A diagnosis of coronary artery disease usually comes after a series of procedures, including blood tests, enzymes to reproduce symptoms, an electrocardiogram, a chest X-ray, and finally, cardiac catheterization, where a thin tube is inserted through the heart’s blood vessels to check blood flow and function in various parts of the organ.

It can take weeks, even months, for each patient to go through these gold-standard procedures and research data at the PMCC are critical to the success of the centre’s AI goals, says Dr. Rubin. The PMCC recently flowed six of 47 disparate clinical and research databases into a vast “data lake,” and it is now working to bring the remaining datasets into the same central repository.

By integrating all this data – blood tests, clinical notes, X-rays, ultrasounds, CT and MRI scans, pathology slides and genetic information – in one location, clinicians and researchers can use AI to discover potential causes of heart disease. These discoveries, in turn, can lead to new cures. “For example, if we have data on 20,000 patients with a narrow heart valve, and it turns out that 2,000 of these patients have a similar gene mutation, we could determine how that gene works and develop new therapies that would prevent the heart valve disease from ever developing in patients with that mutation,” says Dr. Rubin.

Toronto is one of the two epicentres for healthcare leadership in AI – the other place is in Silicon Valley in California – and boasts a robust ecosystem for AI, and digital-based health-care innovations, says Ying Tam, head of health at the venture services for MaRS Discovery District, a Toronto innovation hub that connects entrepreneurs, business experts, researchers, educators and social scientists.

He points to Ontario companies such as Cloud DX and Deep Genomics, which use AI and machine learning to diagnose disease and design more targeted therapies.

While AI champions continue to innovate in health care, it will likely take years before many of these new technologies are adopted in clinical practice, says Mr. Tam. Regulations that govern medical technology are complicated, says Mr. Tam, and could work against the very nature of artificial intelligence. For instance, when an organization such as the U.S. Food and Drug Administration approves a medical solution, it does so based on a specific information package. With AI, information continues to change as the underlying algorithm learns from existing and new data.

“Neveretholess, AI solutions have already been proven in other areas in health care. Dr. David Jeffrey, Senior Scientist at Princess Margaret Cancer Centre in Toronto, points to the use of algorithms at the hospital to automate the design of treatments for cancer patients.

“The technology is very attractive because it allows us to design the treatment sooner, treat patients sooner and even ensure that the treatment plan follows the appropriate protocols,” he says. This level of AI-enabled efficiency can, in the future, also help hospitals to optimize the use of their resources, while ensuring the best outcomes for patients, says Dr. Rubin.

“If we had complete data on all of our patients, we could use AI to predict which patients that had heart valve surgery would stay in hospital three days 10 days after their operation,” he says. “Using this AI-based approach, we will be able to better plan and better utilize our health-care resources.”

Having cemented its partnership with the Vector Institute, the PMCC must now work to integrate AI into practice – an undertaking that requires a shift in mindset among patients and health-care providers.

“We need to work to train clinicians and students at the PMCC to work in environments where AI-based predictions will inform treatment decisions and the management of patients,” says Dr. Rubin. “There’s no question that AI and machine learning are the future.”

“A new era in artificial intelligence launches a new era in cardiac care.”

By Marjo Johne

“arificial intelligence launches a new era in cardiac care.”