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Spring 3-29-2024

“The Role of Artificial Intelligence in the Pharmaceutical Field: Enhancing Therapeutic Outcomes and Repurposing through the Acceleration of Drug Discovery”

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Recommended Citation

Valeriano, Tonivie, “The Role of Artificial Intelligence in the Pharmaceutical Field: Enhancing Therapeutic Outcomes and Repurposing through the Acceleration of Drug Discovery” (2024). *Belmont University Research Symposium (BURS)*. 377.

<https://repository.belmont.edu/burs/377>

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“The Role of Artificial Intelligence in the Pharmaceutical Field: Enhancing Therapeutic Outcomes and Repurposing through the Acceleration of Drug Discovery”

The development of new drugs and their repurposing have considerably benefited the field of pharmacy. It will not only affect the pharmaceutical sector but also its diverse facets of health will be significantly influenced. Yet, the development of innovative medical treatments necessitated a lengthy period of expectancy for human survival. Individual survival rates were decreasing over time before the development of the treatment. Humanity has a limited lifespan. Moreover, investments in new drugs often go unnoticed because of the prolonged and complex process of drug research and development (R&D). In the future of pharmacy, artificial intelligence will continue to have an integral part in data analysis and therapeutic outcome optimization. With the assistance of AI, numerous facets of the pharmacy industry—including medication management, drug discovery, and streamlined operations—are being programmed, enhanced, and customized. This research will emphasize the use of artificial intelligence as an instrument for advancing drug discovery, improving therapeutic outcomes, minimizing expenses, and strengthening both the precision and effectiveness of various pharmacy practices. Compared to the prior system that relied on human expertise and traditional procedures, the new artificial intelligence pharmacy system automates common tasks, creates personalized treatment methods, reduces expenses, and promotes patient results. Further, the study will address the necessity it is to guarantee that AI is used ethically and responsibly and thoroughly evaluate how it will affect the community in general as well as the workforce. Improved precision and productivity in patient care are the fundamental advantages of integrating AI into particular pharmacy applications. All things considered, this study will provide an in-depth analysis of the prospects of the pharmacy industry, as well as the significant implications that artificial intelligence may have on it.

In recent years, the pharmaceutical sector has encountered constraints due to the limited scope of modern advances in the pharmaceutical field. One reason for these limitations is the complicated and time-consuming process of developing new drugs, which is associated with high risks and costs (Lu et al., 2023). The development of innovative medical treatments necessitated a lengthy period of expectancy for human survival. Individual survival rates were decreasing over time before the development of the treatment. Similarly, the reliance on traditional procedures and human intuition in this field has resulted in human errors, operational inefficiencies, and subsequent delays (Khan et al., 2023). Moreover, the conventional pharmacy system cannot personalize pharmaceutical schedules to particular patients, potentially limiting the efficacy of drug treatment.

Recent research has shown that healthcare costs, problems with patient care delivery, and dissatisfied patients are all directly attributable to pharmaceutical shortages. In accordance with Phuong, 2019, drug shortages have also been associated with increased expenses for patients, particularly, have resulted in poor outcomes for patients like fatalities, treatment changes, inadequate treatment, and prescription errors. Correspondingly, In accordance with statistics from the 2019 Patient W.A.I.T. Indicator Survey, countries in the European Economic Area (EEA) as well as the European Union (EU) still take a long time—504 days on average—to compensate for innovative medications. This time frame varies among countries, with Poland having 823 days and Germany having 127 days. The pharmaceutical sector acknowledges that

extended delays pose a threat and concerns about the impact they have on patients when combined with the unavailability of medicines (Efpia, 2020).

Considering the preceding factors, it is evident that the current state of the pharmaceutical industry is extremely significant and that innovative measures must be put into place immediately. There is a real risk to human life, and the chances of survival for patients decrease as the delay for a potentially valuable medicine to be developed. Further, it is essential to emphasize that despite human mistakes are to be expected, those who are in a fragile state of health, in particular individuals with critical conditions, are unable to afford the margin for error that may result from medication errors or untimely delays.

In line with current research, artificial intelligence (AI) holds promise for improving pharmaceutical industry productivity, cost-effectiveness, and convenience while decreasing human lapses in judgment. Pharmaceutical procedures will be significantly impacted by AI's growing progress in improving drug delivery. AI can help optimize prescriptions and management decisions by monitoring inventory, anticipating demand, and detecting potential drug interactions and harmful reactions. Applying developments found in data on intake and recovery, artificial intelligence helps with compliance monitoring substantially. More efficient treatments are made available as a result of improved patient-pharmacist communication. It is feasible for machine learning algorithms to accurately predict the number of patients admitted by utilizing historical data, reports, environmental trends, and social media participation. In accordance with Mingle, 2023, knowledge about the medical history of a person and symptoms improves faster and better pharmaceutical treatment as well as more accurate evaluation of the patient.

Accordingly, AI facilitates the distribution of medication that has been personalized for each patient by thoroughly examining patient data, such as reactions and medical records, and recognizing possible risk indicators. This means that pharmacists can more effectively modify prescriptions to the specific demands of individual patients. Apart from that, AI-assisted genetic analysis of data has the potential to reduce the occurrence of negative effects by recognizing patients who are more likely to improve from a particular medicine. In contemporary pharmacy operations, artificial intelligence is a key factor in the automation of inventory control and dispensing. Timesaving and error-reduction techniques raise the quality of both manufacturing and services. Pharmacists can prioritize patients according to their level of urgency by using artificial intelligence (AI) to evaluate medicine usage and prescription history, which guarantees that those in need of help receive it right away.

Researchers have recently discovered that AI could potentially help oncologists anticipate how cancer cells would react to specific therapies. In a similar vein, studies reveal that algorithms may successfully identify cancerous tumors from radiological scans (Przybek, 2023). Another indication of an innovative approach to drug development is the use of advanced generative models and machine learning algorithms in AI-powered de novo drug creation. Computers equipped with artificial intelligence (AI) can self-learn information about molecular characteristics and potential drug targets, leading to more efficient and cheaper compound production. Simultaneously, pre-clinical research is one of the main uses of AI. Early physicochemical and ADMET property evaluation improves pharmacokinetic and toxicological

examinations and reduces the risk of failed medication development. The importance of AI in improving the qualities of possible therapy candidates is shown by this proactive review, which reduces the probability of failure and the costs of clinical trials.

With the assistance of AI, individuals have made huge improvements, and professionals are now granted more accessible availability to vital resources. That being said, with the present rate of upward mobility, it becomes imperative to familiarize oneself with all potential regulatory implications associated with using AI. There are a lot of important factors to consider. Consideration of the following issues is necessary: the impact on medication compliance as well as other permanent repercussions; the moral significance of the confidentiality of data and the threat of unequal treatment; the proper use of AI in satisfying patient demands; and the complexities in establishing data collection and maintaining systems.

Each jurisdiction has its own privacy rules that healthcare professionals must follow when using AI systems to gather, save, or distribute medical information about patients. There must be strict safety procedures in place to prevent unwanted access to patient data. To be more specific, it may be necessary to obtain patient consent before using AI to gather or analyze health data, depending on the specific situation. Medical Professionals should verify whether they adhere to any artificial intelligence legislation by communicating with the pharmaceutical boards in the jurisdictions where they operate. A convenient means of connecting with state pharmacy boards is extremely important since AI differs from one state to another. Inaccuracies and errors that occur during the use of AI for inventory supervision or drug deliveries should be the responsibility of the pharmaceutical industry. Therefore, to guarantee the precision and dependability of AI technology, it is required to strictly conform to all applicable rules and regulations.

Many advantages and disadvantages have appeared as a result of Artificial Intelligence being introduced into the healthcare industry. Machine learning systems can surpass conventional operational efficacy; they ought to signify a fundamental change that can enhance managerial effectiveness and deliver designed specific outcomes. From examining tumor cells to anticipating possible drug interactions, artificial intelligence has substantially enhanced healthcare services. Along with this, using its ability to analyze prescription data and medical treatment use, pharmacists can categorize patients according to the severity of their condition.

In any case, broadening the use of AI is impeded by several intricate barriers, including technological difficulties, constant improvement, and sensible moral reservations. It is evident from understanding these complexities, that the use of AI in the field of medicine will have considerable effects on future medical breakthroughs and progress. The researcher believes that individuals and medical professionals can benefit immediately from the utilization of the present algorithms used to create AI. Filling in the gaps and minimizing the constraints will need serious training, education initiatives, and adequate financing. Following this underlying strategy should enable AI's maximum potential to address any concerns and set an objective for the future that delivers greater medical care and positive results. Therefore, highlighting the many benefits and growing importance of AI technology to the pharmaceutical industry, will certainly resolve concerns and bring forth concrete opportunities for refined patient service.

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