AI use in pharmacotherapy still in the early stages

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Detecting drug interactions, discovering new drugs, predicting treatment response, optimizing doses–the list of the potential benefits of artificial intelligence (AI) for pharmacotherapy is long and promising.

And it's not hard to see why. AI has an insatiable appetite for data and the pharmaceutical field has just what it needs: enormous quantities of data. Just think of all the prescriptions that have been entered into computerized systems over the past few decades, given that a single retail or hospital pharmacy can process 500 to 1,500 prescriptions per day.

Such extensive databases are a valuable resource for developing machine learning models that can identify a therapeutic target or determine the risk of developing a side effect, to give just a couple of examples.

In Quebec, number of initiatives are already underway aimed at harnessing AI for applications in pharmacotherapy, including Valence Discovery, a start-up out of Mila. However, there is still a long way to go.

"AI in pharmacotherapy is an emerging field and it's still too early to say which aspects of pharmacotherapy practice will benefit most," said Jean-François Bussières, a clinical professor in Université de Montréal's Faculty of Pharmacy and director of Ste-Justine Hospital's Pharmacy Practice Research Unit. "Artificial Intelligence in the Service of Pharmacotherapy" was the theme of the Faculty of Pharmacy's recent [2023 centenary conference](link), at which Bussières was a speaker.

No shortage of potential applications

Bussières and his co-authors recently published a [narrative review](link) of studies evaluating the feasibility and impact of AI in pharmacotherapy. The team, which includes pharmacist and clinical informatics specialist Maxime Thibault, also developed a [machine learning model](link) based on 10 years of drug prescription data from Ste-Justine Hospital. Another ongoing project is a [blog](link) that uses AI to identify and categorize published articles that could be of interest to pharmacists.

The research team noticed early on that while scientific articles were lauding the benefits of AI in pharmacotherapy, it was often simply as a computerized decision support tool.

Their literature review found that using AI to manage chronic diseases is a recurring theme in pharmacotherapy, no doubt because these widespread conditions monopolize a significant share of human, material and financial resources in healthcare. For these diseases, AI can be used to "identify what drugs, lab tests and follow-ups are needed to reduce the risk of morbidity, rehospitalization and mortality," the review concluded.

Pharmacogenomics is another area ripe for AI applications but still underdeveloped in Quebec, added Bussières. Pharmacogenomics uses a person's DNA to predict their response to a drug or the optimal dose for treatment. The goal is personalized medicine that tailors treatment and disease prevention to the individual.

"Imagine if we could determine the genotype of all human beings at birth and then store this information in a massive database. Imagine if we could then use this information to predict that someone with such and such a genetic profile is more likely to develop this disease or respond favorably to that drug," said Bussières. "We could significantly improve the efficacy of drug treatments and increase life expectancy."

However, Bussières is quick to point out that genetic testing will never be the only method for determining the best course of treatment, and the final decision must always be made by the care team in collaboration with the patient.

Like it or not, the future is now

While the use of AI in pharmacotherapy is still in its infancy, it is important that we take an active interest in this emerging field, said

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Bussières. He believes that now is the time for people to think about these new technologies and, especially, for teaching people how they work.

This includes future pharmacists. Bussières, who served as director of pharmacy at Ste-Justine from 1996 to 2022, laments the fact that undergraduate and graduate pharmacy programs do not offer basic courses on using and managing databases.

"It's a major gap in our curriculum! All of the software we use in pharmacy are databases, so students need to know at least the basic concepts behind these tools," Bussières argued. "If you don't know how a system works, you're more likely to use it incorrectly and not know how to fix problems that arise."

Understanding the ethical and legal implications of AI is equally important, as is being able to critically analyze any computer-generated solution, Bussières added.

At the end of the day, integrating AI into pharmacotherapy practice in Quebec will require close collaboration between health professionals and AI researchers and developers, as well as a continued commitment to training and developing new skills.

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