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Personalized Medicine: A Utilization In Pharmaceutical Field.(A Review)

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Abstract-Personalized Medicine (PM) is an emerging exercise of medicine that uses a person's genetic summary to monitor judgments made in favor to the diagnosis, inhibition and treatment of diseases. Personalized medicine is presence innovative through data from the Human Genome Project. It is initial to complete its aim of "the right therapy to the right patient at the right time". Currently PM is moving us closer to more exact, predictable and powerful medication tailored for an individual patient. By the way the genomic data is the dynamic force late PM. Combined understanding of genetics is approving us to provide greater diagnoses, safer medication advising, and more effective treatment of the diseases and conditions that have affected us throughout history. This review focus on various aspects of personalized medicine.

Index Terms- Personalized medicine 1, Future 2, Patient 3.

1. INTRODUCTION

Personalized Medicine (PM) is currently or mainly progressive and moving topic in the medicine and healthcare industries. It is a knowledge that has the credible to alter medical participations by providing effective, tailored therapeutic plans based on the genomic, epigenetic and proteomic profile of an individual, also lasting mindful of a patient's personal position. PM is a young but fast increasing field of healthcare where a physician can select a treatment based on a patient's genetic profile that may not only minimize injurious side effects and assurance a more successful result, but can be less cost effective compared with a 'trial-and-error' approach to disease treat ment. The 21st era vision of PM is to provide 'the right drug, with the right dose at the right time to the right patient [(1)].

While significant devotion in personalized medicine is presently actuality paid to the use of genetic tests to guide therapeutic results, a massive variety of medical devices can be used in a personalized approach to progress patient outcomes. Many medical device therapies are now clever of being tailored to specific patient characteristics. These individual features include patient anatomy (e.g., size), physiology (e.g., nervous and cardiovascular systems, metabolism, reproduction) and atmosphere of use (e.g., intensive care unit, home use). Additionally, physiological sensors can be used to predict treatment responses for individual patients. For example, three dimensional (3D) printing has been used to make personalized medical devices based on imaging of a patient's anatomy [(2)]. The ideas of personalized medicine can be applied to new and transformative approaches to health care. Personalized health care is based on the dynamics of systems biology and uses analytical tools to evaluate health risks and to design personalized health plans to help patients mitigate risks, prevent disease and to treat it with precision when it happens. The perceptions of personalized health care are receiving increasing acceptance with the Veterans Administration committing to personalized, proactive patient driven care for all veterans [(3)].

Personalized medicine also known as individualized or precision medicine is a medical model that uses patient genetics profile to customize decision made to select the proper medication, therapy and dose in honors to the prevention , diagnosis and treatment of the disease[(4)].

Data of a patient's genetic profile can help doctors select the proper medication or therapy and administer it using the accurate dose or regimen. This word usually described as providing "the right patient with the right drug at the right dose at the right time. "Pharmacogenomics is one of the portion of Personalized medicine [(5,6,7)].

In primary care, PM could be used to inform decisions regarding treatments, such as smoking cessation by examining a patient's speed of nicotine metabolization or inform decisions regarding drinking reduction of alcohol abusers by identifying patients who would reply well to to primate, a drug that can be used to aid in alcohol abstinence [(8,9,10)].

2. DEFINITIONS OF PERSONALIZED MEDICINE

PM is Define in Different ways:
1. "Providing the right treatment to the right patient, at the right dose at the right time." – European Union.
2. "The use of new methods of molecular examination to better manage a patient's disease or tendency to disease." – Personalized Medicine Coalition.
3. "The tailoring of medical treatment to the individual characteristics of each patient." – President's Council of Advisors on Science and Technology [(11)].

3. ADVANTAGES PERSONALIZED MEDICINE

1. Diagnose disease more precisely
2. Detect onset of disease at the initial moments
3. Increase safety, decrease adverse drug reactions
4. Select optimum therapies and target medicines and dosages more accurately
5. Increase the efficacy of the health system by improving quality, availability and
Affordability
6. Increase patient agreement,
7. Shift the goal of medicine from reaction to prevention,
8. Improve cost effectiveness,
9. Altering the awareness of medicine in the healthcare system
10. Increase patient confidence post-marketing by favourable novel therapeutic strategies and
11.Reduce health care cost
12. Improve diagnosis and treatment [12,13,14].

4. DISADVANTAGES PERSONALIZED MEDICINE

1. Infrastructure wants:
It requires huge infrastructure investments and time to implement.
2. Legal problems:
Genomic data must be collected from a major number of people from population on behalf of each and every segmentation. Massive data is collected it is legally clear whop on the data. The government does not own the data. FDA has blocked individual from assessing their own genetic information from companies.

1. The significance of the information:

According to presidents Obama's plan, data from one million volunteers will be collected for genomic research .The missing out on assured sections of the population.
4.Health care cost:
Ideally pm can remove repeated efforts, readmission and help take preventive measures against disease.
5. Shortages in knowledge
6. Up-to-date consent
7. Data protection
8. Protest of efficacy of new treatments
9. Patents and therapeutic/research autonomy.
10. Clearness
11. Proliferation of experts [15,16].

5. AIM, VISION AND MISSION OF PERSONALIZED MEDICINE:

The purpose of PM is to improve healthcare for every individual at every stage of a disease, from prevention to treatment, by examining individual biological traits, environmental factors and contextual influences throughout the individual's lifespan. "Personalized medicine is the use of diagnostic and screening methods to well manage the individual patient's disease or predisposition toward a disease.

5.1.Vision

The Personalized medicine program dream is to be a uniquely, innovative and effective educational and research program to serve the health needs of the GCC citizens, and worldwide contribute to brilliance in research and development, clinical services and health education.

5.2.Mission

The mission of the Personalized Medicine Program is to gain familiarity with genetic and genomic testing and gain theoretical and practical knowledge of personalized medicine and its role in creating the treatment individualized as the disease (17,18).

6. SCIENTIFIC ADVANCES IN PERSONALIZED MEDICINE

1.1950s.
Watson and Crick determine the structure of the DNA double-helix
2.1960s.
Researchers crack the genetic code
3.1970s
First DNA sequencing technology developed - Researchers determine first enzyme linked to individual variation in response to dosing.
4.1980s.
Polymerase chain reaction (PCR) first established, allowing for fast amplification of DNA sequences.
5.1990s.
Human genome project launched - FDA approves first personalized medicine with a companion diagnostic, for the treatment of HER2 positive breast cancer.
6.2000s to Present.
Human Genome Project completed - First targeted therapies for lung cancer, leukaemia , melanoma, cystic fibrosis, HIV, and many other diseases - 42% of the industry's pipeline has the potential to be personalized medicines[19].

7. AT PRESENT PERSONALIZED MEDICINE APPLIED IN FOLLOWING AREA

7. 1. Drug Development
7. 2. Diagnostics
7. 3. Therapeutics (Including Outcome Evaluation)
7. 4. Guess

7.1. *Drug Development*

No Pharmaceutical company can now afford to ignore pm-related data. It is taken into account at every stage of the development process, containing the planning of clinical trials.

7.2. *Diagnostics*

PM previously plays an important role. In oncology, in particular, different types of cancer are increasingly been diagnosed on the basis of their "genetic fingerprint". But also in other fields, such as cardiology, PM denotes a valuable new diagnostic tool for many physicians.

7.3. *Therapeutics (Including Outcome Evaluation)*

Too, important advances have been made possible by PM. It is now progressively common for therapeutic agents to be approved which are only effective in groups of patients with specific molecular characteristics. This tendency can be observed especially in oncology. As a result, not only is the efficacy of treatment enhanced for the patients concerned, but adverse effects are also summary.

7.4. *Guess*

Both the probable and the limits of PM are superficial. In the case of monogenic (single-gene) disorders, PM can deliver sound predictions. But the enormous majority of disorders arise from complex interactions of multiple genes and environmental factors. For oligogenic disorders (involving up to 10 genes), a prediction may still be made in some cases, but for polygenic disorders this is not usually possible, and genetic tests are therefore of limited value.Whole, a detailed family history is commonly more expressive than predictions based on wide-ranging genetic testing [20,21,22,23]

8. EXAMPL OF PERSONALIZED MEDICINE,DEVICES

8.1. Tinnitus Masker:

Is personalized by the manufacturer to patient tinnitus. The tinnitus treatment custom-tailors the audio signals to suit the individual patient's hearing requirements

Increased knowledge on Biochemistry and cellular processes.

8. 2. Software-Based Quantitative EEG Analysis:

To predict an individual's response to various psychotropic drugs. The device provides the probability of response to various medications to guide clinician in decision making.

8. 3. The Artificial Pancreas Device System:

Is a device below clinical investigation that automatically monitors patient glucose levels and delivers patient-tailored insulin doses in people with diabetes. A computer-controlled algorithm connects the continuous glucose monitoring system and an insulin infusion pump to permit continuous communication between both devices and deliver a personalized treatment based on individual glucose patient readings.

8.4.The Zenith Fenestrated AAA Endovascular Graft :

Is indicated for the endovascular treatment of patients with abdominal aortic or aortoiliac aneurysms having morphology suitable for endovascular repair. The fenestrated device allows for treatment of patients with shorter proximal neck lengths (i.e., length of healthy aorta between the renal arteries and the aneurysm) as compared to those who can be treated using other endovascular grafts. Each device is tailored to the patient's individual aortic anatomy with openings in the graft material placed appropriately to maintain blood flow to branch vessels of the aorta.

8.5. Pedicle Screw Spinal Systems:

Spinal systems containing of a rod/screw/hook / connector kit are assembled by a surgeon to accommodate a patient's unique anatomy/physiology using MRI/CT imaging.[26]

9. CHALLENGES TO THE DEVELOPMENT OF PM:

Modern studies establish the following challenges to the development of PM:

1. Economic Challenges; Operational Issues
(Difficulty identifying technology and operational systems that will save costs); and defense of private information through the investigation and development stages

2. Scientific Challenges
(Wherein genetic markers are the most clinically significant, with a poor understanding of the molecular mechanisms of certain diseases)

3. Policy Challenges
(Concerning the association between government research and regulatory agencies [27].

10. POLICY ISSUES IN PM/ETHICAL ISSUES IN PM:

1. Health care Provider Education and Adoption
2. Comparative Effectiveness Research.
3. R&D Incentives.
4. Intellectual Property.
5. Privacy / Ethics.
6. Patient Education.
7. Regulation.
8. Reimbursement [28].

1. Generating genetic information
2. Viable personal health records (PHRs)

11. OPPOURTUNITIES OF PM:

1. Fruitful applications in cancer therapy
2. Added effective treatment and fewer side effects
3. Typical projects underway standard healthcare practice
4. Advance quality of life:
5. Expose additional or alternative opportunities for medications and medication candidates [30].

12. SELECTED PM DRUG & RELEVENT GENE:

Table :1 Selected PM Drug & Relevent Gene[31]

Drug name (Brand name)	Biomarker	Indication
Cevimeline (Evoxac®)	CYP2D6	Dry mouth
Rasburicase (Elitek®)	G6PD	Hyperuricemia
Sodium phenylacetate& sodium benzoate (Ammonul®)	NAGS; CPS; ASS; OTC; ASL; ARG	Urea cycle disorder
Analgesia & Anesthesiology		
Celecoxib (Celebrex®)	CYP2C9	Pain
Codeine	CYP2D6	Pain
Mivacurium (Mivacron®)	Cholinesterase gene	Anesthesia adjunct
Tramadol (Ultram®)	CYP2D6	Pain
Cardiovascular (CV)		
Carvedilol (Coreg®)	CYP2D6	CVS
Clopidogrel (Plavix®)	CYP2C19	
Isosorbide and hydralazine (Bidil®)	NAT1, NAT2	
Metoprolol (Toprol-XL®)	CYP2D6	
Mipomersen sodium (Kynamro®)	ApoB (Apolipoprotein B)	
Propafenone (Rythmol SR®)	CYP2D6	
Warfarin (Coumadin®)	CYP2C9	
5-Fluorouracil (5-FU) (CaracTM cream)	DPD	
Gastroenterology		
Esomeprazole (Nexium®)	CYP2C19	GERD
Rabeprazole (Aciphex®)	CYP2C19	GERD
Orphan disease		
Ivacaftor (Kalydeco®)	G551D mutation in the CFTR gene	Cystic Fibrosis
Hematology		
Lenalidomide (Revlimid®)	5q deletion	Factor-V-Leiden
Immunology		
Indacaterol (Arcapta®)	UGT1A1	COPD
Mycophenolic acid (Myfortic®)	HGPRT	Transplantation:
Infectious disease		
Boceprevir (Victrelis®)	IL28B	Hepatitis C
Chloroquine (Aralen®)	G6PD	Malaria
Isoniazid (Nydrazid®)	NAT	Tuberculosis
Maraviroc (Selzentry®)	CCR5 receptor	HIV
Peginterferon alfa-2b (Pegasys®)	IL28B	Hepatitis C
Pyrazinamide (Rifater®)	NAT	Tuberculosis
Rifampin (Rifadin®)	NAT	Tuberculosis
Telaprevir (Incivek®)	IL28B	Hepatitis
Voriconazole (Vfend®)	CYP2C19	Antifungal:
Neurology		
Carbamazepine (Tegretol®)	HLA-B*15:02	Epilepsy and bipolar disorder
Carisoprodol (Soma®)	CYP2C19	Musculoskeletal pain
Dextrometorphan& Quinidine (Nuedexta®)	CYP2D6	Neurological disorders
Divalproex (Depakote®)	UCD (NAGS; CPS; ASS; OTC; ASL; ARG)	Bipolar disorder (antiepileptic drug):
Oncology		
ado-trastuzumabemtansine (Kadcyla®)	ERBB2 (HER2)	Breast cancer
Afatinib (Gilotrif®)	EGFR	NSCLC
Anastrozole	HR	Breast cancer

(Arimidex®)		
Arsenic trioxide (Trisenox®)	PML / RARα	Leukemia
Azathioprine (Imuran®)	TPMT	Leukemia
Busulfan (Busulfex® &Myleran®)	Philadelphia Chromosome/ BCR-ABL	Leukemia
BrentuximabVedotin (AdcetrisTM)	CD30	Lymphoma
Capecitabine (Xeloda®)	DPD	Multiple cancers
Carboplatin (Daraplatin®)	RRMI	Lung cancer
Everolimus (Afinitor®)	HR	Breast cancer
Exemestane (Aromasin®)	ER	Breast cancer
Fulvestrant (Faslodex®)	ER	Breast cancer
Lapatinib (Tykerb®)	HER2 / neu receptor	Breast cancer
Letrozole (Femara®)	HR	Breast cancer
Pertuzumab (Perjeta®)	HER2 / neu receptor	Breast cance
Tamoxifen (Nolvadex®)	ER	Breast cancer

13. APPLICATIONS OF PM

At current, the applications of PM come under four titles:

13.1. Prediction,

13.2. Diagnostics,

13.3.Therapeutics (Including Outcome Evaluation) And

13.4.Drug Development.

13.1. Prediction.

"Prediction" denotes to pre symptomatic risk assessment and diagnostics (including prenatal screening) with the goal of primary prognosis, diagnosis and possibly treatment or preventive measures.

As a common point, it should be noted that prediction of any kind (including genome-based prediction) involves probabilistic statements. However, the appropriate communication of probabilities is a complex matter.

13.2 Diagnostics.

Nowadays, PM previously makes a important contribution to the diagnostic and prognostic valuation of disorders, with an enormous prospective for further development. The innovative discipline is oncology, which employs modern PM-based methods to arrive at a molecular diagnosis and molecular characterization of malignancies. Oncology's advantage lies in the fact that genomic, epigenetics, and proteomic studies can be carried out directly on tumor tissue, permitting detailed subtyping of the disease in question

13.3. Therapeutics.

In the zone of therapeutics, PM is well progressive. Once again, oncology is the innovative discipline, mainly in its focus on pharmacogenetic parameters. Of course, developments in this area of treatment – and in outcome evaluation – go hand in hand with developments in diagnostics, i.e. improved subtyping based on molecular characteristics of tumors.

13.4 Drug Development.

The use of PM-related methods is also of major standing in the development of new drugs. Genomics, epigenetics and proteomics play a key role at every stage of the development process (target identification, target validation, lead development, preclinical phases, clinical phases, market. In addition, it is pleasant evident that even before the summary of a new drug selective efficacy should be gauged using PM-based methods. While the clinical trials essential for this purpose may become even more decorative as a result, PM-based stratification of subjects will lead to bigger effect sizes, so that the number of members to be recruited for a study can be reduced. It is clear that PM will have major and clinically helpful effects on drug development. Fundamentally every pharmaceutical company now takes PM into consideration in the development of new drugs for all areas of clinical medicine

13.5. Improves kind of role of genes in normal human development & physiology

13.6. Permits use of genome-wide association studies to examine genetic variation & risk for many collective diseases

13.7. Advanced based upon empiric observations Examples, antibiotics developed to inhibit growth of microbes

13.8. Medications for high cholesterol target absorption & metabolism of cholesterol Drugs for diabetes target improving insulin release & use by tissues

13.9. Drugs for high blood pressure designed to act on pathways involved in hypertension

13.10. Impression on medications - pharmaceuticals

13.11. Identifies single nucleotide polymorphisms (SNPs) SNPs account for genetic variability between individuals [32,33,34,35].

14. CONCLUSION:

For patient compliance there is need of medicine which will be predictive, preventive, and preemptive and personalized. The period of personalized medicine has clearly reached and that Personalized Medicine is the upcoming sustainable knowledge for human wellbeing.

Personalized Medicine has the probable to have a positive effect on the healthcare system. In upcoming,

with use of the personalized approach, each individual, on the day of their birth, will receive their full genomic information to place into an individual medical record.

Personalized Medicine has the probable to achieve requirement to improve health results by reducing healthcare costs, drug-development costs and time in this way it will improve patient compliance.

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