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Personalized Medicine: A Comprehensive Review & its Applications in Disease Management

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ABSTRACT :

In this overview, we present detail information about Personalized medicine it focuses on Individualized medication treatment based on each patient's genetic makeup and molecular diagnoses. Genomics can enhance medication target selectivity, volunteer and patient selection for clinical trials, and ultimately increase success rates. The key promise of customized medicine is the involvement of a large number of agents in specific populations and individuals. This study aims to assess personalized medicine's indications, benefits, difficulties, and consequences for healthcare. Furthermore, our application focuses on personalized medicine for diseases such as cancer, HIV, and diabetes, as well as its application in drug development.

*Keywords:* **Personalized medicine, pharmacogenomics,**

1.Introduction

What is personalise medicine ?

Personalized medicine is a unique approach refers to a tailoring of medical treatment for the individual characteristics of patients. Personalized medicine is also known for precision medicine. These medicines are made based upon the genetic setup of human genome. It becomes the primary concern for the diagnosis, prevention and treatment of any disease and personalized medicine is based on the pharmacogenomics and genomics. The advancement of molecular profile technology to get access on RNA, DNA and protein will potentiate the personalized medicine for managing the disease. Precision medicine having various advantages over conventional medicine like optimum therapy required, increase safety and efficacy, decrease adverse drug reaction, enhance patient compliance, reduce cost, time and clinical trials failure rate. Personalized medicine is a type of targeted treatment and it is helpful for wide spectrum of diseases like lung cancer, brain tumor, prostate cancer, rheumatoid arthritis, autoimmune diseases etc. This technology is also called for next generation sequencing (NGS). It is an evolving field where physicians use some diagnostic test for treating the patient and after combining both tests and medical history of patients, they can easily develop targeted medicine for individual patient? what is personalized medicine?

Personalized medicine is the tailoring of medical treatment to the individual characteristics of each patient. The approach relies on scientific breakthroughs in our understanding of how a person's unique molecular and genetic profile makes them susceptible to certain diseases. This same research is increasing our ability to predict which medical treatments will be safe and effective for each patient, and which ones will not be.

Personalized medicine may be considered an extension of traditional approaches to understanding and treating disease. Equipped with tools that are more precise, physicians can select a therapy or treatment protocol based on a patient's molecular profile that may not only minimize harmful side effects and ensure a more successful outcome, but can also help contain costs compared with a "trial-and-error" approach to disease treatment.
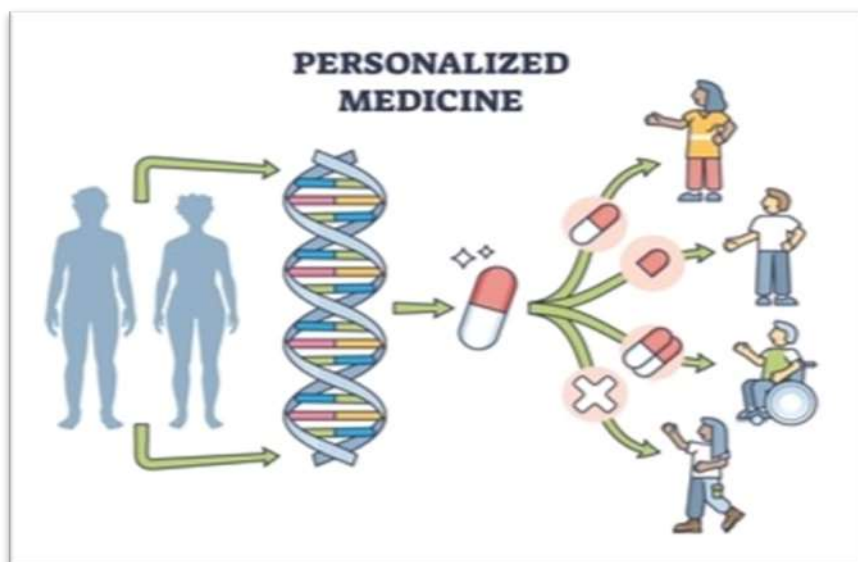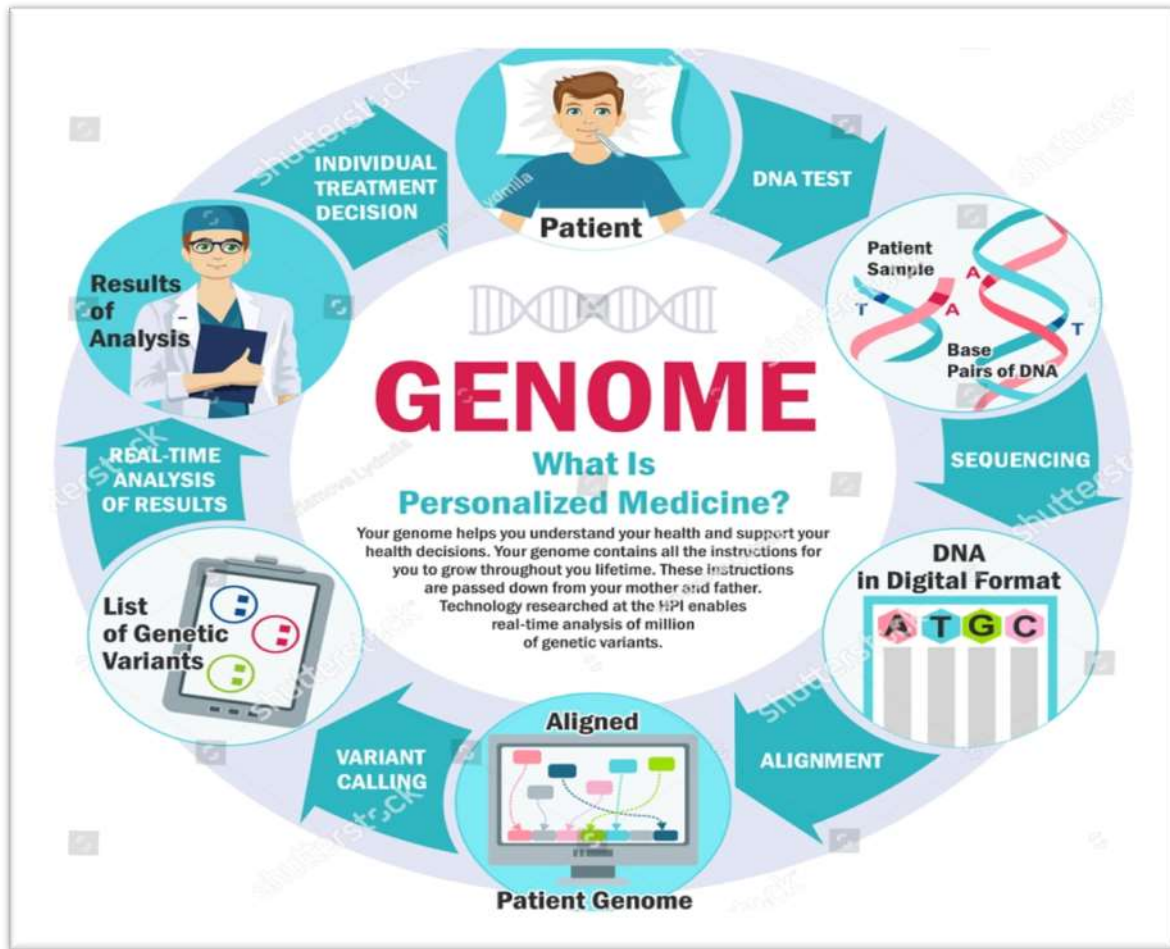
Personalized Medicine Is:

Personalized medicine is a multi-faceted approach to patient care that not only improves our ability to diagnose and treat disease, but offers the potential to detect disease at an earlier stage, when it is easier to treat effectively. The full implementation of personalized medicine encompasses Personalized medicine has the potential to change the way we think about, identify and manage health problems. It is already having an exciting impact on both clinical research and patient care, and this impact will grow as our understanding and technologies improve

1. Risk Assessment:

   Genetic testing to reveal predisposition to disease.

2. Prevention:

Behavior/Lifestyle/ Treatment intervention to prevent disease.

1. Detection:

Early detection of disease at the molecular level.

4. Diagnosis:

Accurate disease diagnosis enabling individualized treatment strategy.

5. Treatment:

Improved outcomes through targeted treatments and reduced side effects.

6. Management:

Active monitoring of treatment response and disease progression.

Yet, bound by the constructs of traditional care delivery models, many of today's doctors still prescribe therapies based on population averages. As a result, health care systems around the world continue to deliver inefficient care that fails to help significant portions of the patient population.

Prersonalized medicine (PM) has the potential to tailor therapy with the best response and highest safety margin to ensure better patient care. By enabling each patient to receive earlier diagnoses, risk assessments, and optimal treatments, PM holds promise for improving health care while also lowering costs. For device and drug manufacturers, PM provides an opportunity to develop agents that are targeted to patient groups that do not respond to medications as intended and for whom the traditional health systems have otherwise failed. The successful practice of PM requires changes in practice patterns and management strategies for health care practitioners as well as for manufacturers in reimbursement, regulatory practices, and knowledge sharing. New value assessments for PM products, along with return-on investment (ROl) models, will also be required as these new strategies for pharmaceutical and diagnostic products emerge. All stakeholders will also need to address barriers to implementation if we proceed down the path of harnessing the ability to alter individualized diagnoses and prognoses. For hospitals, health care providers, and health plan spon-sors, PM represents yet another challenge in uncertain times. Innovation in provider and benefit management, along with clarity in regulatory and legal constructs will be required, just as new national health insurance reforms begin to emerge. Allowing for earlier and more efficient decision-making will require redesigning systems of care and payment just as we are now addressing health care insurance reform in the U.S.

2. History of personalized medicine:

For more than two millennia, medicine has maintained its aspiration of being personalized. In ancient times, Hippocrates combined an assessment of the four humors - blood, phlegm, yellow bile, and black bile - to determine the best course of treatment for each patient. Today, the sequence of the four chemical building blocks that comprise DNA, coupled with telltale proteins in the blood, enable more accurate medical predictions. Ayurveda: As the field of medicine continues to evolve, personalized medicine has become a new frontier for healthcare providers. Personalized medicine allows healthcare professionals to tailor treatments for individual patients. This involves taking into account a patient's unique genetic makeup, lifestyle factors, and environmental influences. Ayurveda, an ancient system of medicine from India, has gained attention as a potential tool for personalized medicine. Ayurveda has been used for thousands of years and has a holistic approach to health and wellness. In this article, we will explore the principles of Ayurveda and how they can be applied to personalized medicine. Introduction to Ayurveda: Ayurveda is a Sanskrit word that means "science of life." It is a holistic approach to health and wellness that emphasizes the interconnectedness of the mind, body, and spirit. According to Ayurvedic philosophy, each person is unique and has a specific combination of three doshas, or energies. These doshas determine their physical and mental characteristics. The three doshas are Vata, Pitta, and Kapha. They are believed to be responsible for regulating bodily functions, such as digestion, metabolism, and energy levels. personalize medecine. it helps healthcare providers understand each patient's unique dosha balance and tailors treatment accordingly. Ayurvedic practitioners use a variety of techniques to assess a patient's dosha balance. These techniques include pulse diagnosis, tongue examination, and observation of physical and mental characteristics. An Ayurvedic practitioner can develop a personalized treatment plan for a patient after identifying their dosha balance. The plan can include dietary recommendations, lifestyle modifications, and herbal remedies. For instance, a patient with a Vata imbalance may be advised to consume warm, moist foods. They may also be advised to avoid cold, dry foods. On the other hand, a patient with a Pitta imbalance may be advised to eat cooling foods. They may also be advised to steer clear of spicy or acidic foods.

Over the past six decades, much evidence has emerged indicating that a substantial portion of variability in drug response is genetically determined, with age, nutrition, health status, environmental exposure, epigenetic factors, and concurrent therapy playing important contributory roles. To achieve individual drug therapy with a reasonably predictive outcome, one must further account for different patterns of drug response among geographically and ethnically distinct populations.

These observations of highly variable drug response, which began in the early 1950s, led to the birth of a new scientific discipline arising from the confluence of genetics, biochemistry, and pharmacology known as pharmacogenetics! Advances in molecular medicine have spawned the newer field of pharmacogenomics, which seeks to understand all of the molecular underpinnings of drug response! Commercialization of this research application is now known as personalized medicine.

3. Application's of personalised medicine in various diseases:

Application:

treatment of patient of their disease based on their characteristic is relatively new medical society strongly developed because the influence of individual personalized medicine treatment develop because of the influence of individuals. personalise medicine treatment is strongly developed. One of Challenges is optimally utilizing all available data on patient characteristics for research applying molecular understanding of the molecule basis and how environmental factors interact with the person. Genetic make-up contrasts with other disease that are considered different today have been shown to share,

environmental factor molecular basis Personal medicine is mainly impacting patient care in many diseases. For example, breast cancer and melanoma are also cardiovascular diseases.

In breast cancer:

One of the earliest and most common example of personalised medicine is trastazumb, which leads to improved diagnosis, prognosis and treatment of cancer. Precision medicine takes into molecular and biological specialities of patient and their tumors that implement the treatment determined by physicians, the drugs that targeted the HER2 protein in 20% of breast cancer. Patients who have disease that tests positive for high level of HER2

In melanoma:

BRAF is responsible For the production of B-Raf which involved in sending signals in cell to direct cell growth, has been shown to be mutated in cancer in 2011.

In cardiovascular diseases:

experience profiling test to identify heart transplant recipients probability of rejecting transplanted organ. The primary method of managing heart transplant rejection was invasive.

General Application's of PM:

• shift the emphasis in medicine because it is reaction to prevention.

• Predict the susceptibility of disease.

• Improve disease detection

• preempt disecise progression.

• prescribed a more effective drug.

• It reduces the time, cost, and failure rate of pharmaceutical clinics.

• It has a better effect and fewer adverse drug reactions.

Various diseases are treated by PM:

a) Diabeties

b) HIV/AIDS

c) Cancer

    a)   Diabeties:

The words diabetes and mellitus come from the Greek language. Diabetes means it passes by simphon and mellitus mean the sweet It is a metabolic disorder caused by the over production of glucose in the blood stream. A group of insulin resistance syndrome characteristics by high blood Sugar level over a prolonged period of time was discovered and explained by the ancient Egyptians 3000 years ago.

Personalized medicine for diabetes:

Personalize medicine in diabetes refers to the use of specific characteristic operation to diagnostic or treatment strategies that are more effective for individual PM are referred to as to as use the characteristic patient to direct direct further pharm and pharmacodynamics, which involved in focus and larger skill, genome analysis, respectively, can provide new information information on genetic variation and personalized medicine from science. The practice of clinical medicine teaches us to assist each patient on the basis of their sign and symptoms and our capacity of comprehensively interdependent action of an individual to infer general principle from which a discrete treatment plan is selected. This axes include development, metabolic cortex, and economic variation, chromatin signal that marks oversupply in tissue, the fellow of adequately understand divert molecule and environmental process that underlying diabetes, inability to know pathology mechanism that triggered diabetes in individual patient.

PM diagnosis of Diabetes :

When referring to precision prevention, precision diagnosis is used to predict response to interverstions. clinicians, use precision diagnosis to determine the best therapy while decreasing unwanted side effects. precision medicine is used to predict the risks and severity of complications. precision diagnosis is can be conceptualised as a pathway that moves through stages rather. then, as a single step, the diagnostic rest that is interperated in light, a diagnosis in precision medicine in a probability-based decision, typically made at a specific point.

PM treatment of Diabetes :

These approach is mostly known as cancer research, where individual ucus treatment are determined for each person, in contrast, precision medicine is based on identifying groups of people with similar disease characteristics and similar responses to treatment and risk complication treatment varies depending on your individual needs.

- ❖ insulin pumps
- ❖ islet cells transplant
- ❖ Tablets and medicines
- ❖ weight loss surgery
- ❖ Diet and exercise
- ❖ insulin

Involves information about a person unique. biology, environment, and or context to guide the choice of an efficacious therapy to achieve the desired therapeutic goal or outcome. Today, the objective of precision therapy is to maximize the mobability that the best treatment of all those available is selected for given patient it is possible that further precision diabetes medicine will be designed according to the biological features of specific patient subgroup rather than for the patient population as a whole

b) HIV/AIDS:

HIV is stand for a Human Immunodeficiency virus. HIV is the Virus that cause AIDS. your immune system is your body defence system which is fight against any infectious and virus disease to kill their antigen and antibodies are control their cell depletion and it also protects cells from germs and illnes. The cells are type of white blood cells called CD4 without medication to control virus.

HIV takes over CD4 cell and turn them into factorise the produce millions of copies or Virus. AIDS: Acquired. immune difficiency Syndrome. is a chronic potentially life threating condition cause by HIV by damaging your immune System interfere with your body ability to fight infection and diseases. consequently, it makes a person more susceptible to illness like meningitis, oral trush, cytomegalovirus. Most of the HIV transmission route have much to do with lifestyle, person, habits, and behavior using drugs, Smoking on any dangerous kind is unhealthful sexual behavior raise of contracting the Inness. uganda and thialand are the two countries that are successfully to control the HIV and lowering its base by following the principle of personalised medicine.

HIV in children's:

Children who made up about 10% of HIV infection worldwide and comprise and estimate every two minute one child was infected with HIV in 2020 and there was about 300,000 children was infected by HIV in 2020 and in every five minute every child was dies from AIDS in 2020.

HIV in women's:

The most common way that woman's get HIV through sex with male partner who also has HIV. The most common way that woman's get HIV through sex with male partner who also has HIV. There are several factors that are increase the risk of women in HIV. it cost some health problems that are unique to women such as gynecological health issue.

How P.M .is treated HIV / AIDS:

The most effective way of treatment of HIV is Antiretroviral therapy (ART) this combination of several medicine that aim to control amount of virus in your body. It show the rate at which the virus grows as HIV is treated lenacapavir receive FDA approval in late 2022 as the second injectable HIV medicine.

- ❖ observe infection patient who was suffering from HIV
- ❖ After that viral load measurements are identified for treatment
- ❖ Genome sequencing
- ❖ Interpreted the sequence data
- ❖ via nutrition table and via rule base system also via statistical model
- ❖ resistant profile

- ❖ Additional information of patient
- ❖ Therapy therapy prediction engine.

Cancer:

Cancer is a large group of disease. With one thing common. They all happen between normal cells become cancer that multiply and spread if the malignant cell are detect in healthy body that causes cancer and directly target the white blood cells and damage. The chemotherapy of malignant is essentially based on the result of prospective randomise double blind face III studies and corresponding clinical guidelines, drug resistant is a major reason for the failure

PM is treated various types of cancer:

The targeted therapy, that sometime called precision medicine, that made to exactly target specific changes or substance in cancer cell and this target can be different. Even when people have the same type of cancer therapy, are..

I) chemotherapy

II) hormone therapy

III) epigenetic modifier

IV) immune stimulator and checkpoint modifier

V) Vaccine

V) Vaccine

VI) Adaptive immunotherapy

VII) Angiogenesis' modifiers'.

Chemotherapy drug are primarily used to treat cancer. Cancer specialist called medical oncologist, often prescribe chemotherapy drug in addition to other cancer treatment like surgery, radiation therapy, or targeted therapy that are fight against some malignant cells of cancer.

4. Personalise medicine in drug development:

Sceptic argue that customise drug, and consequently biomark don't seem to be basis or stimulant or consecutive generation operation medication. It is promising and evolving practice of medicine that employee and individual genetic which can guide clinician in certain the best approach to possibility prevent diagnosis and disease is a medical model that separate people into different groups with Medical decision intervention and or product being tailored involve development, uses of gene therapies and pharmacogenetic test by combining and/or i information

about our genome with other clinical and diagnostic information illness and determine the most effective intervention to help improve our health.

5. Advantages of Personalized Medicine

1. Better treatments for patients

• Reduced adverse events: PM could be targeted at patients who are less likely to have an adverse reaction, reducing safety concerns.

• Improvements in overall survival

• Improved efficacy: patient more likely to receive a medicine delivering a clinical benefit, and treatment targeted at patients who will respond.

2.Delivering benefits to the healthcare system and to society:

PM has the potential to vary the approach health care professionals and systems determine and manage health issues. this could begin with improved diagnoses and coverings because of higher matching of patients' desires and therapeutic advantages, and may ultimately cause additional economical allocation of health care resources.

Theoretically, these can occur in a number of ways: Focusing on prevention and prediction of disease Improving the management of diseases

3.Improving management of diseases :

There area unit some studies showing improvement in bar of bound cancers. One example is NSCLC. Patients with advanced NSCLC World Health Organization won't work do not pay into social contribution schemes like insurance funds, pension funds, or treatment funds. The productivity losses double once Associate in nursing used friend becomes a career for the patient with malignant neoplastic disease. traditionally, patients with pathologic process NSCLC received cytotoxic therapy regimens; but, the invention of genetic alterations that drive neoplasm progression in subsets of NSCLC has remodeled the clinical management of this unwellness. Today, new treatments have extended the time before symptoms worsen, delaying the negative

physical and emotional consequences related to unwellness progression. Recent developments embrace the power to focus on the PD 1/PD-L1 pathway through the synthesis of organism antibodies.

4. Decreased health care cost.

5. Due to better targeted therapies, there will be higher probability to get desired outcomes.

6. Mainly focus on prevention and prediction of diseases rather than reaction.

7. Probability of negative side effects can be reduced.

8. Disease intervention will be earlier in comparison to the past.

9. Better treatments for patients

Conclusion:

PM is considered an innovation in the healthcare system. With the completion of human and other genomes, evidence-based medicine has expanded to encompass fast changing medical practices. Advancements in genome-based technology and bioinformatics can revolutionize diagnostics. The genome-based evidence available to clinicians and healthcare workers is reliable, accurate, and tailored to specific patient populations or teams. Future physicians and health professionals will need knowledge and skills to deploy genomic-based diagnostic and treatment techniques. Expanding the utilization of precision medicine in diabetes treatment can significantly enhance person-centered outcomes and mitigate costs. However, despite its potential, barriers to widespread adoption persist. Addressing these barriers necessitates targeted research to fill gaps in future epidemiological studies. This endeavor is crucial for bolstering our capacity to implement and refine precision diabetes diagnosis methods across diverse populations, while also considering the intersecting complexities of cancer and HIV within the diabetic population.

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