Future of Pharmacy with Artificial Intelligence

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Artificial intelligence (AI) is what we hear a lot these days! This rapidly evolving technology is emerging in different aspects of our everyday life; from language translation to very complex tasks like molecular structure designing. What really is AI? In a simple word it is a technology that enables computers and machines to simulate human intelligence and problem-solving capabilities, so it can perform tasks that would otherwise require human brainpower or intervention (1, 2).

Computers have been used in a pharmacy presumably since 1980s. In today pharmacy, we already have an early form of AI in use. It's called our pharmacy management system. With the disclosure of new generation of artificial intelligence, the pharmacy sector will evolve dramatically in future (3).

Nowadays AI is emerging into different aspects of pharmacy practice; drug safety, pharmacy operations, prescription medicine and pharmacological research. AI Can help with better risk identification of birth defects with different drugs or adverse drug reactions as well as drug abuse or misuse for example opioid overdoses. It can also be helpful in identifying and preventing medication errors from reaching the patients. AI algorithms can help pharmacists for selecting high-risk patients or prescriptions which need pharmacist interventions. It can also be helpful in pharmacy operations by automating certain repetitive tasks like dispensing and maintaining medical records, allowing pharmacists a greater focus on clinical activities. Humans need break from work to refresh themselves but AI -based machines are able to work 24x7 once programmed for long hours. AI can also be used to predict time required for a patient to pick up a prescription that can optimize pharmacy workflow and patients waiting time. Retail pharmacists will be able to predict what they need to by, using AI Algorithms. The ability of robotics using AI technology will help us in handling and preparing hazardous medications like chemotherapeutic agents. AI can be used to design treatment plan or optimize drug dosing, e.g. for warfarin, as well as predicting effectiveness of therapy in patients with chronic diseases like hypertension, epilepsy, schizophrenia and….(4).

AI can also be used in different fields of drug research and pharmaceutical automation like drug modeling, dosage design, protein structure, function prediction, pharmacokinetic and pharmacodynamic modeling and in-vitro and in- vivo correlation (6).

On the other hand, AI can assist patients, in addition to potentially better healthcare services, to guide on how and where to obtain the most cost-effective healthcare and how best to communicate with healthcare professionals; integrating diet and exercise; and supporting treatment compliance and adherence (3).

Despite the potential impact, AI is not well-understood or studied within pharmacy practice, and limited guidance exists. Several challenges are now associated with AI, which include generalizability, bias, safety and chance of cyberattack/malware. Another important concern is the risk of massive unemployment and the creation of systems that are smarter than humans (5). It would also be a source of discouragement among young generation to pursue majors like pharmacy. Patient care needs creativity but artificial intelligence cannot invent anything. It can just perform the tasks it is programmed for, and improve itself by experience. Automating tasks and utilizing more and more digital assistants can lead to increased machine dependency and even human laziness. Relying on AI can cause us to use our brains less to memorize, strategize, and solve issues on our own. These effects may be devasting on future generations if left unacknowledged. The last but not the least, is the fact that there is no emotion attached to the AI-based machines. As a pharmacist who worked in both hospital and community setting for years, I believe that the mutual interaction between patients and their care givers sometimes is the only guarantee of successes of a medical intervention.

In conclusion, good or bad artificial Intelligence is here to stay. But the ethical considerations surrounding AI especially in the field of medical care should be emphasized and addressed carefully. It's important to remember that AI can never completely replace the value

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of the human touch. In fact, AI and humans may make a fantastic team. Education about and exposure to AI is necessary throughout all domains of pharmacy practice. Pharmacy students should be introduced to the essentials of data science and fundamentals of AI through a health informatics curriculum during their PharmD education (4,5).

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