Artificial intelligence in clinical pharmacy practice

Editorial Article

Şule APİKOĞLU

Marmara University, Faculty of Pharmacy, Department of Clinical Pharmacy, Istanbul, Türkiye

The use of artificial intelligence (AI) in healthcare is no longer speculative—it is operational. Clinical pharmacy, a discipline built on the interpretation of complex clinical data and individualized therapeutic decision-making, is particularly well-positioned to both benefit from and critically evaluate this technology integrated into clinical practice. As AI tools become embedded in electronic health records, medication management systems, and predictive analytics platforms, pharmacists must consider not only what these technologies can do but also how they should be used efficiently.

Clinical pharmacists routinely work on laboratory results, medical and medication histories, pharmacokinetic parameters, and evolving clinical guidelines. AI systems, particularly those based on machine learning, are designed to process large datasets and identify and recognize patterns that may not be immediately captured by the human mind. In theory, this is a high-value capability when practicing medication optimization. In practice, the real value of AI will depend on how thoughtfully it is implemented.

One area where AI holds clear promise is medication safety. Conventional clinical decision support systems typically rely on rule-based alerts that generate high volumes of warnings, many of which are overridden. This results in alert fatigue as a barrier to effective medication monitoring. More advanced AI-based systems offer the potential to incorporate patient-specific variables such as renal function status, laboratory test results, and concurrent therapies, to generate more targeted and clinically relevant alerts. When properly validated, such systems reduce unnecessary interruptions while detecting genuinely high-risk scenarios.

* Corresponding author: Şule APİKOĞLU
E-mail: suleapikoglu@gmail.com
ORCID: 0000-0001-9137-4865

Precision dosing represents another area where AI-based technologies are used. Pharmacokinetic variability remains a challenge in the management of anticoagulants, antimicrobials, immunosuppressants, and oncology medications. The use of AI models integrating real-time therapeutic drug monitoring data with individual patient factors may support more refined dosing adjustments. Rather than replacing clinical judgment, these systems can function as sophisticated analytical tools that assist pharmacists while dealing with increasingly complex therapeutic scenarios.

The efficiency of operational work is also likely to be improved. Natural language processing tools capable of extracting the most relevant data from clinical documentation may streamline medication reconciliation processes. Automated summarization and documentation support could reduce administrative workload. In a healthcare environment where pharmacists often have time constraints, even modest efficiency gains could translate into greater capacity for direct patient care.

Yet there are several points where caution should be employed. Algorithm-related bias is a legitimate concern. The use of incomplete or unrepresentative datasets while training predictive models may result in disparities in care. Pharmacists, who frequently serve as patient advocates within interdisciplinary teams, must always consider the ethical dimensions of AI deployment. Vigilant surveillance and ongoing performance evaluation are essential for ensuring fair application.

Transparency presents another challenge. Many AI systems operate using complex computational methods that are not explicable. In clinical settings, recommendations must be easily explained. Pharmacists need to understand not only what an algorithm suggests but also why it suggests it. Without interpretability, trust in these systems may remain limited, and their routine use in patient care may be superficial rather than substantive.

Data governance is another complicated issue. AI relies on large volumes of health information, raising concerns about privacy, cybersecurity, and secondary use of data. Institutional safeguards must evolve in parallel with technological developments. Clinical pharmacists should participate in governance discussions to ensure that medication-related data are handled cautiously and responsibly.

Importantly, AI should be understood as an adjunct and not an autonomous decision-maker. The responsibility for patients' therapeutic outcomes remains with the clinician. Overdependence on automated outputs could diminish critical thinking or create a false sense of certainty in inherently uncertain clinical scenarios. Conversely, resistance to technological innovation risks shrinking the profession within a largely data-driven healthcare system.

Education is essential for facilitating this transition. Future pharmacists must be equipped with competencies in data literacy and digital health technologies, besides traditional pharmacotherapy expertise. Understanding how AI systems are developed, validated, and monitored will empower clinical pharmacists to use them judiciously.

Artificial intelligence is unlikely to change the mission of clinical pharmacy. Rather, it may shape how that mission is pursued. At its core, clinical pharmacy remains dedicated to optimizing medication use and improving health outcomes. AI offers tools that may enhance this work, but only if implemented with rigor, ethical awareness, and professional accountability.

The question is not whether AI will influence clinical pharmacy practice; it already does. The more pressing question is how the profession will guide the integration of AI into clinical practice. Thoughtful stewardship, rather than uncritical adoption or reflexive rejection, will determine whether AI ultimately strengthens or complicates the delivery of patient-centered pharmaceutical care.