International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2019): 7.583

The Patient as Target of Personalized Medicine

Kameliya Tsvetanova

Anesthesiology and Intensive Care Department – Medical University – City of Pleven, Bulgaria

Abstract: ***The idea of personalization, i.e. understanding the need for an individual approach to each patient, has existed since the very beginning of the development of medicine. Even Hippocrates started to talk about the need to "give different drugs to the different patients and that what is good for one patient may not be useful for another." The introduction of personalized medicine provided possibility for developing an individual treatment plan for each patient in conformity with his needs, which are strictly specific to the individual, and this in its turn creates a prerequisite for the conduct of adequate treatment and the achievement of good clinical results.***

Keywords: personalized medicine, pharmacogenetics, pharmacogenomics.

1. Introduction

The idea of personalization, i.e. understanding the need for an individual approach to each patient, has existed since the very beginning of the development of medicine. Even Hippocrates started to talk about the need to "give different drugs to the different patients and that what is good for one patient may not be useful for another." (1)

This thought took various forms throughout the development of medicine, emphasizing the need to "cure not the disease but the patient" by giving the patient "the right medicine, i.e. the drug needed specifically by him in the right dose". (1), (2) The term "personalized medicine" (or personified medicine) first appeared in 1998 as the title of a monograph published in 1998. (Personalized Medicine). (3)

According to the definition of the National Science and Technology Council under the President of the United States (2008), personalized medicine presupposes “adaptation of therapeutic treatment to the individual particularities of each patient, the need to identify subpopulations differing in their susceptibility to certain diseases or their response to the specific treatment“. (4)

Therefore, the goal of personalized medicine is "to find an appropriate drug for the specific patient, and in some cases even to develop a treatment regimen for the patient in conformity with his individual data." (5), (6), (7)

According to Kukes V., the main essence of this type of approach is the application of individual such in the choice of medicinal products and their dosage regimen based primarily on the study of the molecular characteristics of the patient’s body and taking other factors into account, which exert impact over the pharmacological response (gender, age, comorbidities, concomitant use of several drugs, alcohol and smoking abuse, type of nutrition) which are identified in the individual patient. (8)

The concept of personalized medicine is based on the following approaches:

1) Genomic approach - by studying the genome (DNA) of the patient;
2) Proteomic approach - by studying the whole set of proteins;
3) Transcriptome approach - by studying the aggregate of RNA molecules and other methods.

In other words, this type of medicine focuses onto the individual characteristics of the patient.

Hohlova A. states that "Personalized medicine may be viewed as a new tool of evidence-based medicine, but it is necessary to carry out a large part of population research for the purpose." (9)

A number of basic approaches and trends lie at the basis of personalized medicine, to wit:

1) Prediction of the basic genomic data for probabilities related to the occurrence of various diseases and to the development of prophylactic individual schemes. (10)
2) Complementing the traditional clinical diagnosis with the individual characteristics of the patient.
3) Choice of a method of treatment of the patient taking into account his individual characteristics. (11), (12)

It is established that more than half of the adverse pharmacological reactions, as well as side effects, insufficient efficacy of the medicinal products, are related to the genetic characteristics of the patient. (8), (13), (14), (15)

A lot of pieces of evidence have emerged over the last six decades to confirm that a significant portion of the variability of the drug response is genetically determined, and age, nutrition, health status, exposure to environmental factors, epigenetic factors, and concomitant therapy play a significant role for that. (16)

The various drug response patterns amongst geographic and ethnic populations need to be further considered aimed at the attainment of individual drug therapy with a reasonably predictable outcome.

These observations of a highly variable drug response, which started in the early 1950s, resulted in the appearance of a new scientific discipline ensuing from the fusion of genetics, biochemistry, and pharmacology known as pharmacogenetics. The progress in molecular medicine gave rise to the newer field of pharmacogenomics, which seeks to understand all the molecular bases of the drug response. The commercialization of this research application is now known as personalized medicine. (16)

It was proven thanks to pharmacogenomics that some drugs work better in certain patients than in other patients, as well as that one person may develop severe, life-threatening side effects from the drugs used, while others may not.

One of the main reasons for this difference is that people inherit variations in their genes, and even slight variations may affect the manner in which the body responds to certain drugs. Pharmacogenetics is the science that studies how genetic variations in individuals affect their response to drugs, and pharmacogenomics is the broader concept of the manner in which genetic variations affect drug development. (16)

Generally speaking, pharmacogenetics and pharmacogenomics deal with the genetic basis underlying the variable drug responses in individual patients. The traditional pharmacogenetic approach relies on the study of sequence variations in candidate genes that are deemed to affect the drug response, whilst pharmacogenomic studies comprise the sum of all genes (i.e. the genome. (16)

2. Conclusion

The creation of a personalized scheme for postoperative analgesia and treatment based on the analysis of the genetic profile of the patient may improve the results of treatment, the response to acute and chronic pain and the postoperative outcome as a whole. (17)

Regardless of the numerous obstacles in the development of personalized medicine (high cost of the needed genetic research, insufficiently trained specialists in this field, both in conducting tests and in their interpretation) at the moment, it is on the verge of expanding its capabilities. (18), (19)

It is deemed that this is a promising trend in a number of branches of medicine. (20), (21), (22)

The advent of new technologies has given rise to a fundamentally new discipline, pharmacogenomics in essence, which seeks to identify variants of genes influencing drug responses in individual patients and in this manner it may identify genes for susceptibility to diseases that represent potential new drug targets. All this is beginning to lead to new approaches in drug discovery, individual application of drug therapy and new insights into disease prevention. (23)

References

[1] De Goma E. M., Rivera G., Lilly S.M., et al. Personalized vascular medicine: individualizing drug therapy. Vascular Med 2011; 16 (5): 391-404.
[2] Hamburg M.A., Collins F.S. The path to personalized medicine. *N Engl J Med* 2010; 363(4): 301-304.
[3] Jain, K.K., Jain K.K. Personalized Medicine. London: Informa Pharmaceutical Publications, 2001.
[4] Дедов И.И., Тюльпаков А.Н., Чехонин В.П., Баклаушев В.П., Арчаков А.И., Мошковский С.А. Персонализированная медицина: современное состояние и перспектив. Вестник РАМН /2012/ № 12.
[5] Jain K.K. From molecular diagnostics to personalized medicine. *Exp Rev Mol Diagn* 2002; 2(4):299-301.
[6] Jain, K.K., Jain K.K. Nanobiotechnology and personalized medicine. Prog Mol Biol Transl Sci. – 2011. – Vol. 104. – P.325-354.
[7] Sagner M. [et al.]. The P4 health spectrum - a predictive, preventive, personalized and participatory continuum for promoting healthspan.Prog Cardiovasc Dis. – 2016. – Aug 18.
[8] Кукес, В.Г., Бочкова Н.П. Клиническая фармакогенетика: учебное пособие.– М., 2007. – 248 с.
[9] Хохлов, А.Л. Клиническая фармакология: вчера, сегодня, завтра. ЦМИК, 2017. – 43с.
[10] Scudellari, M. Genomics contest underscores challenges of personalized medicine. Nat Med. – 2012. – Vol. 18, № 3. – P. 326.
[11] 10. Scudellari, M. Genomics contest underscores challenges of personalized medicine. Nat Med. – 2012. – Vol. 18, № 3. – P. 326.
[12] Hodgson, D.R., Wellings R., Harbron C. Practical perspectives of personalized healthcare in oncology. // N Biotechnol. – 2012. – Mar 15. (Epub ahead of print).
[13] Thomson, A. Why do therapeutic drug monitoring. The Pharm. Journal. – 2004. – Vol. 273. – P.153-155.
[14] Кукес, В., Палеев Н., Сычев Д. [и др.]. Методология персонализированной медицины: старые идеи и новые возможности. Врач. – 2008. – № 1. – С.4-9.
[15] Кукес В.Г. Метаболизм лекарственных средств: научные основы персонализированной медицины. – М.: ГЭОТАР-Медиа, 2008.
[16] Pharmacoenvironmentology – a component of pharmacovigilance [Text] / S.Z. Rahman [et al.] // Environmental Health. – 2007. – Vol.6, №1. – P.20.
[17] Randy Vogenberg F., Carol Isaacson Barash and Michael Pursel. Personalized Medicine. Part 1: Evolution and Development into Theranostics F., Carol Isaacson Barash and Michael Pursel P. T. (Pharmacy and Therapeutics) 2010 Oct; 35(10): 560-562, 565-567, 576.
[18] Бурлев, А.В., Шифман Е.М. Фармакогенетические аспекты клинической анестезиологии. Анестезиология и реаниматология. – 2010. – № 6. – С.83-86.
[19] Chan, I.S., Ginsburg G.S. Personalized medicine: progress and promise. Annu Rev Genomics Hum Genet. – 2011. – Vol.12. – P.217-244.
[20] Reddy P.J. [et al.] Personalized medicine in the age of pharmacoproteomics: a close up on India and need for social science engagement for responsible innovation in post-proteomic biology. // Curr Pharmacogenomics Person Med. – 2011. – Vol. 9, № 1. – P.67–75.
[21] Nishiyama, M. Personalized medicine and molecular targets of drugs. Nihon Rinsho. – 2010. – Vol. 68, № 10. – P.1917-1922.
[22] Young, J., Stone W.L. Pediatric proteomics: an introduction. // Front Biosci. – 2012. – Vol. 4. – P.1078-1087.
[23] Zineh, I., Huang S.M. Biomarkers in drug development and regulation: a paradigm for clinical implementation of personalized medicine. // Biomark Med. – 2011. – Vol. 5, № 6. – P.705-707.

[24] Mancinelli L, Cronin M, Sadee W. Pharmacogenomics: The promise of personalized medicine. AAPS Pharm Sci. 2(1):E4. 200.