IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

ARTIFICIAL INTELLIGENCE OF PERSONALIZED MEDICINE FOR BETTER HEALTH CARE

[1]Y Sumeet, [2]Varkala sravanthi, [3]Maddela Shirisha, [4]Ravula Anusha, [5]P Jayasree
[1]Student, [2]Student, [3]Student, [4]Student, [5]Assistant professor
Department of pharmacy practice,
Joginpally B.R. pharmacy college, Hyderabad, Telangana, India.

Abstract : Personalized medicine, also known as precision medicine is a novel approach based on the genetic information of a particular individual that helps in the diagnosis and treatment of several diseases. Personalized medicine has been an increasingly significant subject in public health policy since it started in the early 2000s, frequently portrayed in the media as a revolution in medical treatment. Personalize medicine has followed many technical advances, notably in genetics and genomics, allowing new therapeutic options for any medical condition such as coronary artery disease, Alzheimer's disease, severe depression, and cancer. However, personalizing medicine helps in improving medication selection and decreasing adverse effects caused by different drugs. Artificial intelligence helps with data processing and management and increases the accuracy of medical decision-making. Clinical decision support systems with AI capabilities may improve intelligence to enhance decision-making, decrease diagnostic mistake rates, and help physicians extract and document EHR data. Utilization of artificial intelligence and block chain technology might assist in identifying and prioritizing certain patients for monitoring of medication and their side effects, while block chain technology analyzes the patient's overall state, diagnosis, and recovery system and investigates the patient's surgical interventions through simultaneous operations and clinical decision-making computational studies.

IndexTerms **- Personalized medicine,Artificial intelligence(AI),Genetic information, Block chain technology, EHR(Electronic health record)data.**

INTRODUCTION:

Personalized medicine, also known as precision medicine (sometimes called individualized medicine), is a novel approach that divides people into different groups based on their genetic, environmental, and lifestyle characteristics to help doctors make decisions about their treatment. Precision medicine's main goal is to offer a more precise technique for illness diagnosis, treatment, and prevention. [1,2]

Although not new at the time, personalized medicine emerged in the 1990s as a result of advancements in DNA sequencing technologies, such as automation and higher throughput. These developments led to initiatives like the Human Genome Project (HGP; 1990–2003), which clarified the sequences of the human genome's more than three billion base pairs and made them accessible to researchers all around the world. Similarly, the International HapMap Project (2002–2010), which identified the genetic abnormalities that cause human illness, identified specific diseases and disorders. [3] Personalized medicine (PM) has been an increasingly significant subject in public health policy since it started in the early 2000s, frequently portrayed in the media as a revolution in medical treatment [4,5]. PM has followed many technical advances, notably in genetics and

genomics, allowing new therapeutic options for any medical condition such as coronary artery disease, Alzheimer's disease, severe depression, and cancer. [6,7,8]

Need for personalized medicine:
The improvement of medical treatment, namely the safety of pharmacotherapy, is made possible through personalized medicine. In order to improve the safety and efficacy of medications, which are now far from adequate, and to decrease ADRs, Currently, it appears that using genomes and proteomics will be the most effective strategy to increase medicine's safety and effectiveness. [9]

Traditional vs. Personalized medicine:
Drugs and other therapies are created to treat vast populations of individuals who have the same disease, such as cancer or diabetes. In general, many doctors base their therapy on what is most likely to be effective for everyone who has a comparable illness. They may take into account your sex, age, or weight. However, not everybody reacts to therapy in the same manner. For certain people, certain medications work really effectively. Others don't help at all or cause harmful side effects. It may take some trial and error to find the precise medication that is right for the patient.Personalized medicine takes things a step further. Doctors look at the genetic profile, lifestyle, and environment in addition to the disease's features to choose the best course of treatment. Personalized medicine is also known as customized medicine since it is so directly related to a particular person. They may observe how specific gene alterations result in disease and how one person's response to treatment for heart disease, diabetes, or cancer differs from another's. Understanding how genes and illnesses interact might help doctors improve therapies so that they are more effective. [10]

Advantages of personalized medicine:
- Personalised medicine may provide more focused therapy and better drug selection.
- Early diagnosis of diseases.
- Reduces adverse effects.
- boost adherence from patients.
- Change medicine's focus from treating symptoms to preventing them. increase the economy of cost.
- Predicting the susceptibility to illness and enhances the identification of diseases.
- Stop the progression of the disease.
- Tailor your disease-prevention tactics.
- makes the use of prescription drugs more efficient and stops the prescription of drugs with known negative effects.
- lowers costs and saves time. Discover the disease's risk factors and target your therapy.
- It enhances medical judgement.
- Boost the medication's effectiveness and safety. [11]

Role of artificial intelligence's in personalized medicine:
With the use of artificial intelligence, which is a subfield of computer science, difficult problems may be solved by creating intelligent computers that behave like humans. [12] They can quicken data processing and increase the accuracy of medical decision-making by uses several theories, techniques, and computational resources and also conduct intellectual activities including thinking, language comprehension, speech recognition, decision-making, and visual perception. [13,14] There are many different types of AI technologies used in medicine, ranging from the purely virtual (such as deep learning-based health information) to the purely physical (such as management systems and active physician guidance in treatment decisions) to the cyber-physical (such as surgical assistant robots and targeted nanorobots for drug delivery). [15]
It is still very new to use AI in personalized medicine to find, diagnose, and treat cancer. Due to artificial intelligence's (AI) capacity to progress both medicine and research, the use of AI in healthcare has grown dramatically over the years and has the potential to expand even more each year. Without the integration of artificial intelligence, even personalized medicine is limited.[16] Many image-based detection and diagnosis systems in the healthcare industry may now perform as well as or even better than physicians in some circumstances because of the ability of AI technology to distinguish complex patterns and hidden structures. [17] Clinical decision support systems with AI capabilities may improve intelligence to enhance decision-making, decrease diagnostic mistake rates, and help physicians extract and document EHR data.

[18]Personalised medicine with the aid of artificial intelligence (AI) is making significant strides in various diseases. Some of the key areas include:

- Cancer: Al helps in analysing genetic mutations. predicting responses to treatment and customising therapies.
- Cardiovascular Diseases: Al assists in early detection. risk prediction, and tailoring treatment plans based on individual patient data.
- Diabetes: Al aids in predicting complications, optimising insulin therapy, and personalising lifestyle recommendations.
- Neurological Disorders: Al is used in diagnosing and personalising treatment for conditions like Alzheimer's disease, autism spectrum disorder, epileptic encephalopathy, intellectual disability, attention deficit hyperactivity disorder (ADHD), and rare genetic disorders.
- Rare Genetic Disorders: Al helps in identifying specific genetic mutations and developing targeted therapies.
- Infectious Diseases: Al assists in predicting outbreaks. personalising treatment plans and optimising drug development, especially in diseases like HIV and COVID-19.

Personalized medicine in treatment of cardiovascular diseases:

Cardiovascular medicine is an area with a long history of embracing predictive modelling to assess patient risk. Recent work has uncovered methods to predict heart failure and other serious cardiac events in asymptomatic individuals.AI, when combined with personalised prevention strategies [19, 20], may positively impact disease incidence and sequela. Complex diseases, such as cardiovascular disease, often involve the interplay among gender, genetic, lifestyle, and environmental factors. Integrating these attributes requires attention to the heterogeneity of the data. [21] AI approaches that excel at discovering complex relationships among a large number of factors provide such opportunities. A study from Vanderbilt demonstrated early examples of combining EHR and genetic data with positive results in cardiovascular disease prediction. [22] AI-enabled recognition of phenotype features through EHR or images and matching those features with genetic variants may allow faster genetic disease diagnosis. [23] For example, accurate and fast diagnosis for seriously ill infants that have a suspected genetic disease can be attained by using rapid whole-genome sequencing and NLP-enabled automated phenotyping. [24]

Personalized medicine in treatment of cancer:

Personalized medicine is used for tailoring cancer treatments based on the genetic composition, lifestyle, and cellular and molecular properties of each patient's tumour and surrounding tissue.[25] Precision medicine offers a crucial alternative to current standard treatments like radiation and chemotherapy, which only benefit a small number of patients and harm healthy tissues as well as cancer cells. [26] Clinicians can apply precision medicine to choose the right medications for individual patients by using tools such as next-generation sequencing to evaluate the genetic mutations causing cancer or other molecular features of the tumour. [27] Oncology examples of precision medicine, along with the corresponding cancer kind and biomarker or gene they target, are

- Imatinib is a medication that targets the BCR-ABL1 fusion oncogen in the treatment of chronic myeloid leukemia.
- Trastuzumab targets HER2/neu ERBB2 in the treatment of breast cancer.
- PARP inhibitors (olaparib, rucaparib, niroparib, and talazoparib) target BRCA1 and BRCA2 mutations in breast cancer.
- BRAF inhibitors: Target BRAF V600E in the treatment of metastatic melanoma.

Using personalized medicine to treat chronic myeloid leukaemia (CML) is one prominent example. A fusion oncogene called BCR-ABL, the product of a chromosomal translocation, is the main cause of CML. [28] Imatinib, a medication that inhibits the resultant fusion protein, has significantly improved clinical results; instead of chemotherapy, it is now usually the first line of treatment for individuals with CML. [29] Cell-free DNA (cfDNA) testing is another type of personalised medicine that allows doctors to monitor disease progression and tumour burden in addition to diagnosing cancer, performing molecular tumour profiling, evaluating the effectiveness of cancer treatments, and monitoring disease progression. [30]

Artificial Intelligence and Block Chain Technology:

Utilising blockchain, artificial intelligence, and other widely available technologies is the key to success [19, 20]. Artificial intelligence (AI), for instance, might assist in identifying and prioritising certain patients for medication monitoring and growth, vital for controlled drug manufacturing and quicker turnaround times [21]. Clinical trial data was tracked utilising numerical drug design techniques and AI for the purposes of repurposing commercially available drugs, investigating the efficacy of pharmaceutical formulations, and dose measurement [22].

Blockchain platform that focusses on concurrent execution, artificial intelligence healthcare networks, and the suggested method to detect the health state of patient illnesses In order to evaluate the quality of patient care and the viability of diagnosis, the proposed method has been tested in both real-world and simulated healthcare systems. It analyses the patient's overall state, diagnosis, and recovery system and investigates the pertinent surgical interventions through simultaneous operations and clinical decision-making computational studies. [23,24]

Blockchain facilitates the development of a system that creates and manages ledgers, or content blocks, with secure and automated data analysis. The secure recording and analysis of all health-related data will provide fast updates for medical professionals, healthcare workers, and payers. AI algorithms integrated into the blockchain take this a step further.[25]

CONCLUSION:

There is no persenolized medicine without artificial intelligence . Personalized medicine is an emerging approach that considers variability in each person's genes, environment, and lifestyle for treatment and preventio of different disease. Almost every significant sector, including medicine and healthcare, uses artificial intelligence (AI). Three main areas where AI is contribute to the realisation of personalized medicine goals are disease prevention, personalised diagnosis, and personalised treatment. In addition to artificial intelligence, block chain technology may also helps in storage of patients data and provide health care professional or patient with comprehensive information about their health status. This helps in monitoring the patients illness and provide best treatment.

A new approach to healthcare called "personalized medicine" holds the potential to both improve and entirely transform healthcare by offering more accurate, effective care that is tailored to each patient. AI in personalised medicine seeks to accomplish that, but before it can be effectively applied as standard care, a number of issues need to be resolved. AI has the ability to sort through massive data sets and identify patterns that were previously unidentifiable, which enables faster diagnosis, more precise treatment, and improved health outcomes. With the advent of artificial intelligence, personalised medicine may now provide more proactive treatment by customising interventions based on a patient's unique genetics, surroundings, and lifestyle. Artificial intelligence can also assist with administrative tasks, lower expenses, and increase the effectiveness of the healthcare system.A variety of difficulties are also raised by the application of artificial intelligence in personalised medicine, such as privacy concerns, ethical dilemmas, and the need to implement relevant laws that will create a suitable framework and effective points pertaining to patient safety and trust.In conclusion, artificial intelligence (AI) has great promise for improving personalised medicine and paving the way for improved health outcomes in the future. Realising the full benefits of AI in this industry will require continued research, technological investments, and the creation of comprehensive legislation.

REFERENCES:

[1]Stratified, personalised orP4 medicine: a new directionfor placing the patient atthe centre of healthcare and health education(Technicalreport).Academy ofMedical Sciences.May 2015.Archived fromthe original on27October 2016. Retrieved6January2016.

[2] Cyrille Delpierre1* and Thomas Lefèvre2.Precision and personalized medicine: What their current definition says and silencesaboutthemodelofhealththeypromote.Implicationforthedevelopmentofpersonalized health.

[3] KaraRogers-PersonalizedMedicine,EncyclopædiaBritannica(Oct31,2022)

[4] Carver R.B., Castéra J., Gericke N., Evangelista N.A.M., El-Hani C. Young Adults' Belief in Genetic Determinism, and Knowledge and Attitudes towards Modern Genetics and Genomics: The PUGGS Questionnaire. 2017;12:e0169808. doi: 10.1371/journal.pone.0169808. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

[5] Marcon A.R., Bieber M., Caulfield T. Representing a " Revolution" : How the Popular Press Has Portrayed Personalized Medicine. 2018;20:950– 956. doi: 10.1038/gim.2017.217.[PubMed] [CrossRef] [Google Scholar]
[6] Chan I.S., Ginsburg G.S. Personalized Medicine: Progress and Promise. 2011;12:217– 244. doi: 10.1146/annurev-genom-082410-101446. [PubMed] [CrossRef] [Google Scholar]
[7] Prasad V.,Fojo T., BradaM.Precision Oncology:Origins, Optimism, and Potential. 2016;17:e81– e86. doi: 10.1016/S1470-2045(15)00620-8. [PubMed] [CrossRef] [Google Scholar]
[8] Souslova T., Marple T.C., Spiekerman A.M., Mohammad A.A. Personalized Medicine in Alzheimer' s Disease and Depression. 2013;36:616– 623. doi: 10.1016/j.cct.2013.06.012. [PubMed] [CrossRef] [Google Scholar]
[9] CaitlinBeddows,WhyDoWeNeedPersonalizedMedicineandWhatShouldOurPrioritiesBe?(December18,2015)
[10] StephanieWatson.raditionalvs.PrecisionMedicine:HowTheyDiffer.(June10,2022)
[11]Association of the British Pharmaceutical Industry:The stratification of disease for personalised medicines. [Apr16; 2009].
[12] O.Adir,M.Poley,G.Chen etal.," Integrating artificial intelligence and nanotechnologyfor precision cancermedicine," AdvancedMaterials,vol.32,no.13,p.1901989,2020.Viewat:PublisherSite|GoogleScholar
[13] I. Kavakiotis, O. Tsave, A. Salifoglou, N. Maglaveras, I. Vlahavas, and I. Chouvarda, " Machine learning and data mining methodsindiabetesresearch," Computational andStructural BiotechnologyJournal,vol.15, pp.104– 116,2017.View at:PublisherSite|GoogleScholar
[14] A. Qayyum, A. Lalande, and F.Meriaudeau," Automatic segmentation oftumors and affected organsinthe abdomen using a 3D hybrid model for computed tomography imaging," Computers in Biology and Medicine, vol. 127, article 104097,2020.Viewat:PublisherSite|GoogleScholar.
[15] Hamet,P.&Tremblay,J.Artificial intelligence in medicine.Metabolism 69S,S36– S40(2017). [PubMed] [GoogleScholar]
[16] KamalJaint&VinitaShah,ArtificialIntelligenceforPrecisionMedicineandBetterHealthcare.
[17] Topol, E.J. DeepMedicine: How Artificial Intelligence Can Make Healthcare Human Again(Basic Books, New York, NY, 2019).[GoogleScholar]
[18] Davenport,H.T.etalUsingAItoimproveelectronichealthrecords.HarvardBus.Rev.12,1–6(2018).[GoogleScholar]
[19] Schwalm, J.D. et al Resource effective strategies to prevent and treat cardiovascular disease. Circulation 133, 742–755 (2016). [PMC free article] [PubMed] [Google Scholar]
[20] August, G.J. & Gewirtz, A. Moving toward a precision-based, personalized framework for prevention science: introduction to the special issue. Prev. Sci. 20, 1–9 (2019). [PMC free article] [PubMed] [Google Scholar]
[21] Tannenbaum, C. et al Sex and gender analysis improves science and engineering. Nature 575, 137–146 (2019). [PubMed] [Google Scholar]
[22] Zhao, J. et al Learning from longitudinal data in electronic health record and genetic data to improve cardiovascular event prediction. Sci. Rep. 9, 717 (2019). [PMC free article] [PubMed] [Google Scholar]
[23] Gurovich, Y. et al Identifying facial phenotypes of genetic disorders using deep learning. Nat. Med. 25, 60–64 (2019). [PubMed] [Google Scholar]
[24] Clark, M.M. et al Diagnosis of genetic diseases in seriously ill children by rapid whole-genome sequencing and automated phenotyping and interpretation. Sci. Transl. Med. 11, eaat6177 (2019). [PMC free article] [PubMed] [Google Scholar]
[25] Habeeb NW-A, et al. The use of targeted therapies for precision medicine in oncology. Clin Chem. 2016;62(12):1556-1564.
[26] Krzyszczyk P, et al. The growing role of precision and personalized medicine for cancer treatment. Technology. 2018;6(3-4):79-100.
[27] Morash M, et al. The role of next-generation sequencing in precision medicine: a review of outcomes in oncology. J Pers Med. 2018;8(3).
[28] Iqbal N, Iqbal N. Imatinib: a break through of targeted therapy in cancer. Chemother Res Pract. 2014;2014:357027.
[29] Schwartzberg L, et al. Precision oncology: who, how, what, when, and when not? Am Soc Clin Oncol Educ B. 2017;(37):160-169.

[30] Wan JCM, et al. Liquid biopsies come of age: towards implementation of circulating tumour DNA. Nat Rev Cancer. 2017;17(4):223-238.
[31] Wong ZSY, Zhou J, Zhang Q. Artificial intelligence for infectious disease. Big data analytics. Infect Dis Heal. 2019;24(1):44–48. doi: 10.1016/j.idh.2018.10.002. [PubMed] [CrossRef] [Google Scholar] [Ref list]
[32] Bragazzi NL, Dai H, Damiani G, Behzadifar M, Martini M, Wu J. How big data and artificial intelligence can help better manage the covid-19 pandemic. Int J Environ Res Public Health. 2020;17(9):3176. doi: 10.3390/ijerph17093176. [PMC free article] [PubMed] [CrossRef] [Google Scholar] [Ref list]
[33] Paul D, Sanap G, Shenoy S, Kalyane D, Kalia K, Tekade RK. Artificial intelligence in drug discovery and development. Drug Discov Today. 2021;26:80–93. doi: 10.1016/j.drudis.2020.10.010. [PMC free article] [PubMed] [CrossRef] [Google Scholar] [Ref list]
[34] Cha Y, Erez T, Reynolds IJ, Kumar D, Ross J, Koytiger G, Kusko R, Zeskind B, Risso S, Kagan E, Papapetropoulos S, Grossman I, Laifenfeld D. Drug repurposing from the perspective of pharmaceutical companies. Br J Pharmacol. 2018;175(2):168–180. doi: 10.1111/bph.13798. [PMC free article] [PubMed] [CrossRef] [Google Scholar] [Ref list]
[35] Bryatov SR, Borodinov AA. Blockchain technology in the pharmaceutical supply chain: researching a business model based on hyperledger fabric. In: CEUR Workshop Proceedings; 2019. pp. 21–24. [Google Scholar] [Ref list]
[36] Hylock RH, Zeng X (2019) A blockchain framework for patient-centered health records and exchange (healthChain): evaluation and proof-of-concept study. J Med Internet Res 21. [PMC free article] [PubMed] [Ref list]
[37] Hang L, Choi E, Kim DH. A novel EMR integrity management based on a medical blockchain platform in hospital. Electronics. 2019;8:467. doi: 10.3390/electronics8040467. [CrossRef] [Google Scholar] [Ref list]