datasets. Otherwise you compromise your AI algorithms and make them useless as real-world tools. Most importantly, people underestimate the amount of

work it takes to develop and deploy AI in healthcare. They suggest “giving the job to AI,” as though we could just snap our fingers and do it. That’s because they conflate AI research and application. Conducting and publishing AI research is only a first step, and it often goes nowhere. As a case in point, a recent study reviewed about 400 articles on AI tools developed to address issues emerging from the pandemic. The authors looked at each of the papers to see how many of the tools could be applied in the real world. The answer was zero.

**So what’s the solution? How do you bridge the gap between AI research and application?**

You have to create a human environment that supports the technology. If you don’t do proper change management, nobody will use the tools. This means stakeholders have to be part of the development process. That’s the model we’re using at Unity Health. We involve the end users – clinicians and staff – from the get-go. You also need the teams and supports in place to resource an AI application before, during, and after launch.

Data sources for AI need to be *credible*, such as data from peer-reviewed publications. Big tech companies are already working on training AI algorithms with better-quality data.

**Are there any AI applications you're especially proud of?**

Unity Health helped launch an AI-based early warning system called CHARTwatch at St. Michael's hospital in 2020. It runs every hour on the hour, grabbing patient data and categorizing each patient as low, medium, or high risk. As soon as the system flags a patient as high risk, the medical team is paged and has to see the patient within two hours. As expected, St. Michael's saw a big increase in mortality throughout the early months of the Covid-19 pandemic. After we deployed CHARTwatch, we started seeing reductions in mortality rates, despite Covid cases continuing to increase. To put a figure on it, we had over 20% fewer deaths following our deployment of CHARTwatch. That's when we got very excited: our AI tool is actually saving lives.

**In ten years, what role do you think AI will play in healthcare settings?**

We're probably going to see AI much more ingrained in day-to-day health care. Generative AI will be pulling data from our systems and helping us make

sense of it. I'm hoping that AI will be reliable enough to help us with diagnosis and treatment. I see it playing a special role in predicting health risks in specific individuals and serving as a 'clinical assistant' that suggests diagnoses and optimal treatment pathways. I also anticipate a huge expansion in the role of AI in automation. Right now we're using AI to help us with menial tasks such as scheduling. As AI becomes more powerful, I think our definition of "menial" will expand and we'll be automating an increasing variety of administrative tasks.

**How do we balance the risks and benefits of AI in healthcare?**

It's a matter of embracing and welcoming AI, while putting some guardrails around it. It's a tough balance, because too many guardrails can stifle innovation, while blind trust can result in serious mistakes. That's why it's helpful to have guiding principles, such as the Good Machine Learning Practice developed in 2021 by the FDA, Health Canada, and the UK's Medicines and Healthcare Products Regulatory Agency. The

document offers a values-oriented approach that can be applied to a variety of healthcare AI projects.

**Overall, how would you say Canada is doing in healthcare AI?**

Canada is home to many AI experts. Several of us are involved in discussions to help inform regulations, so Canadians can benefit from responsible AI that helps improve our healthcare system. We're also ramping up data consolidation, with groups like the IC/ES data repository in Ontario and initiatives like Genome Canada, which consolidates data around genomics. Alberta Health Services has taken the bold step of saying, as an entire province: 'we're going to bring together our data to make it more powerful and using it to help our patients.' So we're starting to think the right way about all this.

Within 10 years, I hope AI will be *reliable* enough to help us with diagnosis and treatment. I see it as playing a special role in predicting personal health risks.

# On the reading list

[Dr. Atul Butte: Precisely practicing medicine with a trillion points of data](#)

[5 ways that AI is impacting healthcare](#)

[Building equitable AI for public health](#)

[Thousands of images at the radiologist's fingertips: Seeing the invisible](#)

[Need for patient education on AI in healthcare to build trust revealed in new survey](#)

[Investissements publics favorisant le développement et le déploiement responsables de l'IA dans le secteur de la recherche](#)

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