Issue 12/2023

PRESCRIPTION

Latest news and updates from the Faculty of Pharmacy, UiTM

HARNESSING ARTIFICIAL INTELLIGENCE FOR SAFER MEDICATION PRACTICES

The Global Patient Safety Challenge: Medication Without Harm initiated by the World Health Organization, aims to reduce the level of severe, avoidable harm related to medications by 50% within a span of 5 years (1). Over the years, substantial progress has been made in improving medication safety, yet challenges persist (2). Majority of current patient safety approaches were developed prior to the healthcare digital revolution. Significant advances in healthcare practises can be achieved by adopting modern technological tools and digital advancements which hold the potential to substantially improve the prediction and prevention of patient safety risks.

Artificial Intelligence (AI) has rapidly transformed industries, notably in healthcare. AI implementation in the domain of medication safety is not, however, new. Using inputs from databases containing known effects, patient parameters, and drug information, a neural-network analysis with a high accuracy, was implemented in the early 1990s to forecast adverse effects of antidepressants (3). Recent years have witnessed AI, particularly machine learning, predominantly employed in patient safety and pharmacovigilance, notably in identifying adverse drug events and extracting insights from safety reports and clinical narratives (4).

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The following examples highlight the application of AI in an effort to enhance medication safety:

1. Zitnik et al. (5) developed a prediction model capable of identifying the adverse effects of drug combinations by integrating molecular protein–protein and drug–target networks with side effect data at the population level, utilising neural network techniques. It was discovered to have an exceptionally high degree of precision when predicting polypharmacy side effects.

2. Pavani et al. (6) utilised an artificial neural network to construct a pharmacogenomic algorithm that predicted the safe and effective dose of warfarin with 92.5% accuracy by combining therapeutic warfarin dose, age, gender, body mass index, plasma vitamin K levels, thyroid status, and genetic variables with therapeutic warfarin dose. This application has decreased the incidence of international normalised ratio (INR) values that are outside the acceptable range by 49% and the time required to achieve the first therapeutic INR by 6.6-fold, with no adverse drug reactions.

3. In their study, Wang et al. (7) employed machine learning techniques to ascertain potential causal relationships in the US Food and Drug Administration Adverse Event Reporting System (FAERS) with regards to pharmacovigilance in two case studies: acute liver failure associated with analgesics and fatalities related to tramadol. The model successfully recalculated established risk factors associated with these adverse events and detected possible secondary risk factors that increase the susceptibility of individuals to liver failure.

4. Weissenbacher et al., (8) applied convolutional neural network to identify tweets discussing changes in medication treatment, particularly focusing on users' explanations for medication non-adherence. Another study utilised a natural language approach to extract information on medication intake and birth defects from Twitter and revealed that women reporting birth defects exhibited increased medication intake (9). These analyses enable the monitoring of vulnerable groups, such as pregnant women, who are often excluded from clinical trials, and where drug safety is not well-established. These studies underscore social media's potential in complementing current resources and enhancing medication safety monitoring.

AI holds promise in elevating medication safety, yet most efforts are led by computer science and AI experts, lacking adequate involvement from healthcare professionals, emphasising the need for increased collaboration in this domain (10). Despite the considerable potential of AI, hurdles remain. Inadequate understanding and proficiency in navigating complex AI systems and interpreting their outcomes might burden healthcare professionals and the healthcare system overall. Hence, integrating AI training into healthcare education becomes critical to empower professionals with essential knowledge for comprehending AI basics and extracting clinically valuable insights.

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Questions
Let's dive deeper into the article and evaluate your comprehension. We have 5 questions for you here.

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