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TRENDS REPORT:

Using Artificial Intelligence in Cell & Gene Therapies

The global market for **personalized medicine is expected to reach $3.18 trillion** within the next five years. While cell and gene therapy models present countless advantages for life science companies and their patients, there are a number of challenges in actualizing treatments for patients. Fortunately, the advent and evolution of artificial intelligence is well-timed to help life sciences companies meet and overcome these obstacles handily. Below, we outline four key trends demonstrating how businesses are using artificial intelligence in personalized medicine, including cell and gene therapy.

TREND #1:

Making Sense of the Data

One of the significant advantages of AI systems is the ability to sift through and analyze copious amounts of data. Businesses in the life science industry, particularly personalized medicine providers, can derive major benefits from patient-related data, which is currently severely underutilized. The average individual is estimated to **produce over 1 million gigabytes of health-linked data** throughout their lifetime. However, genetic data's high-dimension, low-sample-size form can make it difficult to manage.

The advent of machine learning in healthcare provides exciting possibilities for developers of precision therapies to make sense of patient-related data. One example comes from a study that used AI to analyze the genetic data of 800 Mayo Clinic patients, with hopes of assisting psychiatrists with prescribing anti-depressants. After processing each individual's genetic data and health record, the algorithm predicted whether a particular drug would alleviate the patient's symptoms **with a 90% accuracy rate**. Previously, the psychiatrists used a standardized method to prescribe depression-related medication which was accurate only 50% of the time. Ultimately, the ability of AI to process and analyze vast amounts of structured and unstructured data paves the way for many other opportunities within personalized medicine.

"The combination of an AI system and HCP's expertise increased the success rate of the diagnosis to 99.5%, reducing the human error by 85%."

SOURCE

TREND #2:

Enhancing the Treatment

Through the analysis of vast amounts of patient-related data, AI can assist HCPs in their treatment efforts. Since personalized medicine tailor's unique treatment to each individual patient, both diagnosis and treatment require a high degree of skill and precision. Therefore, machine learning models can provide immense support to HCPs by dissecting bountiful amounts of information and providing data-driven diagnoses for each patient. An example of this productive assistance was exhibited at the International Symposium on Biomedical Imaging, where participants developed algorithms to detect breast cancer in images of biopsies. As a result, combining an AI system with a HCP's expertise **increased the success rate of the diagnosis to 99.5%, reducing the human error by 85%**.

Additionally, the growth of health apps and wearables will produce a myriad of patient-related data points over the next decade. Using AI to analyze this data can provide HCPs with a holistic understanding of patients' health conditions and habits, i.e. diet, exercise, sleep. For example, a research team at Cardiogram used an AI neural network to analyze their patients' wearable data to facilitate early detection of sleep apnea and atrial fibrillation. Both conditions were diagnosed **with over 90% accuracy**.

TREND #3:

Addressing Clinical Trial Eligibility Bottlenecks

Due to a variety of bottlenecks, the success rate of conventional clinical trials is low. Since the year 2000, over 300,000 trials were reported worldwide, but **only 35,000 became registered studies**. While cell therapy trials have greater chances of high success rates due to smaller patient groups, they still face obstacles that could be addressed through the implementation of AI.

Through the analysis of health data records via machine learning algorithms, those conducting clinical trials can identify patients and efficiently eliminate non-responders. A retroactive study conducted on oncology trials at the Comprehensive Blood and Cancer Center demonstrated that the implementation of an AI algorithm **enhanced the correct identification of eligible patients by 50%**, compared to standard practices. Furthermore, a patient's adherence to the trial's dosage requirements could be easily tracked using wearables, which would make the data accessible in real-time. Since only **15% of all trials do not have patient dropouts**, AI could also predict the probability of individual patients leaving the trial early.

TREND #4:

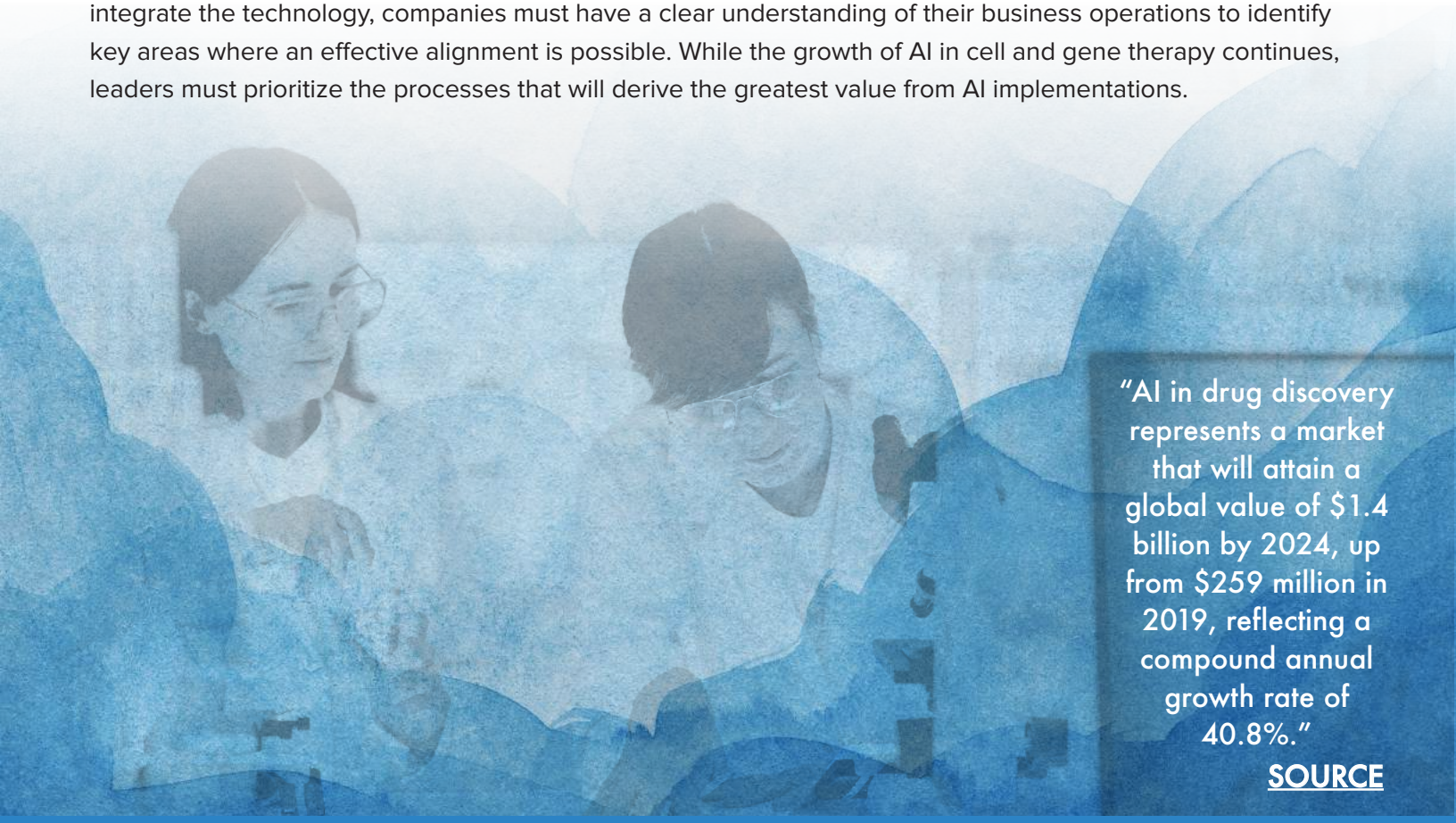
Cost Reduction Strategies

Considering the costly nature of personalized medicine, where some treatments reach **$350,000 per patient annually**, AI can provide significant cost-saving benefits for both companies and their patients. The high costs result from small groups of patients, quick treatment windows, and high R&D investments. Consequently, many personalized medicine companies use a value-based pricing model to rationalize the high costs associated with the development of a treatment.

Creating cost-savings in cell and gene therapy is inherently difficult. Most treatments require significantly more lab work for both design and manufacturing while the individual nature of the treatments makes standardizing the processes and scaling up production more complex. That said, collaborations like the one between Microsoft and Oxford BioMedica illustrate how businesses can utilize AI to accelerate cost-savings. In this agreement, Oxford BioMedica provides enormous data sets on its manufacturing processes to Microsoft's Station B artificial intelligence cloud platform with the aim of creating computational models that would identify opportunities to improve yield and cost efficiency. Similarly, **other AI tools and platforms** are automating certain aspects of the laboratory process in order to generate cost savings.

Going Forward

AI provides a lot of promise for the enhancement of cell and gene therapy models. In order to successfully integrate the technology, companies must have a clear understanding of their business operations to identify key areas where an effective alignment is possible. While the growth of AI in cell and gene therapy continues, leaders must prioritize the processes that will derive the greatest value from AI implementations.



"AI in drug discovery represents a market that will attain a global value of $1.4 billion by 2024, up from $259 million in 2019, reflecting a compound annual growth rate of 40.8%."
SOURCE

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