Mini-review on personalized medicine: a revolution in health care

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Abstract—Health care has evolved since the reduction in mortality caused by infections as well as chronic and noncommunicable diseases. This has had a direct influence on the expense of public health and individual health care, as well as the quality of health care. It’s time to move away from traditional reactive medicine centered on symptoms, diagnosis, and treatment to a system that targets illness before it develops and, if it cannot be prevented, treats it in a customized manner. The expansion of established techniques to understanding and treating disease is personalized medicine. Individual genetic and epigenetic information is a fast-growing multiple-faceted therapeutic strategy, used to customize pharmacological therapy or preventative treatment. Personalized medicine seeks to make early intervention better diagnoses and to improve medication development and therapy. In this study, the impact of customized medicine on the therapy, its applications, and prospects for healthcare are evaluated.

Key words—Personalized medicine, Genetic, Epigenetic, Drug therapy, Future medicine

INTRODUCTION

There have been several major advancements in the pathophysiology and genetics of many illnesses. As a consequence of multicentre research and meta-analyses, these advancements are connected with the introduction of new technology related to diagnosis, management, and the lowering of expenses from genetic investigations, and the adoption of new management techniques. Numerous genetic variations have been identified in these investigations, including mutations and polymorphisms, which have enabled the construction of databases [1]. Determination of a disease's biological processes is the first step in developing viable therapies. One thing became clear over time: A single illness does not always correspond to a single mechanism. The human body is extremely complex, consisting not only of juxtaposed components but also of numerous interactions at all levels, from organ systems down to molecular networks, just as nature is. It is pointless to consider persons outside of their surroundings because of external variables that exacerbate the complexity of the situation. It’s impossible, to sum up, an organism as the sum of its parts since it's more complex than that [2].

As a key area in health care began to develop i.e., Personalised Medicine (PM) with the accomplishment of the human genome project in 2003. The rapid growth of PM has been further improved by remarkable progress in genomics, computational biology, medical imaging, regeneration, and microarray biochip technology inventories. The therapeutic approach involves the utilization of genetic and epigenetic information of an individual to tailor medicinal treatment or preventative care. PM attempts to individualize the therapy as well as the condition. This includes the identification of genetic, genomic, and clinical data that may be used to accurately forecast a person's vulnerability to disease development, the course of the disease, and its response to therapy. The conventional “one-dose-all” strategy for the development of drugs and clinical therapy has failed, with all the dangers of later pharmaceutical toxicity and failure to treat them. PM attempts to create logical methods to optimize medication therapy concerning the genotype of the patient to achieve optimum effectiveness with the least negative effects. PM can help physicians to determine the optimal dosage of medicines to minimize negative effects for their patients. PM aims ultimately to provide the appropriate individual with precise therapy at the right moment [3].

Each person's unique clinical, genetic, genomic, and environmental information influences PM, a fast-evolving field of health treatment. An integrated, coordinated, and evidence-based strategy to individualizing patient treatment throughout the continuum from health to illness is at the core of PM in health care. While patients are still healthy, it aims to strengthen preventative health care practices and initiate pharmacological treatments at the earliest stages of the disease [4]. However, there are obstacles to overcome in the application of PM, such as (i) the adoption of new ethical norms by government and medical institutions; (ii) In addition, pharmaceutical therapies that result from this knowledge are expensive; (iii) how to responsibly use and share information; (iv) Before the government, the pharmaceutical industry, and the expectations of patients and/or family members, how to approach and direct what will be done with patients who are participating in research studies; (v) Bioinformatics analysis is still poor; (vi) There is a need to improve the implementation of the computational data analysis system; (vii) Clinical, laboratory, and genetic evaluations can be predicted and analyzed using computer algorithms; (viii) The future of precision medicine will not be available to everyone who may benefit from large-scale sequencing and timely results [5].

The patient may switch to another medicine if the first does not work. Because of this strategy, patients suffer from severe side effects, medication interactions, disease progression, and unhappiness. PM allows for the approval of novel therapeutic strategies and changes in the perception of medicine in the healthcare system, it has the potential to improve medication selection and targeted
therapy as well as reduce adverse effects, increase patient compliance, shift the goal of medicine from reaction to prevention, improve cost-effectiveness, and increase patient confidence post-marketing [6]. Figure 1 shows the differences between the current therapy and personalized medicines.

**PERSONALIZED MEDICINE IN THE TREATMENT OF ASTHMA**

It’s no secret that asthma is one of the chronic diseases for which the idea of the phenotype has advanced the most in recent decades. Asthma sufferers have been able to research airway inflammation thanks to the development of the induced sputum method. Several forms of airway inflammation have been identified in asthma, which is defined by the presence of chronic or recurring respiratory symptoms and varying airflow restrictions. Some researchers believe that asthma may be classified into different phenotypes depending on the sort of airway granulocytes that are invading the lungs. Eosinophilic asthma is now widely recognized as distinct from neutrophilic and paucigranulocytic asthma. Different molecular pathways arose to support this cellular categorization quite quickly. There is an increase of the T-helper cell type 2 (Th2) pathways associated with eosinophilic asthma, while neutrophilic asthma was associated with an upregulation of local innate immunity [7].

A patient’s mild to moderate asthma should also be treated with PM, which is now only available for individuals with severe asthma. Patients with mild to moderate illness may be spared long-term therapy with ineffective medications if they receive PM, which is not just about scaling up treatment with expensive pharmaceuticals in severe cases [8].

**PERSONALIZED MEDICINE IN THE TREATMENT OF HIV**

In certain patients within six weeks of the beginning of therapy, Abacavir, an inhibitor of nucleoside reverse transcriptase used to treat people with human immunodeficiency (HIV), is known to induce life-threatening hypersensitivity syndrome. This hypersensitive reaction was determined by clinical diagnosis before the advent of personalized therapy. In 2002, the hypersensitive reaction to the major histocompatibility complex class I HLA-B*5701 was linked to two separate trials [9, 10]. In follow-up research, Mallal et al. only provided abacavir to patients who were negatively affected by the gene HLA-B*5701, and the patient group was not hypersensitive. The results showed a 60-percent risk of producing a hypersensitive reaction in patients who have HLA-B*5701 when treated with abacavir, whereas the drug reaction is not at all developed in individuals who do not possess the gene [11-13]. These findings clearly show that the genome of a patient can determine a reaction to certain medication therapy.

**PERSONALIZED MEDICINE IN THE TREATMENT OF CANCER**

Personalized treatment can be used to forecast how likely a person is to acquire specific cancers. It also helps physicians discover the genetic make-up of an individual and how their tumor evolves. This information is intended to enable clinicians to identify more effective preventive, screening and treatment techniques. Doctors can also identify therapies that provide fewer adverse effects than traditional therapies. Breast cancer, the top cause of cancer...
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mortality among women around the globe, is one of the first and most prevalent instances. Mutations in the family breast cancer of the BRCA1 and BRCA2 genes and deletion of APC gene in family adenomatous polyposis [14].

Researchers discover particular genes and proteins for the development and survival of cancer cells and identify new targets and test novel medicines for them. Figure 1 shows the personalized medicine targeting cancer cells through a different approach in different persons. Targeted therapy is utilized in several diseases, such as breast cancer, colorectal cancer, gastrointestinal stromal tumor, kidney cancer, lung cancer, melanoma, multiple myeloma, leukemia and lymphoma, and pediatric malignancies.

FUTURE PERSPECTIVES

In the realm of personalized treatment, massive revolutions would help produce safer, more efficient means of treatment. PM can be used to examine a patient’s DNA to determine if he or she is likely to acquire a certain disease and can influence decision-making on the preventive procedure. The screening method allows for early treatment and a decrease in diseases morbidity and mortality to discover protein indicators long before clinical symptoms [15]. The idea is to change medical practice once completely developed and modify the diagnostic-based paradigm of medicine. Additional improvements must be made in the field of PM in a way to produce it economically for the benefit of human beings in general. As a result of PM, patients can receive more effective and safe treatment. Patient-centered medicine provides a potential for improving health care while simultaneously reducing costs [16, 17].

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