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Review Paper

Personalized Medication: Transformative Approach in Health-Care-A Review

Preeti Aneja*, Rajender Guleria, Kartik Thakur, Karan, Kartik Thakur

Abhilashi College of Pharmacy, Nerchowk, Mandi, Himachal Pradesh, India.

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ABSTRACT

Objectives: Personalized medication is a revolutionary approach to healthcare that customizes treatment according to a patient's genetic, environmental, and lifestyle characteristics. This strategy improves medication efficacy, reduces side effects, and permits predictive and preventative care in contrast to traditional "one-size-fits-all" therapy. Pharmacogenomics, which studies gene-drug interactions to enhance therapy, is a key component of personalized medicine. Developments in proteomics, metabolomics, genomics, and bioinformatics have sped up the search for bio-markers and made it easier to incorporate complicated biological data into therapeutic procedures. Oncology, cardiovascular, neurological, psychiatric, and infectious disorders are among the conditions for which individualized medication is used. Despite its potential, there are still obstacles to overcome, such as exorbitant expenses, moral dilemmas, a lack of clinical validation, and infrastructure needs. Artificial intelligence, gene-editing technology, and electronic health records will be integrated in the future to improve the effectiveness and accessibility of tailored treatment. **Analysis:** Every stage of a patient's medication management journey can be transformed by eHealth. Making appointments, consulting a healthcare provider, making decisions, dispensing medications, assisting caregivers, gathering and keeping track of information, and learning about medications and how to manage them in everyday life are all examples. It could facilitate monitoring and personalization, which would improve adherence. **Conclusion:** Patients participation in the continuous administration of medication treatment was mostly lacking in the evaluated studies. We suggest using the term "mutually agreed tailoring" (MAT). This explains the continuous pharmacological treatment of ailments that considers the unique requirements, experiences, and current drug usage techniques of the patients as well as the clinical judgment of the specialists. This typically entails people keeping an eye on their symptoms and, with the expert's assistance, adjusting the substance, dosage, or time as needed. According to our

***Corresponding Author:** Preeti Aneja

Address: Abhilashi College of Pharmacy, Nerchowk, Mandi, Himachal Pradesh, India.

Email ✉: preetianeja08@gmail.com

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earlier research, many patients and physicians are effectively using MAT, thus we propose that a formal explanation could encourage broader application of techniques that will enhance patient outcomes.

INTRODUCTION

What is personalized medicine? Is it really something new? The first, instinctive answer is that “personalized medicine means providing the right care to the right person at the right moment”, which has been a fundamental principle in medicine since some humans began treating others [1]. But, although old in its principles, the concept is trapped in a never-ending modernization process that sometimes makes it difficult to fully capture it [2]. Deciphering diseases has been a first step towards personalizing care, aiming at answering the question “what is this patient suffering from?” This process began several centuries ago and is certainly not completed, as illustrated, for example, by debates surrounding the links, differences and overlaps between asthma and chronic obstructive pulmonary disease (COPD) [3]. Elucidating underlying biological mechanisms is the immediate correlate of a disease's identification, hopefully leading to the development of effective treatments. However, in the last century it appeared that one single disease seldom equals one single mechanism: as in nature in general, there is huge complexity in the human body, which is made not only of juxtaposed components but also of multiple interactions at all levels, from organ systems down to molecular networks. Complexity is increased by external influences that make it futile to consider individuals outside their environment. Altogether, an organism cannot be summarized as the sum of its parts.

The prospective value of individualized medicine in improving patient outcomes remains unmatched. Treatment strategies can be tailored to the patient's biological make-up and anticipate

their reaction to the specific medicine by including genetic and molecular information. This advancement allows health providers to sidestep the ineffectual trial-and-error method rampant in contemporary medicine, considerably shortening the time spent finding suitable treatment [4]. Genetic markers and tumor profiling have revolutionized cancer treatment in oncology by enabling sophisticated decisions concerning personalized therapy. Treatments can be adjusted to each patient through specific genetic mutations and tumor characteristics, enhancing survival while reducing adverse effects. This method has remarkably improved the effectiveness of cancer care by providing more targeted and less harmful alternatives to traditional, one-size-fits-all approaches [5]. Regardless of the opportunities that medicine offers, there is little to no flexibility when attempting to integrate individualized medicine into the everyday clinical workflow. The gaps related to lack of standardized protocols for data integration and modeling methods needed for personalized treatment planning are quite evident in the literature [6]. In addition, there is a huge gap in the creation of effective comprehensive frameworks that translate scientifically innovative discoveries into applicable forms within healthcare. The absence of well-defined policies impedes the smooth incorporation of personalized medicine into clinical practice. To solve this issue, there is an urgent need for comprehensive, uniform policies aimed at bridging the divide between state-of-the-art research and the practical application of services in the healthcare system. Furthermore, collaboration across various fields, including genomics and precision medicine, needs to be properly and securely streamlined into patient care to improve the efficacy and safety of treatments, boosting overall patient safety [7,8].

A review of relevant literature shows that there is an emerging trend in healthcare personalized to individual patients needs that individualizes



medicine, which can greatly benefit the patient. Such a method would allow disease detection and treatment with drugs to be more accurate, efficient and less expensive due to preventive measures. Treatment would be based on the patient's genetic indicators, environment and lifestyle factors, thereby optimizing patient outcomes and minimizing risks and making healthcare delivery efficient and cost-effective as well as revolutionizing patient care [9]. Finally, some scenarios such as low adoption by healthcare practitioners, insufficient evidence for large-scale use, and other secondary factors remain challenging. These barriers greatly impede the potential to realize the benefits posed by personalized medicine integrated into day-to-day clinical practice. These challenges pose the need to sharpen provers' educational curricula and evidence-based cost efficiency, while creating and maintaining uniform procedures that enable frameworks to be designed for flexible adaptation and scaling in various healthcare systems [10,11].

Precision medicine is an approach that tailors medical treatment to individual characteristics such as lifestyle, environment, and genetics. By focusing on these individual variabilities, precision medicine aims to provide more effective and targeted treatments compared to the traditional “one-size-fits-all” approaches in conventional medicine, which are based on population averages. The terms “precision medicine” and “personalized medicine” are often used interchangeably, though some point out a subtle distinction. Nonetheless, these approaches represent distinct paradigms with unique methodologies and implications for patient care.

While some use “personalized medicine” to refer to the broader concept of holistic care (including the patient’s social context and preferences), and “precision medicine” to refer to the data-driven,

biological approach, both terms generally describe the modern movement away from conventional medicine. Overall, personalized medicine is a therapeutic approach that takes into account a patient’s genetic makeup, integrating their knowledge, environment, preferences, social context, and other daily life factors into a tailored treatment plan. Under the Personalized Medicine Model, the genetic basis of disease, combined with individual characteristics (e.g., based on molecular profiling, lifestyle data, multi-omics with data integration at multiple levels, and patient involvement in the decision-making process), is used for the medication-based management of diseases [12].

Pharmacogenomics

Pharmacogenomics is a discipline of personalized medicine concerned with the impact of genetic polymorphisms on the metabolism of drugs and is equally important in individualizing therapy for each patient. The reduction of Adverse Drug Reactions (ADRs) and the optimization of treatment outcomes are directly related to resolving issues with pharmacogenomics. Between 2020 and 2022, a study examined the impact of pharmacogenomics on personalized medicine and concluded that the metabolic pathways conditioned by polymorphisms of a given gene determining the metabolism of a drug facilitate the adjustment of the dose of the drug to the level that makes treatment effective and safe. Through customizing drug therapy for different patients with the same disease using their individual genetic profiles, pharmacogenomics enables adjustments of the prescribed medications to the appropriate doses for maximum effectiveness, reduced toxicity and minimal side effects. This method not only decreases ADRs but also improves the potency of the drugs, as it enables treatment tailored to the patient’s genetic characteristics. In conclusion, pharmacogenomics



is one of the best innovations of medicine because it provides the possibility of more precise action of drugs, which increases the safety and effectiveness of treatment [13].

Health professionals role in informing and engaging patients

On one hand, recent advances in diagnostics facilitate the process of obtaining a precise diagnosis at a molecular level, leading to planning the most effective therapeutic strategy, and predicting the most probable prognosis. On the other hand, greater scientific and clinical clarity has prompted growing patients' requests for help

in fully understanding the science behind their medical condition, and to be subsequently supported in participating in the care process. A good example is in the unravelling of familial conditions. Despite the increased use of informal sources of information external to the healthcare setting such as the Internet, the patient–health professional interaction still represents a critical juncture for the exchange of health information [14].

Role of Health Professionals Description

Role of Health Professionals	Description
Providing Medical Information	Health professionals explain diseases, treatment options, medications, and possible side effects to patients in a clear and understandable manner. They help patients understand personalized medication, genetic testing, and the importance of following treatment plans. Health professionals involve patients in decision-making regarding their treatment and healthcare choices. Effective communication helps develop trust between healthcare providers and patients, improving treatment cooperation. They evaluate the patient's medical history, lifestyle, genetic factors, and preferences to provide personalized care. Health professionals guide patients on proper medication use and encourage them to follow prescribed treatments correctly. They answer questions, reduce fears, and clarify doubts related to diseases, medications, and treatment procedures. Health professionals ensure that patients fully understand the benefits, risks, and alternatives before agreeing to treatment. They motivate patients to adopt healthier habits such as balanced diet, exercise, stress management, and regular health monitoring. Healthcare providers may use electronic health records, telemedicine, and digital communication tools to engage and monitor patients effectively. They protect patient privacy, confidentiality, and ensure ethical use of medical and genetic information.
Educating Patients	
Encouraging Patient Participation	
Building Trust and Communication	
Assessing Patient Needs	
Promoting Medication Adherence	
Addressing Patient Concerns	
Supporting Informed Consent	
Encouraging Healthy Lifestyle Changes	
Using Technology and Digital Tools	
Maintaining Ethical Standards	
Improving Patient Outcomes	



	Through education, communication, and engagement, health professionals help improve treatment success and overall patient satisfaction.
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Healthcare professionals have to deal also with patients' expectations about an innovative treatment, perhaps hyped by the media or the Internet and therefore perceived as of higher quality

than traditional treatments. The results of diagnostic omic tests may also indicate that a particular patient is not eligible for a given treatment. This possibility must be explained to patients at the earliest moment, certainly pretesting. There is thus a danger of patients feeling discriminated against because their genetic makeup is "not right", and this might lead to a fracture in the communication between patient and health professionals, and subsequent disengagement. It is therefore important to continuously assist patients in understanding clearly the background of any decision made on their treatment. Given that it is the responsibility of health professionals to speak to patients in an easily understandable language, several strategies have been proven to be effective in improving the comprehension of medical terms [15,16]

The Reason for Examining the Personalized Medication Articles

Examining and comprehending the new strategy of customizing medical care based on a patient's

genetic profile, lifestyle, exposure to the environment, and medical history is the goal of reading an article on personalized medication. Because it concentrates on giving each patient the best possible care rather than employing a generalized treatment approach, personalized medication, also referred to as precision medicine, represents a significant advancement in healthcare. The purpose of this review is to assess the scientific data, research techniques, findings, and conclusions that are provided in the chosen article. Through an analysis of the article, the reviewer will be able to comprehend the ways in which personalized medication enhances overall patient care, improves treatment accuracy, increases drug effectiveness, and minimizes adverse drug reactions. The review is also beneficial.

Evaluating the research study's advantages and disadvantages is another crucial goal of the review. This entails assessing the quality of the evidence offered, the validity of the experimental procedures, the dependability of the data, and the usefulness of the results in clinical contexts. The review also aids in determining whether the paper effectively tackles contemporary healthcare issues and makes a significant contribution to the field of precision medicine.

Aspect of Review	Detailed Purpose
Understanding Personalized Medication	To understand the concept of personalized medication, which focuses on tailoring medical treatment according to an individual's genetic makeup, lifestyle, environment, and medical history.

Evaluation of Research	To critically examine the research methods, scientific data, findings, and conclusions presented in the article.
Improvement in Patient Care	To analyze how personalized medication improves treatment effectiveness, reduces

Role of Genetics and Pharmacogenomics	side effects, and enhances overall patient outcomes. To study how genetic testing and pharmacogenomics help in selecting appropriate drugs and dosages for patients.
Assessment of Strengths and Limitations Clinical Significance	To identify the strengths, weaknesses, reliability, and limitations of the research study and evaluate the quality of evidence provided.
Ethical and Economic Considerations	To determine the practical applications of personalized medication in modern healthcare and clinical practice. To understand ethical issues such as patient privacy, data security, accessibility of genetic testing, and healthcare costs related to personalized medicine.
Technological Advancements	To explore the role of biotechnology, artificial intelligence, and modern diagnostic tools in the development of personalized treatment approaches.
Educational Purpose	To improve critical thinking, analytical skills, and scientific understanding through detailed article analysis.
Future Scope	To examine the future potential of personalized medication in advancing precision medicine and patient-centered healthcare systems.
Overall Objective	To gain comprehensive knowledge about personalized medication and evaluate its importance in improving healthcare quality and medical research.

Applications of Personalized Medication:

Oncology: Oncology specializes in personalized therapies, with trastuzumab for HER2 breast cancer serving as one of the most prominent examples due to the survival rate and recurrence improvements. These therapies, which are tailored towards specific molecular pathways, have proven to be more efficacious than conventional chemotherapy which is rooted in a one-size-fits all approach that overlooks genetic mutations. Consistently, research shows that modifying the approach deployed to treat patients to align with

their biological make-up results in heightened outcomes and better overall disease control. Apart from enhancing the survival rates, personalized medicine also improves preventive medicine. With the inclusion of genetic data, clinicians can formulate plans that mitigate possible health problems proactively, decreasing the chances of unfavorable results. In this context, pharmacogenomics optimizes drug administration by individualizing dosages and minimizing ADRs that needlessly put patients at risk. It is reported that personalized medicine, especially through the lens of pharmacogenomics, could lower ADRs by



as much as 30%, proving the claim that patient safety is bolstered and health management becomes easier in the long run [17].

Occupational health:

Efforts in personalized medicine may offer unique opportunities for occupational health, as it can support a suitable redefinition of the processes employed for risk assessment, able to take into consideration the complex interaction between occupational and individual factors. These procedures are intended to integrate a mechanistic understanding of occupational risk factors, information on specific conditions of workplace exposure, and workers' susceptibility due to "omics" features in a "gene environment" perspective [18].

Advantages of personalized medication:

- a. Improved medication safety and efficacy
- b. Decreased negative drug responses
- c. Precise illness forecasting and prevention
- d. Enhanced patient satisfaction and adherence
- e. Effective use of healthcare resources

FUTURE PROSPECTIVE

Future Perspective of Personalized Medication: As scientific knowledge of human genetics and disease mechanisms advances, personalized medicine will become more accurate, accessible, and effective in preventing and treating diseases. One of the most important future developments will be the increased use of artificial intelligence (AI) and machine learning in healthcare. AI systems

will help analyze large volumes of genetic, clinical, and lifestyle data to predict disease risks, identify appropriate treatments, and support clinical decision-making. These technologies will speed up the development of personalized therapies.

Personalized medicine has a bright future and is predicted to revolutionize healthcare by combining cutting-edge technologies, genetic research, and patient-centered treatment approaches. Personalized medicine will become increasingly precise, accessible, and successful in treating and preventing illnesses as scientific knowledge of human genetics and disease pathways advances.

The growing application of machine learning and artificial intelligence (AI) in healthcare will be one of the most important future advances. Large amounts of genetic, clinical, and lifestyle data will be analyzed by AI systems to enhance clinical decision-making, anticipate illness risks, and find appropriate treatments. Personalized medicines will be developed more quickly thanks to these technologies, which will also decrease treatment errors and increase diagnostic accuracy.

The future of personalized medicine is also anticipated to be greatly influenced by gene-editing technologies like CRISPR, which may enable scientists and medical professionals to correct genetic mutations that cause inherited diseases, resulting in more accurate and long-lasting treatments. Gene therapy may be able to cure some genetic disorders instead of just treating their symptoms. The integration of genomic and pharmacogenomic data with electronic health records (EHRs) will further improve personalized healthcare by giving healthcare providers real-time access to comprehensive patient information. With the use of these technologies, scientists and medical experts may be able to fix genetic abnormalities that cause inherited diseases.

Personalized healthcare will be significantly improved by integrating genetic and pharmacogenomic data with electronic health records (EHRs). Real-time access to detailed patient data will allow healthcare providers to monitor, plan treatments, and manage medications more effectively. Additionally, this connection



will enhance patient involvement and medication adherence by supporting telemedicine and eHealth solutions.

The accuracy and reach of personalized medication are expected to be improved by developments in artificial intelligence, machine learning, and gene-editing technologies like CRISPR (Ashley, 2016). Wider adoption will be facilitated by the development of affordable diagnostics and the integration of genomic data with electronic health records. Addressing regulatory issues and ensuring fair access would require cooperative policies and moral frameworks.-

CONCLUSION

In modern healthcare, personalized medication signifies an evolution away from traditional "one-size-fits-all" treatment techniques and toward therapies customized to each patient's unique traits. This method improves treatment efficacy, reduces adverse medication reactions, and encourages predictive and preventative care by combining genetic, molecular, environmental, and lifestyle data. Evidence from infectious diseases, neurology, cardiovascular medicine, oncology, and psychiatry shows that tailored medication can greatly enhance patient quality of life and clinical outcomes.

The concept of "Mutually Agreed Tailoring" (MAT) further emphasizes the significance of active patient participation and collaboration between patients and healthcare professionals in the continuous management of medication therapy. This collaborative approach supports personalized treatment adjustments based on patient experiences, symptoms, and clinical expertise, ultimately improving patient satisfaction and healthcare quality. Additionally, the integration of eHealth technologies and digital healthcare tools has improved patient monitoring, medication management, communication, and

treatment adherence. The idea of "Mutually Agreed Tailoring" (MAT) emphasizes even more how crucial patient involvement and teamwork are to the ongoing administration of drug therapy. In the end, this cooperative strategy enhances patient happiness and healthcare quality by supporting individualized treatment modifications based on patient experiences, symptoms, and clinician competence.

Despite these developments, a number of issues need to be resolved before widespread adoption is possible. Significant obstacles still include high costs, restricted access to cutting-edge diagnostic equipment, ethical worries about the privacy of genetic data, and the requirement for unified clinical protocols. It will take interdisciplinary cooperation, policy creation, and investments in healthcare infrastructure to overcome these obstacles.

The concepts of accuracy, forecasting, and patient-centeredness are embodied in personalized medicine. In addition to optimizing therapeutic results, its ongoing development promises to promote a more proactive and preventative healthcare system, ultimately enhancing people's quality of life everywhere.

REFERENCES

1. Sznajder JI, Ciechanover A. Personalized Medicine: The Road Ahead. *American Journal of Respiratory and Critical Care Medicine*. 2012 Nov 15;186(10):945-7.
2. Sznajder JI, Ciechanover A. Personalized Medicine: The Road Ahead. *American Journal of Respiratory and Critical Care Medicine*. 2012 Nov 15;186(10):945-7.
3. Caillaud D, Chanez P, Escamilla R, Burgel PR, Court-Fortune I, Nesme-Meyer P, Deslee G, Perez T, Paillasseur JL, Pinet C, Jebrak G. Asthma-COPD overlap syndrome (ACOS) vs 'pure' COPD: a distinct phenotype?. *Allergy*. 2017 Jan;72(1):137-45.



4. England NH. Improving outcomes through personalised medicine. *NHS Engl.* 2016 Sep.
5. Quraish RU, Hirahata T, Quraish AU, ul Quraish S. An overview: genetic tumor markers for early detection and current gene therapy strategies. *Cancer Informatics.* 2023 Jan;22:11769351221150772.
6. Chinni, Bhargava K., and Cedric Manlhiot. "Emerging analytical approaches for personalized medicine using machine learning in pediatric and congenital heart disease." *Canadian Journal of Cardiology*, 40, no. 10, October 2024, pp. 1880-1896. <https://www.sciencedirect.com/science/article/abs/pii/S0828282X24005853>.
7. Bush, William S. et al "Bridging the gaps in personalized medicine value assessment: a review of the need for outcome metrics across stakeholders and scientific disciplines." *Public Health Genomics*, 22, no. 1, August 2019, pp. 16-24. <https://karger.com/phg/article/22/1-2/16/321969>.
8. Brunak S, Bjerre Collin C, Eva Ó Cathaoir K, Golebiewski M, Kirschner M, Kockum I, Moser H, Waltemath D. Towards standardization guidelines for in silico approaches in personalized medicine. *Journal of Integrative Bioinformatics.* 2020 Aug 24;17(2-3):20200006.
9. Maltsev D, Tyravskaya Y, Shpryakhya Y, Kaminsky V, Merzliak S. Individualised medicine: application of a personalised approach in clinical practice. *Journal of Pioneering Medical Sciences.* 2025 Jul 5;14:7-19.
10. Blobel B, Ruotsalainen P. Healthcare Transformation Towards Personalized Medicine-Chances and Challenges. *InpHealth* 2019 May 15 (pp. 3-21).
11. Johnson KB, Wei WQ, Weeraratne D, Frisse ME, Misulis K, Rhee K, Zhao J, Snowdon JL. Precision medicine, AI, and the future of personalized health care. *Clinical and translational science.* 2021 Jan;14(1):86-93.
12. Nimmesgern, E.; Norstedt, I.; Draghia-Akli, R. Enabling personalized medicine in Europe by the European commission's funding activities. *Pers. Med.* 2017, 14, 355–365.
13. Number Analytics, Future of personalized medicine in healthcare & pharma NumberAnalytics Blog. 2025, <https://www.numberanalytics.com/blog/future-personalized-medicine-healthcare-pharm>
14. Kennedy A, Gask L, Rogers A. Training professionals to engage with and promote self-management. *Health Education Research.* 2005 Oct 1;20(5):567-78.
15. Sudore RL, Schillinger D. Interventions to improve care for patients with limited health literacy. *Journal of clinical outcomes management: JCOM.* 2009 Jan 1;16(1):20.
16. Coulter A, Ellins J. Effectiveness of strategies for informing, educating, and involving patients. *Bmj.* 2007 Jul 5;335(7609):24-7.
17. Goetz LH, Schork NJ. Personalized medicine: motivation, challenges, and progress. *Fertility and sterility.* 2018 Jun 1;109(6):952-63.
18. Schulte PA, Whittaker C, Curran CP. Considerations for using genetic and epigenetic information in occupational health risk assessment and standard setting. *Journal of Occupational and Environmental Hygiene.* 2015 Nov 25;12(sup1):S69-81.

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