

Exploring AI's Potential in Rheumatology: Early Steps Toward Innovation

By Carrie Ye, MD, FRCPC, MPH; and Claude 3.5 Sonnet (AI assistant)

As I picture a busy rheumatology clinic, I see the traditional practice of rheumatology—detailed patient histories, careful physical examinations, thoughtful interpretation of lab results and patient-focused counselling. While artificial intelligence (AI) hasn't yet transformed our daily practice, researchers are exploring how it might one day enhance the care we provide to patients with rheumatologic conditions. As both a practicing rheumatologist and AI researcher, I'm cautiously optimistic about the potential intersection of this technology with our specialty.

Rheumatology faces several challenges that make it an interesting testing ground for AI applications. Our specialty continues to experience workforce shortages, with patients often waiting months for appointments. The diseases we treat are complex, requiring careful monitoring and frequent adjustments to powerful medications. Many of our diagnostic tools, from joint examinations to magnetic resonance imaging (MRI) scans, rely heavily on pattern recognition—an area where AI has shown promise in other fields.

In our research lab, Joint AI, we're in the early stages of investigating several potential AI applications. One project explores the possibility of using AI to assist with referral triage. The goal is to develop a system that could help prioritize referrals. While still in development, this could potentially help ensure patients with time-sensitive conditions receive expedited care.

Another preliminary project addresses the challenge of patient education. We're investigating whether a specialized large language model chatbot (ChatRheum), drawing exclusively from peer-reviewed rheumatology literature and validated patient education materials, could provide reliable information to patients between visits. Unlike generic AI chatbots, our proposed system would use retrieval-augmented generation (RAG) to ensure responses are grounded in verified medical sources. However, significant testing and validation will be needed before any such system could be considered for clinical use.

We're also exploring computer vision AI applications in rheumatology. Our early-stage research includes training AI models to detect joint effusions (swelling) in



hand photographs and videos. While initial results show promise, extensive validation will be required to determine whether such technology could reliably assist in disease diagnosis and monitoring, particularly for patients in remote regions of Canada.

One of our research projects that has already been used to answer clinical questions involves investigating whether AI could extract bone density measurements from routine computed tomography (CT) scans—a technique called "opportunistic CT-DXA." The focus now is on scaling this project to large at-risk populations such as men

with prostate cancer on androgen deprivation therapy, to identify osteoporosis in these men who undergo CT scanning for cancer staging and monitoring.

As we conduct this research, we maintain a clear-eyed view of both the potential and limitations of AI in medicine. Any AI systems would need rigorous validation in diverse patient populations to ensure they work equally well for all demographics. Questions of data privacy, clinical workflow integration, detecting and mitigating bias, and the appropriate role of AI in clinical decision-making must be carefully considered.

Looking ahead, I see AI as a potential tool to complement, not replace, clinical expertise in rheumatology. While the technology shows promise, we must remember that the core of rheumatology practice remains the thoughtful application of clinical judgment and the essential doctor-patient relationship. Our research aims to explore how AI might one day support these fundamental aspects of care. These technologies represent exciting possibilities for the future of rheumatology care, but their development must be guided by evidence, ethical considerations, and most importantly, patient benefit.

*Carrie Ye, MD, FRCPC, MPH
Assistant Professor,
University of Alberta
Department of Medicine
Faculty of Medicine & Dentistry
Edmonton, Alberta*