A Review Article on AI in Personalized Medicine & Novel Pharamacology

[1]Ms. E. Honey, M. Pharmacy., *[2]Shaik. Athavulla

[1]Assistant professor, Department of pharmacology

[2]IV B. Pharmacy, Dr. K. V. Subba Reddy Institute Of Pharmacy

DOI: https://dx.doi.org/10.51244/IJRSI.2025.12110088

Received: 24 November 2025; Accepted: 04 December 2025; Published: 09 December 2025

ABSTRACT

A revolutionary change in contemporary healthcare is represented by the incorporation of artificial intelligence (AI) into personalized treatment. Utilizing a patient's genetic, molecular, and clinical characteristics, personalized medicine customizes treatments and diagnostics to maximize benefits and reduce side effects. By making it possible to analyse complicated datasets, such as those from genomes, proteomics, medical imaging, and electronic health records, AI technologies improve this paradigm by identifying biomarkers, forecasting treatment outcomes, and directing precision drug delivery. The creation of predictive, preventive, individualized, and participative healthcare models is encouraged by this synergy. At the same time, new developments in pharmacology keep redefining treatment strategies for a variety of illnesses. Drug development innovations for diseases like Parkinson's disease, anxiety, cardiovascular disease, cystic fibrosis, gastrointestinal problems, and urinary tract infections concentrate on focusing on certain neurotransmitter systems and molecular pathways.

These include innovative tactics utilizing adenosine signaling and vagal tone modulation, as well as dopaminergic, serotonergic, cholinergic, glutamatergic, and GABAergic drugs. AI combined with innovative pharmacology has the potential to provide highly customized, efficient, and resource-efficient healthcare. This review highlights the potential for synergy between AI-enhanced personalized medicine and innovative pharmaceutical therapies to transform clinical practice by examining their current status, obstacles, and future possibilities.

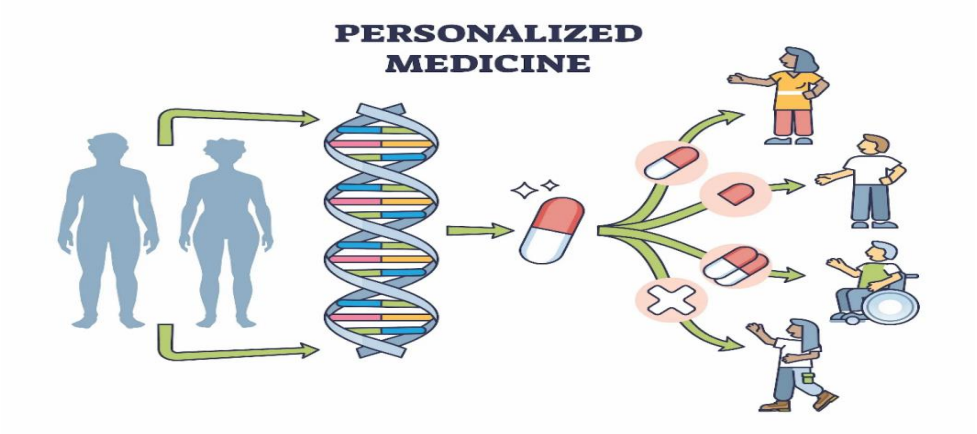
Key words: Artificial intelligence (AI)in healthcare, Personalized medicine, Precision medicine Predictive medicine, Genomic and proteomics, Biomarkers in medicine

INTRODUCTION

Personalized Medicine

One of the best ways to use patient history is in personalized medicine, which helps create medications and medical equipment that are specific to each patient. according to their DNA and genetic makeup. By using genetics to understand the range of treatments for various diseases, customized medicine offers a futuristic approach. The application of personalized medicine to address each patient's unique disease causation, development, and response to treatment represents a paradigm shift in healthcare, moving away from uniform approval [1] Using genetic profiles to identify the best medication and treatment for a patient while reducing side effects is one of the most crucial personalized medicine goals that will benefit patients as well as healthcare systems in general. Predictive, preventative, customized, and participative medicine (fig. 1), along with the personalized medical paradigm, will make it feasible to identify the right medication for the right patient at the right time, avoiding the dispensing of costly and ineffective medications and potential harmful side effects [2]. In particular, a combination of genetic data and clinical research should significantly advance preventive medicine and, consequently, future medicine. New genome-based diagnostic technology represents a significant advancement in medical practice when compared to current prevention methods.[3]

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue XI November 2025



Numerous efforts are being made to identify individual differences in the molecular processes that contribute to disease pathogenesis, disease course, and response to therapeutics in order to achieve personalized medicine, or the high-order tailoring of medical practice to the individual. [4]

In this piece, we provide a general overview of those technologies' current state and talk about the paths that must be taken in order to completely develop and apply personalized medicine. We focus on instances that highlight the importance of molecular markers in the development and treatment of disease, including medication response and drug monitoring markers, screening and progression markers, and disease predisposition markers [4].

Examples of personalized medicine:

S.NO	DRUG	DISEASE	DOSE	MECHANISM
1	Rifampicin	Tuberculosis	300-900mg	Inhibiting bacterial DNA-dependent RNA polymerase
2	Levetiracetam	Epilepsy	500-1000mg	Binding to the synaptic vesicle protein 2A
3	Levodopa	Parkinsons disease	100mg	Crossing the BBB and being converted into dopamine
4	Methotrexate	Juvenile idiopathic arthritis	1ml=100mg	interfering with rapidly dividing cells and modulating the immune response, primarily through folate antagonism and the accumulation of adenosine.
5	Cytarabine	Leukemia	500mg	DNA replication and repair also halt due to the inhibition of DNA polymerase by cytarabine.
6	Aspirin	Cardiovascular disease	80-160mg	To block the COX-1 enzyme
7	Roflumilast	COPD	250mg 500mg	To selectively inhibiting the phospodiesteres-4 enzyme to increase the Camp
8	Ceftriaxone	Meningitis	500-1000mg	Inhibiting the mucopeptide synthesis in the bacterial cell wall

Artificial Intellegence In Personalised Medicine

The idea of customized medicine, which adjusts a patient's therapy based on their unique characteristics, has been a persistent goal in the medical field. Through technical developments, artificial intelligence has achieved these goals, improving diagnosis and treatment. In terms of diagnosis, treatment, patient care, and expedited

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue XI November 2025

drug discovery, artificial intelligence has profoundly transformed the healthcare sector [4]. AI can find patterns and connections that a clinician would miss by using information from a patient's genetics, history, and photos, among other data inputs. Artificial intelligence (AI) applications in image identification can assist in identifying subtle differences in X-ray or MRI images for the diagnosis of neurological disorders, cancer, and cardiac illnesses.[5]

The goal of 21st-century personalized medicine is to prescribe the appropriate medication and dosage for each patient. The topic of personalized medicine is currently quite popular in the medical and healthcare industries [6]. By providing medication based on the proteome profile, genomes, and epigenomics of each patient's unique illness, it moved the medical intervention. the diagnostic and treatment strategy, which will boost patient involvement both during and satisfaction.[7]

In personalized medicine, artificial intelligence (AI) can improve medication selection, target treatment, reduce side effects, and increase patient compliance. the advancement of genetic profile-based personalized medicine.[8]

In modern clinical practice, a doctor makes a pathologic diagnosis based on a patient's symptoms and clinical tests, then prescribes a drug in a generic way without considering the patient's genetics, metabolomics, or proteome [9]. Combining omics data may reveal genetic variations among people reacting to selective serotonin reuptake inhibitors. The question of whether the medication may be tailored was raised by these discoveries that linked genetic plus omics to therapeutic response [10]. Personalized medicine for cancer prevention and treatment is a potential example. Bioinformatics

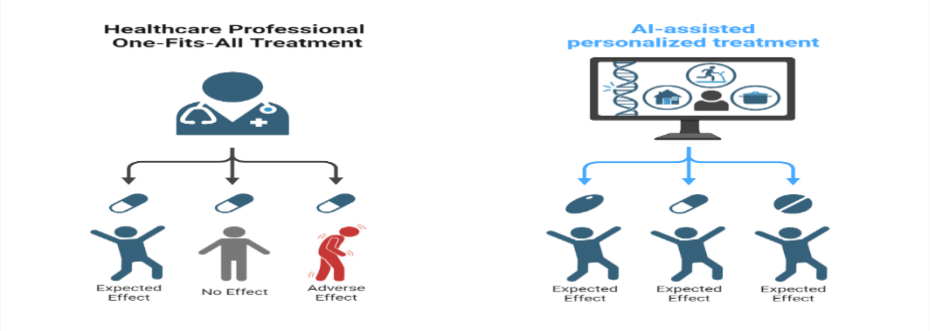


Fig-2 shows - The difference b/w the personalized medicine and ai in personalized medicine

When a drug works for one person but not for another, or causes adverse effects in another, it is always a mystery. Genetic makeup and other differences, such as age and lifestyle, may be the cause of these issues. Personalized medicine is the term used to describe this type of medical practice.[11] The use of artificial intelligence techniques in the development of customized medicine is essential for the accuracy and precision of drug delivery, disease detection, and treatment. Controlling undesirable drug reactions and enzyme metabolism might cause some people to have trouble eliminating medications from their systems, which can lead to overdose; for others, the drug is eliminated from the body before it has a chance to work.[12]

The medical field, and personalized medicine in particular, uses a variety of machine learning and artificial intelligence methods. Government rules and legislation pertaining to genetic research and public medical information, as well as the attitudes, understanding, and education of healthcare professionals, are some of the ways that a larger picture might be seen from perspectives.[13] For a wide range of disorders, genetic research can identify biomarkers that aid in diagnosis, risk assessment, and treatment prediction. The two procedures most frequently used in genetic research are DNA and RNA sequencing. Understanding genetic variation—including variations in DNA and RNA—is essential to comprehending the biology of disease. promising, but assessing the vast amount of information is the case's main obstacle.[14] The problem of personalized medicine, which seeks to correctly and safely improve disease outcomes by translating this enormous pool of genetic data, is being met by artificial intelligence. The successful application of these AI techniques may contribute to the development of better systems-level understanding of illnesses in order to identify genetic regulatory networks.[15]

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue XI November 2025

Our objective in this study was to examine, contrast, and record the scientific objectives, methodology, development, performance evaluation, datasets, data sources, ethics, and flaws of AI/ML techniques applied in the field of genomics.[16]

Role Of Ai in Personalized Medicine

The role of personalized medicine, a recent paradigm change in healthcare, is to tailor interventions and therapies to each patient's unique genetic composition, lifestyle, and environmental,circumstances.[17] The development of personalized medicine has been significantly aided by technology advancements in recent decades. Clinicians now have greater access to genetic data than ever before thanks to the human genome sequence and advanced computational biology, which may help with early disease identification and the development of individualized, tailored therapeutic treatments. [18]

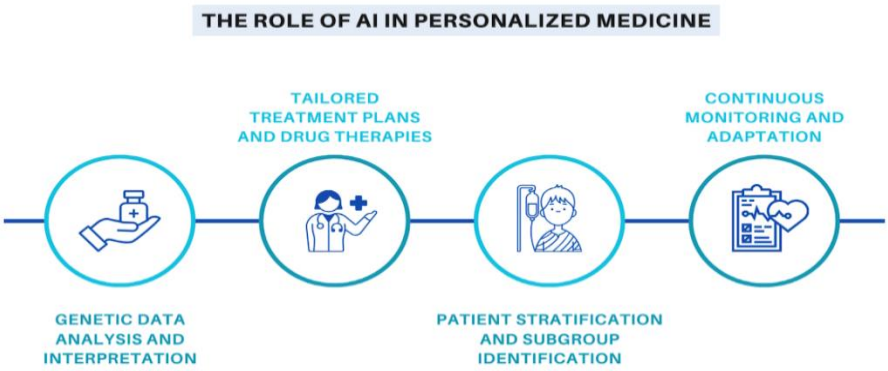


fig-3 shows-the role of AI in personalized medicine

AI's capacity to analyse and interpret vast volumes of patient data in real-time is one of its primary advantages in the healthcare industry. The exponential expansion of medical information tends to outpace the conventional methods of data analysis (fig. 3).

Artificial intelligence has significantly advanced the assessment of personalized medicine by utilizing state-of-the-art imaging technology. Radiomics is a high-throughput mining technique that has shown increasing importance in cancer research for extracting quantitative picture attributes from regular medical imaging. By rapidly creating and evaluating image-based signatures from medical imaging data using cutting-edge image analysis technology and transferring them to clinical decision support systems to improve diagnosis, prognosis, and prediction accuracy, imaging is a crucial tool for modern medicine. [18]

There is currently no standardized assessment of the scientific validity and clinical applicability of rapidly evolving imaging resources, despite the fact that imaging has demonstrated enormous potential for improving clinical decision-making, particularly in the diagnosis and treatment of cancer patients. Strict evaluation standards and reporting guidelines must be established if imaging omics is to become a mature field of research.[19] In order to identify this criterion gap and enable its application and development in personalized medicine, research.

Technological innovation has been the driving force behind a revolution in clinical practice during the past fifty years. The fields of diagnostics, medicine research, drug delivery, and data analytics have all been transformed by artificial intelligence. AI is a well-known technology for analysing health data. It has been used, among other things, for diagnostics, prognosis and the choice of individualized treatment strategy.[20] One of the main factors that contributed to the development of AI healthcare was its adaptability. However, as of right now, representative, heterogeneous, and suitably big training data may not always be accessible for particular patient situations or reasons. It is expensive to aggregate, annotate, and integrate the medical data needed to support customized medicine using population-based AI techniques, and there is currently insufficient infrastructure to treat patients based on AI-acquired knowledge in a fair and sustainable way.[21]

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue XI November 2025

Over the past few years, the use of AI in personalized medicine has revolutionized the modern healthcare industry by greatly advancing the ability to provide patient-specific therapies. More specialized and individualized therapy measures result from this process shift, which is fluid from the earlier generic conclusions. In order to provide effective therapies with fewer side effects, the personalized medicine system, sometimes referred to as precision medicine, takes into consideration a patient's genetic traits, behaviours, environment, and medical history. Deep learning makes this determination by using a wealth of data, including patient genomes, electronic health records, and lifestyles, to give medical personnel the toolkit they need to customize therapy and forecast result probability. [22]

Historically, treatments and cures have been based on averages from populations of samples. However, because it ignored patient variability, such a strategy frequently produced less than ideal patient outcomes. In contrast, personalized medicine considers the patient's lifestyle, environment, and genetic variations to create treatment plans that are more successful and have fewer drug adverse effects. In this way, AI-based systems play a crucial role in this trend change since they enable the use of vast and complex data configurations for advantageous purposes and to provide insight that was before unthinkable. [23,24] These answers are usually erratic and differ according on the participant subgroups in machine learning and deep learning. AI can pick up knowledge from the patient's genetic data and determine how each gene will react to a specific drug, allowing caregivers to select the drugs that are most appropriate for the patient. By lowering the possibility of initial trial-and-error effort by their doctors, this precise delivery of specific medications not only improves patient safety but also lowers the entire cost of their care. One of the two major benefits of customized medicine is its ability to improve the utilization of scarce healthcare resources. [24]

With an emphasis on the effective and efficient use of resources, this paper will try to go into detail about the various ways that we might improve the delivery of health care. Even when artificial neural networks are used to rate patients according to their risk characteristics, the cost of therapy can be greatly reduced. For instance, the health care solution can focus the majority of its resources on individuals who are most likely to experience specific consequences, such as those who have diabetes, a viral infection, or a genetic disease. Its customers not only raise the standard of health care services but also lower the cost of health care delivery. care services, but also lowers the cost of effective service delivery, making care affordable.[25]

Compared to the previous generic judgments, this process change is seamless and leads to more focused and customized therapeutic actions. In order to provide effective therapy with a lower risk, the personalized medicine system, sometimes referred to as precision medicine, takes into account a patient's genetic traits, behaviour, environment, and medical history. In order to give healthcare professionals, the toolkit they need to customize therapy and forecast result probabilities; deep learning uses massive datasets like genomes, electronic health records, and patient lifestyles.[26]

In the past, medications and cures have been created using averages from big population samples. Because it ignored patient variance, the method has frequently resulted in less-than-ideal patient outcomes. However, in order to develop pharmacological treatment programs that are more successful and less likely to have adverse drug effects, personalized medicine considers the patient's lifestyle, environment, and genetic variations.Given that massive and complex data configurations may now be used to gain and produce knowledge that was previously unattainable, AI-driven systems are crucial to this trend change. The foundation of AI for enhancing and producing better, patient-focused care remains machine learning and deep learning algorithms.[27]

Additionally, these answers are typically random and change depending on the participant. AI can analyse a patient's genetic data to determine how the patient's genes will react to a certain medication, allowing caregivers to select the best prescriptions for their patients. By lowering the possibility of early guesswork by their doctors, this precise dovetail of targeted medications not only improves patient safety but also lowers the entire cost of their care. Artificial intelligence in customized medicine has two major benefits, one of which is the potential to increase the use of scarce healthcare resources. This essay will try to examine a number of ways we may improve the delivery of healthcare, with an emphasis on the effective and efficient use of resources.[28]

Even when using artificial neural networks to classify patients according to their risk characteristics, treatment spending can be greatly optimized. For instance, a healthcare service can focus the majority of its resources on

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue XI November 2025

patients who are most likely to experience certain consequences, such as those who have diabetes, a viral infection, or a genetic disease. By eliminating inefficient expenditures associated with service delivery, its clients not only raise the standard of health care service delivery but also lower the cost of such services.[29]

Novel Pharmacology

Novel pharmacological targets for the treatment of Parkinson's diseases:

The incidence rate of Parkinson's disease, a multicentric degenerative condition, is approximately 1 in 300. Asymmetrical development of bradykinesia, stiffness, and tremor are among the clinical manifestations. All of these result from the substantia nigra pars compacta's dopaminergic neurons degenerating, which lowers dopamine levels in the striatum. The locus coeruleus, dorsal motor nucleus, autonomic nervous system, and cerebral cortex are among the other neuronal fields and neurotransmitter systems involved in Parkinson's disease. Consequently, serotonergic, cholinergic, and non-adrenergic neurons are also eliminated. Cognitive decline, sleep disorders, depression, gastrointestinal and genitourinary issues, and a variety of medications are among the symptoms that result from this loss.[29]

Serotoninergic medications

5-HT receptors play a crucial role in both healthy and diseased motor function regulation. Particular attention should be paid to 5-HT1A, 5-HT1B, 5-HT2A, and 5-HT2C in PD, particularly in light of their potential role in L-dopa-induced dyskinesia. Sacristan (Merck)34 and 8-hydroxy-2-di-n-propylamino-tetralin, which agonists of the 5HT1A receptor, significantly reduce LID in monkeys administered 1-methyl-4-phenyl-1,2,3,6-tet-rahydropyridine (MPTP), which causes Parkinsonian symptoms. Sacristan and buspirone, a second 5HT1A agonist, reduced LID and extended the duration of L-DOPA effect in clinical trials. However, sacristan can worsen Parkinsonism36 at very high doses. An interaction with D2dopamine receptors may be the cause of this. Therefore, it would be helpful to remove D2activity when creating the next generation of 5-HT1A agonists. Recent research indicates the potential value of creating such drugs, as 5-HT1A agonists may possibly be neuropurspective. [30] **Ex: tramadol**

Dopaminergic medications

Since the early 1960s, dopamine replacement therapy has dominated the treatment of Parkinson's disease motor symptoms. None of the more recently created synthetic dopamine agonists have been able to surpass the therapeutic effect that levodopa can provide, and the effects are expected. More recently, transdermal patch technology with rotigotine and subcutaneous or intravenous infusion of apomorphine have provided longer-lasting anti-Parkinsonian action through non-oral delivery. However, the search for new approaches based on dopamine-replacement therapy continues despite the abundance of dopaminergic medications now available. Although the brain's many dopamine receptors offer a wide range of possible targets, the use of medications that interact with certain receptor subtypes has not been fruitful up to this point. Most medications on the market now only act to increase D2 and D3 dopamine receptors6and no significant advance has been made in synthesizing D1dopamine agonists, a known target for anti-Parkinsonian agents. [30,31] **ex: dopamine hydrochloride**

Cholinergic drugs

The tegmentum, the septum, and cholinergic interneurons are the sources of cholinergic afferents that innervate the cortisol-striatal loop and the nigrostriatal system. PD targets most cholinergic systems, such as choline transporters16, nicotinic receptors13,15, muscarinic receptors13,14, and others.[31] **ex: acetylcholine**

Glutamate and GABA drugs

Since glutamate and GABA (γ-amino butyric acid) are the ex-citatory and inhibitory neurotransmitters used in most basal ganglia pathways, these systems are prime candidates for medication. Remakes-mid, amantadine, and dextromethorphan are examples of N-methyl-d-aspartate (NMDA) receptor antagonists that may actually reduce the motor side effects of L-dopa medication, according to some data from clinical trials. Even though it

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue XI November 2025

may be highly appealing, targeting these amino acid receptor systems is fraught with difficulties. For instance,[31] **Ex: ketamine hydrochloride**

Novel drug pharmacological targets for the treatment of anxiety

Anxiety is an emotional reaction to a perceived threat or danger in the future. It can take many different forms, depending on intensity and persistence, and can include negative affective, physical, behavioural, and cognitive symptoms. While 'natural' anxiety serves to alert and prime the body for potential threats, when anxiety becomes maladaptive, permanent, and unmanageable. anxiety disorders typically start to develop in infancy or adolescence and are persistent, lasting into adulthood. The lifetime prevalence of these illnesses is between 20 and 30 percent in the Western world is the most prevalent neuropsychiatric conditions in the general population. [32] This review's objective is to discuss the state of novel pharmacological approaches in this field. After giving a brief history of the search for anxiolytic drugs, we discuss novel targets derived from our current understanding of the neurobiology of anxiety mechanisms. We will list the four main current avenues for developing novel anti-anxiety medications:

1. Optimization and enhancement of drugs that interact with known drug targets

2. Research on drugs having new mechanisms of action

3. Research on phytochemical and

4. Using the pharmacological enhancement of psychotherapy.

Press releases and announcements were found by conducting a comprehensive search of the US National Institutes of Health's index for active, not recruiting, recruiting, enrolling by invitation, and recently suspended as in September 2018 and updated in April 2019 trials for pharmacotherapy to treat GAD, SAD, specific phobias, PD, PTSD, and OCD. Additionally, an open internet search was conducted using novel or new and anxiolytic or treatment anxiety disorders as search terms.[33]

Novel pharmacological therapies of Cystic fibrosis

A hereditary disorder of the lungs and digestive tract, cystic fibrosis (CF) causes the creation of thick, sticky mucus, which can lead to serious respiratory and nutritional issues. The discovery and cloning of the gene responsible for cystic fibrosis (CF) was revealed over ten years ago. CF is one of the most common and deadly hereditary autosomal recessive diseases in the Caucasian race worldwide, despite rapid advancements in our understanding of the disease's molecular causes. The most common mutation, F508, is present in at least one copy in 70% of individuals, however over 800 other variants have been identified. Genotypes can be categorized into one of five classes of mutations based on the molecular consequence. [34,35]

Novel pharmacological therapies for the cardiovascular disease:

Worldwide, cardiovascular disease is the primary cause of death and disability. The pathophysiology and course of cardiovascular disease are significantly influenced by the autonomic nervous system. The autonomic imbalance of parasympathetic withdrawal and sympathetic dominance in a variety of cardiovascular disorders, including heart failure, arrhythmia, ischemic injury, and hypertension, has been directly linked to impaired cardiovascular functions as well as increased morbidity and mortality, according to a growing body of evidence. It is commonly known that increased sympathetic nerve activity has clinical importance and prognostic implications. While β-adrenoceptor antagonists are a well-established treatment for heart failure and cardiac ischaemia, pharmacological therapies have been focused on lowering sympathetic over-activation. However, the potential to raise vagal tone has been disregarded.

The importance of raising vagal activity has received increased attention in recent years. Recent clinical trials examined vagal stimulation as a potentially novel and successful treatment option for chronic heart failure, and a series of animal experiments showed the significant protection it offered in the context of heart failure. During

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue XI November 2025

ischaemia and/or reperfusion injury, vagal stimulation also has protective effects on the cardiovascular system.[35]

Adenosine

There is mounting evidence that adenosine and the vagal nerve are functionally related. In canine isolated atria, adenosine promoted vagal activity and may have increased ACH release from motor neurons. In the ischemic myocardium, our earlier research suggested a possible functional relationship between muscarinic M2 receptors and adenosine receptors. It appears that not otherwise specified (NOS) serves as the crucial link between these two receptor families. Importantly, adenosine has a positive impact on M2 receptors Consequently, the improved heart function was facilitated. These results have described a possible new mechanism that underlies the cardioprotective effects of adenosine. Adenine sulphate, a precursor molecule of adenosine, was also shown to have cardioprotective benefits by increasing cholinergic nerve density and M2 receptor expression in another study conducted by our lab.[36]

Cholinesterase inhibitors

In a rat model of heart failure, pyridostigmine, a cholinesterase inhibitor, improved vagal tone and cardiac function by decreasing ACH breakdown and increasing synaptic ACH levels. Later research has shown that pyridostigmine plays important roles in preserving autonomic balance. In rats with myocardial infarction, our results further suggested that pyridostigmine improved peripheral vascular endothelial function and reduced cardiac remodelling by restoring baroreflex sensitivity and heart rate variability. These results support the notion that pyridostigmine's ability to increase vagal tone is beneficial for cardiovascular conditions.

Statins

Simvastatin medication partially restored vagal function in animal models of chronic heart failure, as seen by the reversal of decreased heart rate variability. Atorvastatin raised serum ACH levels and baroreflex sensitivity in ischemic damage. Atorvastatin enhanced heart rate variability in a clinical investigation, indicating increased vagal activity. It may also reduce the incidence of arrhythmias in individuals with heart failure. The complex underlying mechanisms by which statins affect cholinergic systems are still not entirely understood. demonstrated how pravastatin's ability to lower cholesterol could affect the expression of a molecular marker of cardiac vagal reactivity. [37,38]

Novel pharmacological therapies for the gastrointestinal disorders

Inflammatory bowel diseases like Crohn's disease and ulcerative colitis, peptic ulcers, gastroesophageal reflux disease, and functional disorders like irritable bowel syndrome are all included in the very broad category of gastrointestinal (GI) disorders. Millions of individuals worldwide suffer from these disorders, which have a significant impact on healthcare systems due to their complex ethology and widespread prevalence. According to estimates from the World Gastroenterology Organization, nearly everyone on the planet will experience some kind of gastrointestinal problem at some point in their lives, which will result in substantial morbidity, high medical costs, and a lower standard of living. Historically, a range of medications, including antacids, PPIs, anti-diarrheal medications, and anti-inflammatory compounds, have been used pharmacologically to treat GI issues. Despite their potential to alleviate underlying illness states or reduce symptoms, these treatments typically have some intrinsic limitations, such as limited efficacy, adverse effects, and the potential for drug interactions. For instance, long-term PPI usage has been associated 6–8 with increased susceptibility to gastrointestinal infections and the potential for nutritional deficient malabsorption. Novel therapeutic techniques that can more effectively meet the diverse demands of patients suffering from GI diseases are desperately needed in light of these difficulties. A new age of treatment has been ushered in by recent developments in pharmacology, including the development of biologics, biosimilars, and novel small-molecule medications that target disease-specific pathways implicated in GI pathophysiology. New pharmacologic treatments have been the mainstay of therapy for many gastrointestinal (GI) diseases. The most frequent medications are:[39]

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue XI November 2025

Antacids:

These over-the-counter medications neutralize stomach acid, quickly alleviating the symptoms of indigestion and acid reflux. Common antacids include calcium carbonate, magnesium hydroxide, and aluminium hydroxide. They are frequently recommended to treat moderate, intermittent stomach pain or heartburn.[39]

Proton Pump Inhibitors:

These medications, such as omeprazole, esomeprazole, and lansoprazole, reduce the production of gastric acid by permanently inhibiting the stomach lining's proton pump. PPIs are widely used to treat conditions like GERD, peptic ulcers, and to avoid mucosal illness brought on by stress.[39]

Antidiarrheals:

By slowing intestinal motility and reducing fluid output, medications such as loperamide and bismuth subsalicylate are commonly used to treat diarrheal. They are particularly beneficial in cases of acute diarrheal, such as those brought on by infections.

Anti-inflammatory Agents:

In order to reduce inflammation and relieve symptoms, NSAIDs and corticosteroids are commonly used in the treatment of inflammatory bowel illnesses (IBD), including Crohn's disease and ulcerative colitis.[39]

Novel pharmacological therapies for the UTI

More than half of women will experience at least one urinary tract infection (UTI) throughout their lifetime, making it one of the most common illnesses in the world. Despite being typically self-limiting and infrequently progressing to more severe infections, cystitis causes substantial expenses for both the patient and the public health system. Infections will also reoccur multiple times a year in many women. While women are far more likely than men to be impacted in adults without predisposing circumstances, the gender ratio in children varies with age, with males being more at risk when they are younger than 12 months. However, the cumulative incidence in the first six years of life is almost 2% for boys and nearly 7% for girls.

Most infections have a good prognosis, although depending on the diagnostic method used, the chance of renal scarring could reach 40%. Recurrence risk is present in 25% to 40% of children with UTI just like women. antibiotics are typically used to treat acute infections, and

women who frequently get infections may benefit from antimicrobial prophylaxis. Escherichia coli is the most common Ur pathogen, accounting for 80% of simple UTIs. Ur pathogenic E. coli cultures in nations with less regulated antibiotic use frequently exhibit multi-drug resistance and ESBL resistance, despite the fact that highly resistant strains are now uncommon in nations with comparatively controlled antibiotic regimens.[40]

CONCLUSION

The combination of customized medicine and artificial intelligence is a revolutionary development in the development of contemporary healthcare. Personalized medicine moves the emphasis from generic treatment regimens to patient-specific therapeutic approaches by utilizing genetic, genomic, and clinical data. This change is accelerated by artificial intelligence, which makes it possible to analyse large and complicated datasets, enhance diagnostic precision, choose the best medications, and reduce side effects. By focusing on certain molecular pathways and enhancing drug delivery technologies, new pharmacological advancements are also broadening the therapeutic landscape for a variety of illnesses, such as neurological, cardiovascular, gastrointestinal, and infectious conditions.

Notwithstanding the encouraging possibilities, there are obstacles to the broad application of AI in personalized medicine, such as worries about data privacy, legal restrictions, and the requirement for thorough clinical validation. Furthermore, interdisciplinary cooperation, ethical supervision, and ongoing training for medical

personnel are necessary for the incorporation of AI operations. In the end, the combination of cutting-edge pharmacology and AI-driven analytics presents a previously unheard-of chance to improve patient outcomes, lower healthcare expenses, and usher in a period of genuinely customized medicine. The full potential of this new paradigm in global healthcare systems will require ongoing study, technical advancement, and ethical regulation.

REFERENCES

1. Karalis VD. The Integration of Artificial Intelligence into Clinical Practice. Applied Biosciences. 2024; 3:14–44.
2. Johnson KB, Wei WQ, Weeraratne D, Frisse ME, Meulis K, and Rhee K. Precision medicine, AI, and the future of personalized health care. Clin Trans Sci. 2021;14(1):86-93. Cross Ref
3. Shah HH, Lodhi SK. AI in Personalized Medicine: Tailoring Treatment Plans Based on Individual Patient Data. Global Trends in Science and Technology. 2025 Jan 24;1(1):15-2
4. Odenike, O.; Thirman, M.J.; Artz, A.S.; Godley, L.A.; Larson, R.A.; Stock, W. Gene mutations, epigenetic dysregulation, and personalized therapy in myeloid neoplasia; are we there yet? *Semin. Oncol.* **2011**, *38*, 196–214. [**Google Scholar**] [**CrossRef**]
5. Khoury MJ, Gwinn M, Yoon PW, Dowling N, Moore CA and Bradley L: The continuum of translation research in genomic medicine: How can we accelerate the appropriate integration of human genome discoveries into health care and disease prevention? Genet Med. 9:665–674. 2007. View Article: Google Scholar: PubMed/NCBI
6. Schroth, W.; Goetz, M.P.; Hamann, U.; Fasching, P.A.; Schmidt, M.; Winter, S.; Fritz, P.; Simon, W.; Suman, V.J.; Ames, M.M.; Safron, S.L.; Kuffel, M.J.; Ulmer, H.U.; Boländer, J.; Strick, R.; Beckmann, M.W.; Koelbl, H; westbound, R.M.; Ingle, J.N.; Eichelbaum, M.; Schwab, M.; Brauch, H. Association between CYP2D6 polymorphisms and outcomes among women with early stage breast cancer treated with tamoxifen. *JAMA* **2009**, *302*, 1429–1436. [**Google Scholar**] [**Cross ref**]
7. Parekh AD, Shaikh OA, Simran F, Manan S. Artificial intelligence (AI) in personalized medicine: AI-generated personalized therapy regimens based on genetic and medical history: short communication. Ann Med Sorg (Lond). 2023; 85:5831–3.
8. Kawale T, Bandagi S, Dane B, Jamdade K. Pharmacological innovations in the treatment of gastrointestinal disorders: a comprehensive review. International Journal of Scientific Research and Technology. 2024 Sep 27. Hamburg MA, Collins FS. The path to personalized medicine. New England Journal of Medicine. 2010 Jul 22;363(4):301-4.
9. Parekh AD, Shaikh OA, Simran F, Manan S. Artificial intelligence (AI) in personalized medicine: AI-generated personalized therapy regimens based on genetic and medical history: short communication. Ann Med Surg (Lond). 2023;85: 5831–3.
10. Kumar Y, Koul A, Singla R, Ijaz MF. Artificial intelligence in disease diagnosis: a systematic literature review, synthesizing framework and future research agenda. J Ambient Intell Human Computer. 2023;14: 8459–86.
11. Hu Y, Wen G, Liao H, et al. Automatic Construction of Chinese Herbal Prescriptions from Tongue Images Using CNNs and Auxiliary Latent Therapy Topics. IEEE Trans Cybern. 2021;51(2):708–721.
12. Baldwin DS, Anderson IM, Nutt DJ, Bandelow B, Bond A, Davidson JR, den Boer JA, Fineberg NA, Knapp M, Scott J, Wittchen HU. Evidence-based guidelines for the pharmacological treatment of anxiety disorders: recommendations from the British Association for Psychopharmacology. Journal of Psychopharmacology. 2005 Nov;19(6):567-96.
13. Hanrahan JW, Sampson HM, Thomas DY. Novel pharmacological strategies to treat cystic fibrosis. Trends in pharmacological sciences. 2013 Feb 1;34(2):119-25.
14. Blasiak A, Khong J, Kee T. CURATE. AI: optimizing personalized medicine with artificial intelligence. SLAS TECHNOLOGY: Translating Life Sciences Innovation. 2020 Apr;25(2):95-105.
15. Schork NJ, Nazor K (2017) Integrated genomic medicine: a paradigm for rare diseases and beyond. Adv Genet 97:81–113
16. Kumar Y, Koul A, Singla R, Ijaz MF. Artificial intelligence in disease diagnosis: a systematic literature review, synthesizing framework and future research agenda. J Ambient Intell Human Computer. 2023;14: 8459–86.

17. Parekh AD, Shaikh OA, Simran F, Manan S. Artificial intelligence (AI) in personalized medicine: AI-generated personalized therapy regimens based on genetic and medical history: short communication. Ann Med Surg (Lond). 2023;85: 5831–3.
18. Johnson KB, Wei WQ, Weeraratne D, Frisse ME, Meulis K, and Rhee K. Precision medicine, AI, and the future of personalized health care. Clin Trans Sci. 2021;14(1):86-93. Cross Ref
19. Parekh AD, Shaikh OA, Simran F, Manan S. Artificial intelligence (AI) in personalized medicine: AI-generated personalized therapy regimens based on genetic and medical history: short communication. Ann Med Sorg (Lond). 2023; 85:5831–3.
20. Serrano DR, Luciano FC, Anaya BJ, Ongoren B, Kara A, Molina G, Ramirez BI, Sánchez-Guirales SA, Simon JA, Tomietto G, Rapti C. Artificial intelligence (AI) applications in drug discovery and drug delivery: Revolutionizing personalized medicine. Pharmaceutics. 2024 Oct 14;16(10):1328.
21. Cè M, Irmici G, Foschini C, Danesini GM, Falsitta LV, Serio ML, Fontana A, Martinenghi C, Oliva G, Cellina M. Artificial intelligence in brain tumor imaging: a step toward personalized medicine. Current Oncology. 2023 Feb 22;30(3):2673-701.
22. Kumar Y, Koul A, Singla R, Ijaz MF. Artificial intelligence in disease diagnosis: a systematic literature review, synthesizing framework and future research agenda. J Ambient Intell Human Computer. 2023;14: 8459–86.
23. Blasiak A, Khong J, Kee T. CURATE. AI: optimizing personalized medicine with artificial intelligence. SLAS TECHNOLOGY: Translating Life Sciences Innovation. 2020 Apr;25(2):95-105.
24. Schork NJ, Nazor K (2017) Integrated genomic medicine: a paradigm for rare diseases and beyond. Adv Genet 97:81–113
25. Parekh AD, Shaikh OA, Simran F, Manan S. Artificial intelligence (AI) in personalized medicine: AI-generated personalized therapy regimens based on genetic and medical history: short communication. Ann Med Surg (Lond). 2023;85: 5831–3.
26. Kumar Y, Koul A, Singla R, Ijaz MF. Artificial intelligence in disease diagnosis: a systematic literature review, synthesizing framework and future research agenda. J Ambient Intell Human Computer. 2023;14: 8459–86.
27. Parekh AD, Shaikh OA, Simran F, Manan S. Artificial intelligence (AI) in personalized medicine: AI-generated personalized therapy regimens based on genetic and medical history: short communication. Ann Med Surg (Lond). 2023;85: 5831–3.
28. Baldwin DS, Anderson IM, Nutt DJ, Bandelow B, Bond A, Davidson JR, den Boer JA, Fineberg NA, Knapp M, Scott J, Wittchen HU. Evidence-based guidelines for the pharmacological treatment of anxiety disorders: recommendations from the British Association for Psychopharmacology. Journal of Psychopharmacology. 2005 Nov;19(6):567-96.
29. Baldwin DS, Anderson IM, Nutt DJ, Bandelow B, Bond A, Davidson JR, den Boer JA, Fineberg NA, Knapp M, Scott J, Wittchen HU. Evidence-based guidelines for the pharmacological treatment of anxiety disorders: recommendations from the British Association for Psychopharmacology. Journal of Psychopharmacology. 2005 Nov;19(6):567-96.
30. Schork NJ, Nazor K (2017) Integrated genomic medicine: a paradigm for rare diseases and beyond. Adv Genet 97:81–113.
31. Lewis J, Lopez M, Ramachandran H. The Role of Artificial Intelligence in Revolutionizing Industries: Opportunities, Challenges, and Ethical Considerations. AlgoVista: Journal of AI and Computer Science.;2(2):23-31.
32. Hu Y, Wen G, Liao H, et al. Automatic Construction of Chinese Herbal Prescriptions from Tongue Images Using CNNs and Auxiliary Latent Therapy Topics. IEEE Trans Cybern. 2021;51(2):708–721.
33. Serrano DR, Luciano FC, Anaya BJ, Ongoren B, Kara A, Molina G, Ramirez BI, Sánchez-Guirales SA, Simon JA, Tomietto G, Rapti C. Artificial intelligence (AI) applications in drug discovery and drug delivery: Revolutionizing personalized medicine. Pharmaceutics. 2024 Oct 14;16(10):1328.
34. Bonuccelli U, Del Dotto P. New pharmacologic horizons in the treatment of Parkinson disease. Neurology. 2006 Oct 10;67(7_suppl_2): S30-8.
35. Van Bulck M, Sierra-Magro A, Alarcon-Gil J, Perez-Castillo A, Morales-Garcia JA. Novel approaches for the treatment of Alzheimer's and Parkinson's disease. International journal of molecular sciences. 2019 Feb 8;20(3):719.

36. Gifari MW, Samodro P, Kurniawan DW. Artificial intelligence toward personalized medicine. Pharmaceut. Sci. Res. 2021;8(2):1.
37. Hanrahan JW, Sampson HM, Thomas DY. Novel pharmacological strategies to treat cystic fibrosis. Trends in pharmacological sciences. 2013 Feb 1;34(2):119-25.
38. Zeitlin PL. Novel pharmacologic therapies for cystic fibrosis. The Journal of clinical investigation. 1999 Feb 15;103(4):447-52.
39. Kawale T, Bandagi S, Dane B, Jamdade K. Pharmacological innovations in the treatment of gastrointestinal disorders: a comprehensive review. International Journal of Scientific Research and Technology. 2024 Sep 27. Hamburg MA, Collins FS. The path to personalized medicine. New England Journal of Medicine. 2010 Jul 22;363(4):301-4.
40. Schapira AH, Bezard E, Brotchie J, Calon F, Colling ridge GL, Ferger B, Hengerer B, Hirsch E, Jenner P, Novère NL, Obeso JA. Novel pharmacological targets for the treatment of Parkinson's disease. Nature reviews Drug discovery. 2006 Oct 1;5(10):845-54