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Letter to the Editor

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Artificial Intelligence in pharmaceutical process: A key strategy to reduce medication errors

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Dear editor

The National Coordinating Council on Medication Error Reporting and Prevention (NCC MERP) defines a medication error (ME) as any preventable incident that could lead to the incorrect use of a medication or to patient harm at any point (1). Medication errors are a major healthcare issue, leading to severe problems like death, disability, and long-term harm. The most common preventable cause is side effects, accounting for 10–18% of hospital injuries (2,3). A study in England reports that about 237 million medication errors occur during various stages of the medication process, with 38.4% of them taking place in primary care. Although 72% of these errors had a minimal chance of causing harm, around 66 million were clinically significant. In primary care, prescribing was responsible for 34% of all potentially clinically important errors. It is estimated that Adverse Drug Events (ADEs) cost the NHS approximately 98.5 million pounds annually and cause 1,708 deaths (4).

Artificial Intelligence (AI) technologies can help prevent medication errors by offering decision support to clinicians. By examining patient information—like medical history, current medications, allergies, and potential drug interactions—AI algorithms can help propose suitable drug options and dosages (5). This directly addresses the problem of medication errors by minimizing the risk of incorrect prescriptions. Research shows that AI can enhance medication safety by predicting potential adverse drug events, which directly links it back to the importance of reducing medication errors (6). By integrating AI into clinical workflows, healthcare providers can identify discrepancies and errors more effectively, which improves overall patient safety.

Several AI applications are currently in use in healthcare that illustrate their potential to enhance medication management. For instance:

- Medisafe is a patient-facing app that provides personalized medication management through reminders and alerts about medication schedules, thereby reducing the likelihood of missed doses. Studies have shown that apps like Medisafe can improve adherence rates among patients, leading to better health outcomes (7).

AI can enhance nanosystem design, broaden existing drug testing models, and boost the precision of parameter and agent selection throughout drug discovery, development, and reuse. Additionally, by examining drug penetration, simulation, and human cell targets, AI aids in elucidating membrane interaction mechanisms within the human body (8).

Using AI can support healthcare professionals in safeguarding patient safety by improving error detection, patient stratification, and medication management (8). However, there are disadvantages to using AI in this field, such as the need for large data sets, lack of transparency, potential job displacement, biases, fairness issues, and privacy concerns (8). For example, AI can generate algorithmic biases in processing information, affecting predictions and hypothesis evaluations. Therefore, human participation remains essential for effective decision-making and cross-validation to mitigate system biases (8).

The development of AI-based applications and tools for clinical pharmacy services is still in its early stages. Pharmacists need to stay up-to-date with these developments to maintain their roles while ensuring strong human relationships with healthcare teams and patients. Successful AI implementation depends on effective collaboration with healthcare professionals to

improve clinical outcomes and support accurate decision-making. However, there are challenges, including the need for high-quality data, transparency, interpretability, ethical considerations, and regulatory frameworks. To better evaluate the added value of AI in clinical pharmacy, further studies should be conducted collaboratively with data scientists, pharmacists, physicians, nurses, health service managers, and policymakers.

Conclusion

Medication errors remain a critical patient safety challenge. Artificial Intelligence offers a promising strategy to reduce these errors through enhanced decision support, medication management, and predictive analytics. While practical tools like Medisafe demonstrate AI's potential, challenges such as data quality, algorithmic bias, and the need for human oversight must be addressed. AI should serve as an augmentative tool to healthcare professionals, not a replacement. Future collaborative efforts among clinicians, data scientists, and policymakers are essential to integrate AI responsibly and effectively into pharmaceutical practice.

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Competing Interests

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Ethical Approval

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