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DIGITAL TRANSFORMATION IN PHARMACY USING ARTIFICIAL INTELLIGENCE (AI)

[*1]Yachita Jokhi, [2]Dr. Priyanka Patil and [3]Dr. Nidhi Chauhan

[1]Research Scholar, Department of Pharmaceutical, Science, Sigma University, Vadodara, Gujarat, India.

[2]Provost, Sigma University, Vadodara, Gujarat, India.

[3]Co-guide, Sigma University, Vadodara, Gujarat, India.

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***Corresponding Author**
Yachita Jokhi
Research Scholar,
Department of
Pharmaceutical, Science,
Sigma University, Vadodara,
Gujarat, India.

ABSTRACT

Artificial Intelligence (AI) has become a popular remedy for issues involving numbers and data. Numerous technological advances have resulted from this discovery in almost every industry, including engineering, architecture, education, business, accounting, health, and so forth. AI has made significant contributions to the healthcare industry in a number of areas, including the management and storage of data and information about patient medical histories, medication stocks, sale records, and more; automated machinery; software and computer applications; and diagnostic tools like CT and MRI diagnostics. All of these have been developed to support and streamline healthcare procedures. Without a doubt, artificial intelligence (AI) has transformed healthcare to be more effective and efficient, and the pharmaceutical industry is not exempt. Over the last few years, AI technology is being used to analyze and interpret data in several key pharmacy domains, including polypharmacology, hospital pharmacy, drug development, and dosage form design. We intended to produce a thorough report that would aid every practicing pharmacist in understanding the major advancements made possible by the application of artificial intelligence (AI), in light of the field's expanding significance.

KEYWORDS: Artificial Intelligence, Drug discovery, Personalized medicine, Pharmacy.

INTRODUCTION

The field of pharmacy is undergoing significant modernization**,** driven by rapid technological advancements. Let's explore how digitalization is reshaping the global pharmacy sector: Computers simulating human intelligence is known as artificial intelligence (AI). Information gathering, creating usage guidelines, inferring broad or specific conclusions, and self-correction are all steps in the process. The development of AI is viewed as a double-edged sword: while some people worry that it may jeopardize their jobs, others welcome each new development in the field since they believe it would significantly improve society. AI is utilized in many different fields, from automating commercial processes to developing new teaching strategies. The assumption that artificial intelligence (AI) would soon be used in drug research has grown from hype to hope. This paper discusses potential uses of AI in drug development strategies and processes, pharmaceutical R&D, and the drug development pipeline.[1][2][3]

Enhancing medicine discovery, development, and delivery through the application of Industry 4.0 technologies such as blockchain, additive manufacturing, and artificial intelligence.[4]

Our everyday lives involve AI and machine learning, from facial recognition to Siri. Nonetheless, by hastening the creation of fresh and improved disease remedies, they can save lives. Applications for AI and machine learning range from image processing to self-driving automobiles. But one area of AI research that remains unexplored is its potential application to drug discovery and healthcare. Finding drugs that have a positive effect on the body, or that can be used to treat or prevent a certain condition, is the main objective of drug discovery research.[5]

AI in Drud Discovery[5]

Drugs come in a wide variety of forms, although many of them are tiny molecules created chemically. These have the ability to connect precisely to a target molecule that is present in the illness. Target-driven drug discovery techniques involve using a known target to find tiny compounds that either interact with it or alter its function in cells. These strategies are effective for targets that are easily druggable, have a clear structure, and have well-understood intracellular interactions. These approaches are, however, limited because of the intricacy of cellular connections and the ignorance of complicated biological pathways. By identifying novel interactions and figuring out the functional importance of different biological pathway components, artificial intelligence (AI) in the drug discovery industry can

get over these challenges. AI extracts valuable information from massive datasets by utilizing sophisticated algorithms and machine learning. AI, for instance, finds genes whose expression corresponds with a particular biological state using RNA sequencing data. AI is also capable of recognizing substances that may attach to proteins with unclear structures or "undruggable targets." Iterative simulations involving the interactions of several compounds with fragments of a protein can readily place a predictive collection of compounds in a comparatively short time. Moreover, a novel therapeutic candidate may not succeed in clinical trials even if it exhibits promise in laboratory testing. Actually, less than 10%.

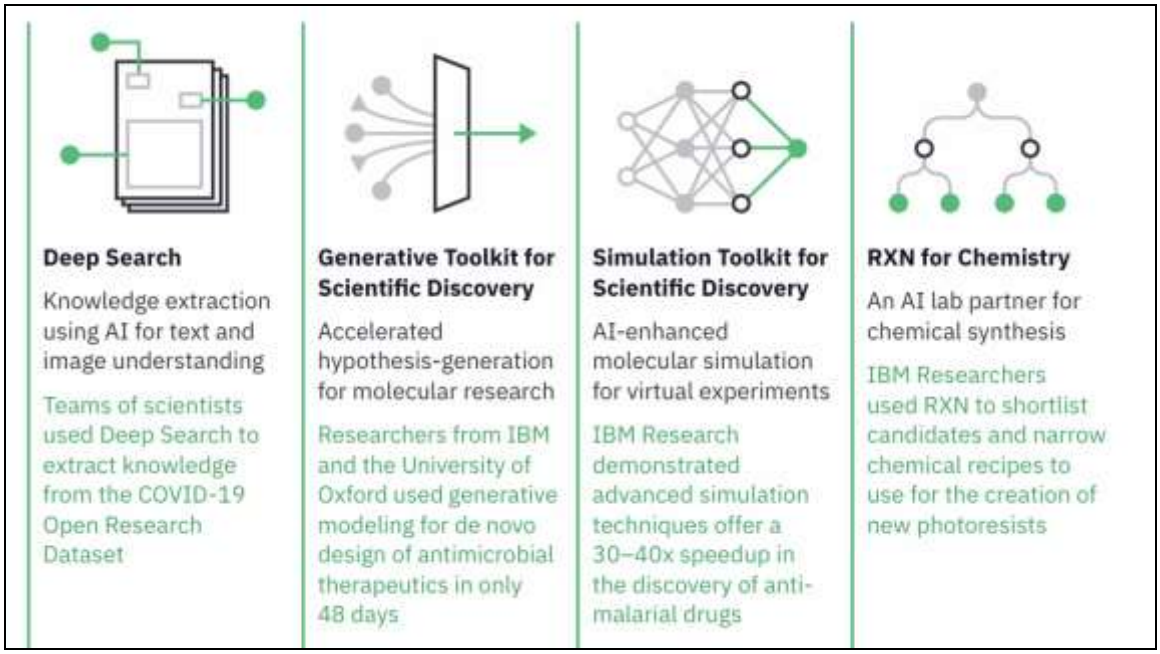

Figure 1: AI tools to accelerate Drug Discovery.[6]

The following variables will fuel AI's expansion in the drug research industry

- Increased demand to reduce expenses and time.
- Adoption of apps and services hosted on the cloud.
- Growth of the pharmaceutical sector
- Patent expiry delay.

Role of AI in Drug Discovery

Phase I - AI in Drug Discovery

The process of finding new medications involves reviewing, evaluating, and testing current literature as well as examining possible interactions between drugs and targets.

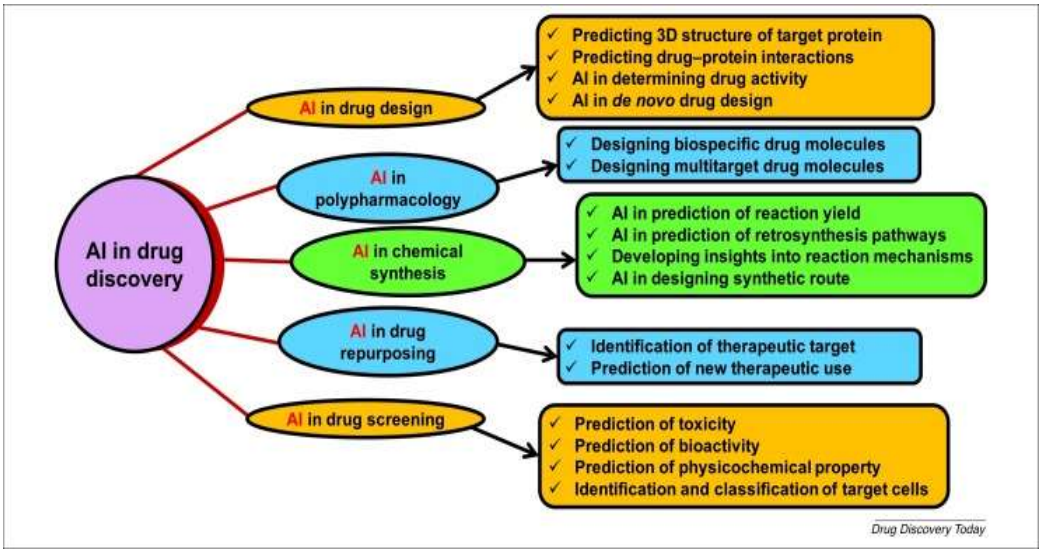

Figure 2: AI in Drug Discovery.[6]

Phase II: Preclinical AI Development

In the preclinical development phase of drug discovery, animal models are utilized to assess prospective therapeutic targets. Using AI in this stage could make trials run more smoothly and enable researchers to make more accurate and timely predictions about how a drug will interact with the animal model.

Phase III: AI in Clinical Research

Researchers start testing the medication on humans once it has been approved by the FDA and successfully completes the preclinical development stage. All things considered, this four-step procedure is typically seen to be the most costly and time-consuming part of the drug-making process. AI is useful for monitoring through clinical trials by producing a larger set of data more quickly, and it can also aid in retention by making the trial experience more tailored to the individual. Because of this, AI is able to rapidly identify a large number of chemicals at a fourth of the time and cost of conventional methods.

AI in Personalized Medicine[17][18][19]

Precision medicine, another name for personalized medicine, is a revolutionary approach to healthcare. It customizes medical care to meet the unique needs of every patient. This method predicts a person's reaction to therapy and risk of disease by taking into consideration characteristics such as their genetic makeup, lifestyle, and environment. Here's a closer examination of customized medicine.

Genetic and Genomic Data: Genetic and genomic data are frequently used in personalized medicine to inform choices about illness prevention, diagnosis, and therapy. With this information, doctors may make more educated and sensible choices based on the individual genetic profile of each patient.

Pharmacogenomics: This field studies how genes affect a person's response to drugs. It aims to develop rational means to optimize drug therapy, with respect to the patients' genotype, to ensure maximum efficacy with minimal adverse effects.

Disease Risk Assessment: Personalized medicine uses genetic marker analysis to determine a person's susceptibility to specific diseases and ailments. This information enables early intervention or preventive measures.

Diagnostic Testing: Based on the patient's genetic composition or other molecular or cellular analysis, diagnostic tests are used to choose the best courses of treatment. This aids in selecting the course of treatment that will have the fewest negative effects.

AI and Machine Learning: Complex biomedical data is increasingly being analyzed using AI and machine learning methods. They are able to spot trends that could indicate disease risk or response to treatment.

Ethical Considerations: Privacy problems, potential biases in data, and the requirement for regulatory control to safeguard patient interests are just a few of the significant ethical difficulties raised by personalized medicine.

Future Prospects: Potential benefits of personalized medicine include more effective, consistent, and powerful healthcare that is tailored to each patient. Better results, more effective use of resources, and improved patient care could result from this.

DISCUSSION

Numerous successful uses of personalized medicine have been observed in a variety of medical specialties. Tumor molecular profiling informs the design of treatments such as trastuzumab (Herceptin) for patients with HER2-positive breast cancer. This makes it possible to develop treatments that target cancer cells directly while protecting healthy cells and minimising negative effects. Genetic testing can help with the choice and dosage of drugs, like the blood thinner warfarin. Personalized medicine uses genetic and biomarker data

to assess an individual's risk for heart disease and customize preventive strategies according. For infectious diseases, vaccines can be tailored based on the patient's genetic makeup to maximize efficacy and minimize bleeding.

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