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ROLE OF AI IN PHARMACY

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ABSTRACT

By increasing medication safety, customizing therapy, and boosting decision-making, artificial intelligence (AI) is transforming pharmacy practice. These days, AI is used in adherence tracking, clinical decision assistance, and medication discovery. With an emphasis on new technologies, pharmacist responsibilities, and ethical issues, this narrative study examines significant advancements, real-world uses, and the ramifications of AI integration in pharmacy practice. Clinical Decision Support Systems (CDSS), telepharmacy, pharmacogenomics, AI-based medication interaction checkers, and predictive analytics were all included in the thematic synthesis. AI promotes precision medicine, lowers prescription mistakes, and improves clinical decision-making. Pharmacists and other medical professionals can optimize care with the use of AI solutions. Nevertheless, issues with workflow integration, algorithmic bias, and data privacy still exist. AI has the potential to revolutionize pharmacy, but integrating it will require resolving issues with workflow and ethics. Realizing the full potential of AI requires interdisciplinary cooperation, pharmacist training, and ethical and regulatory monitoring.

KEYWORDS: Artificial Intelligence (AI): Clinical Decision Support System (CDSS); Drug-Drug Interactions (DDIs); Electronic Health Records (EHRs); Pharmacovigilance (PV); Personalized Medicine; Telepharmacy.

INTRODUCTION

The study of intelligent machine learning, primarily intelligent computer systems that provide results that mimic human attention, is known as artificial intelligence (AI). This process usually involves collecting data, developing efficient methods for utilizing the data, and presenting exact or approximate conclusions, self-corrections, and modifications.

Artificial intelligence (AI), commonly known as machine intelligence, is sometimes used synonymously with robots and automation. While robotics is merely the creation of machines that can carry out difficult repetitive tasks, artificial intelligence (AI) is the exhibition of human-like behaviours or intelligence by any computer or machine.

APPLICATIONS OF AI

AI in diagnosis and targeted genomic treatments

AI is used in hospital-based health care systems in a number of ways, such as organizing dose forms for specific patients and choosing appropriate or accessible administration methods or treatment regimens.

- **Maintaining of medical records:** Keeping up with patient medical records is a challenging endeavour. The AI system facilitates data gathering, storage, normalization, and tracing.
- **Treatment plan designing:** AI technology makes it feasible to create treatment programs that work. The AI system is required to manage the scenario when a patient develops a severe state and choosing an appropriate course of therapy becomes challenging. The treatment plan as recommended by this technology takes into account all prior data and reports, clinical expertise, etc.
- **Assisting in repetitive tasks:** AI technology also helps with some repetitious jobs, such analyzing radiography, X-ray imaging, ECHO, ECG, etc. to identify and detect illnesses.
- **Health support and medication help:** AI technology has been shown to be effective in both health support services and pharmaceutical aid in recent years.
- **Medical accuracy:** AI has a positive effect on genetic development and genomics. An AI system called Deep Genomic is helpful for seeing trends in genetic data and medical records to find mutations and connections to illnesses. This system tells medical professionals about what happens inside a cell when genetic variation modifies DNA.
- **The "open AI ecosystem":** was listed as one of the top 10 promising technologies in 2016. AI assists people in the health care system. Data from social awareness algorithms can be gathered and compared. Patients' medical histories and treatment records from childhood until that age are among the many pieces of information that are documented in the healthcare system. The ecosystems can analyse this massive amount of data and provide recommendations regarding the patient's lifestyle and behaviours.

AI AND DEVELOPMENT OF PHARMACEUTICALS

Every day, research is conducted to battle drug resistance, reduce treatment failure, improve the safety profile of presently available medications, and discover novel active principles for diseases and ailments that are currently incurable. As a result, the quantity and diversity of biomedical data sets used in medication design and discovery are growing. The development of AI in the pharmaceutical sector was aided by this and numerous other factors. These days, some businesses provide software that is highly relevant to data processing, drug creation, and treatment outcome prediction.

Reverse Engineering and Forward Simulation (REFS), an AI machine program used by **GNS Healthcare**, can transfer millions of data points from clinical to genetics, laboratory, imaging, drug, consumer, geographic, pharmacy, mobile, proteomic, and so on. In drug design, a company called Atomwise created the first deep learning neural network for structure-based drug design and discovery, which they named AtomNet. n order to predict the binding characteristics of small molecules with proteins, AtomNet uses a statistical method to extract information from thousands of protein structures and millions of experimental affinity measurements. Pharmaceutical chemists can complete essential drug discovery and design tasks like hit discovery, lead optimization, and toxicity prediction with high precision and accuracy in weeks rather than years thanks to AtomNet technology, which displays three-dimensional images of the protein and ligand pair that show channels for carbon, oxygen, nitrogen, and other types of atoms.

Pharm AI, the company's AI initiative, was revealed by **Insilico Medicine.** According to Insilico Medicine, they used algorithms for reinforcement learning and Generative Adversarial Networks (GAN). One kind of generative model that can both create samples and learn from training examples is the GAN. They consist of the discriminator and the generator, two neural networks. "Adversarial" describes the connection between the discriminator and the generator. The discriminator determines whether a sample is "real" or "fake," with "real" denoting examples that are part of the data set and "fake" denoting examples created by the generator. The discriminator receives samples that the generator attempts to make and learns to construct. As the discriminator improves its identification process, the generator starts to produce samples that resemble the genuine ones through ongoing training. Insilico Medicine asserts that Pharm AI can produce novel molecular structures and identify the biological cause of an illness using GAN and reinforcement learning.

AI IN PHARMACY PRACTICE IN HOSPITAL AND COMMUNITY PHARMACIES

Emails can be tailored more quickly and accurately than any human can thanks to machine learning models. The efficiency of service delivery can be improved by using chatbots. Chatbots can simulate conversations between consumers and customer service representatives. Customer complaints and questions can be automatically resolved by chatbots, and complex concerns are forwarded to human employees. This idea can be used in retail pharmacies. It is possible to program the chatbots to simulate interactions between pharmacists and patients.

Walgreen and Medline, a telehealth company, partnered to provide a video chat platform for patients to communicate with medical professionals. Inventory management is another area where AI might be helpful. Imagine, as a retail pharmacist, being able to anticipate what your patients will require in the near future, stock them, and send them emails reminding them of their medication needs using customized software. AI-powered data analytics can be used to forecast a patient's future medication purchases. The pharmacist will be able to make better stock procurement selections if AI is used to predict the patient's drug purchase.

While inventory management software and applications such as Mckessons, Liberty, Winpharm, PrimeRx, and WinRx are used in retail pharmacy stock management, not all of them make use of artificial intelligence or machine learning. For instance, Blue Yonder, an AI firm, created software for the German online and catalogue retailer Otto Group. With 90% accuracy, this software can forecast what Otto will sell in 30 days. By allowing direct delivery of the product from the supplier to the customer without going via the warehouse, this shortened the delivery timetable for purchased goods from one week or more to one or two days.

IMPLICATIONS FOR PHARMACISTS AND THEIR PRACTICE

AI has the potential to significantly impact and change pharmacists' priorities from distributing prescription drugs to offering a wider range of patient care services. AI can be used by the pharmacist to assist patients maintain their health and get the most out of their medications. Above all, AI gives pharmacies the chance to collaborate more with numerous organizations that serve the same patient. In addition to potentially improving the healthcare services provided by their professionals, AI may be a helpful tool for patients in the following ways: optimizing the value of wearable data; offering daily lifestyle guidance; integrating diet and exercise; supporting treatment compliance and adherence; and offering guidance on how

and where to obtain the most cost-effective healthcare and how to communicate with healthcare professionals.

CONCLUSIONS

AI's incorporation into pharmaceutical practice is a revolutionary development in contemporary healthcare. AI technologies are improving the quality, safety, and effectiveness of pharmaceutical care in a variety of areas, such as drug interaction detection, clinical decision assistance, PV, personalized medication, and automated dispensing. These tools accelerate the transition from reactive to proactive healthcare delivery, support real-time interventions, and allow for better informed decision-making.

By utilizing massive databases and predictive models, AI enables pharmacists to provide tailored treatments, track adherence, and maximize drug use. Additionally, by bringing pharmacological expertise outside of typical settings, it enhances remote healthcare services like telepharmacy and RPM. AI enables pharmacists to move from operational roles to clinical collaborators, educators, and patient advocates as pharmacy practice becomes more data-driven.

Although there are obstacles, AI offers a lot of potential in pharmacy. Data privacy, algorithmic bias, inadequate system compatibility, and ambiguous rules are major issues. Strong regulations, ethical checks, and thorough validation frameworks can help address these issues. Investing in digital systems is necessary to make good use of AI. Pharmacists require continual training, and pharmacy education needs to be updated. This will give pharmacists the knowledge and abilities they need to manage AI-enabled care.

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