

ORIGINAL ARTICLE

Medicine Science 2025;14(1):38-42

Genomic medicine, precision medicine, and personalized medicine: A survey of Turkish physicians' perspectives on new paradigms in medicine

 Zerrin Gamsizkan¹,  Mehmet Ali Sungur²¹Düzce University, Faculty of Medicine, Department of Family Medicine, Düzce, Türkiye²Düzce University, Faculty of Medicine, Department of Biostatistics and Medical Informatics, Düzce, Türkiye

Received 01 November 2024; Accepted 30 November 2024

Available online 28 February 2025 with doi: 10.5455/medscience.2024.11.142

Content of this journal is licensed under a Creative Commons Attribution-NonCommercial-NonDerivatives 4.0 International License.



Abstract

Advances in medicine and new approaches are transforming health services. How these new approaches affect clinicians' decision-making is still unclear. This research aimed to evaluate the reflections of the concepts of personalized, genomic and precision medicine, which are new approaches in medicine, among physicians, and to discuss these practices together with their theoretical, practical and moral dimensions. In this study, a questionnaire was used to question the theoretical, practical utility and necessity, and moral perspectives of clinicians about the applications of genomic medicine, precision medicine, and personalized medicine. The questionnaire also questioned the clinical decision-making processes of these clinicians. In the study, 58.7 (n=186) of the physicians participating in the study thought that planning treatment according to genetic medicine would solve many problems and that the medicine of the future would advance in this direction. In the study, 49.5% (n=157) of the physicians participating in the study stated that there is no objection to genomic and precision medicine applications. It has been stated that 39.1% (n=124) of the physicians have concerns that a new area of exploitation may occur in the medical profession. On the other hand, 20.1% (n= 64) of the physicians stated that such practices would distract the medical profession from evidence-based practices. On the other hand, 68.5% (n=217) of the physicians stated that they wanted to receive training on personalized, genomic and precision medicine. The results of the study show that although clinicians think that genomic and precision medicine applications are the medicine of the future, the majority of them have reservations. Before these applications become widespread in all medical fields, their theoretical, practical and moral frameworks should be established.

Keywords: Personalized medicine, genomic medicine, precision medicine, new medical applications, new paradigms in medicine

Introduction

Personalized medicine is an approach that takes into account the needs of individuals and offers personalized therapeutic options [1]. Developing diagnostic methods especially with the technological advantages of our age have started to provide the opportunity for a special and sensitive approach to each individual. The fact that we applied the same treatment to everyone but did not get the same result in line with the algorithms presented by the evidence-based guidelines increased the need for a sensitive approach and accelerated the development of these new approaches. It is known that physicians have dilemmas about these applications, which are inevitable in the medicine of the future. We see that clinicians are still distant from these

applications due to lack of information about genomic test results, ethical problems, and lack of evidence-based guidelines [2-4].

In the historical process, the clinician's perspective on the patient and the disease has changed with the practices of the time. The emphasis on health, illness, climate, environment and lifestyle, especially in Hippocrates' advice in ancient times, shows that there was a holistic approach [5]. In the 19th century, when positive science rose, it is seen that the dominance of the biomedical approach increased [6,7]. With the increase in scientific research and the accumulation of evidence, "Evidence-Based Medicine" practices began to come to the fore in the 1990s [8]. Over time, as evidence-based science in medicine progressed, empirical

CITATION

Gamsizkan Z, Sungur MA. Genomic medicine, precision medicine, and personalized medicine: A survey of Turkish physicians' perspectives on new paradigms in medicine. Med Science. 2025;14(1):38-42.



Corresponding Author: Zerrin Gamsizkan, Düzce University, Faculty of Medicine, Department of Family Medicine, Düzce, Türkiye
Email: zgamsizkan@yahoo.com

and theoretical contradictions accumulated and a crisis emerged due to unmet health expectations. Accordingly, evidence-based medicine practices have also begun to be discussed in terms of scientific criteria [9,10]. While acknowledging that evidence-based knowledge is useful in the discovery phase, it is emphasized that it is insufficient in some areas of application, including expert knowledge, patients' values, and the psychosocial context [11]. At this point, we think that the problem of managing evidence-based excessive knowledge in medicine evokes the tendency to seek a new paradigm in science after the bottleneck in normal science. Today's new paradigm seems to come to the forefront of patient care with the concepts of genetic therapy and personalized medicine [12-14].

Since the clinical decision-making habits of physicians are also affected by these transformations, seeking the opinion of clinicians always makes an additional contribution to the field. In this article, after discussing these new approaches to human health in terms of their theoretical and practical implications, we will examine their implications in a sample of clinicians. We also aim to discuss the subject in the context of paradigm shifts in medical science.

Material and Methods

Study Design

This study was carried out in a descriptive cross-sectional plan between April and June in 2020. The data collection method used in the study was planned to be in the form of an online survey. The survey was developed by the researchers who conducted this study. While developing the survey questions, two studies were used to investigate clinicians' perspectives on new applications used in the field of precision medicine and genomic medicine [15,16]. In the first part of the survey, inspired by the aforementioned studies, clinicians were asked about the demographic characteristics of the physicians, including their age, gender, the institution they work for and their academic titles. In the second part of the questionnaire, the approaches used by clinicians in clinical decision making were questioned. In the third part of the questionnaire, clinicians' experience in using precision and genomic medicine, their personal perceptions of these applications, and their intention to receive and use future training were questioned. Ethical Approval was obtained from the ethics committee of Düzce University Faculty of Medicine (Approval no: 2019/105).

Sample Size Calculation

Survey monkey was used to calculate the number of samples. The universe is 95,000 physicians actively caring for patients in Turkey, and it was planned to reach at least 272 clinicians with a 90% confidence interval and 5% margin of error. The survey was piloted by 10 clinicians to assess possible ambiguity of the questions. The data were collected through the Google Forms web survey platform by the virtual snowball sampling method. The online survey link was shared through social media tools

(Instagram, Facebook, and WhatsApp,) and physicians were invited. Informed consent was obtained from each physician. An informed consent form was designed for the web survey platform. A total of 343 responses were collected; 7 respondents who were not active working physician in a health center. This study excluded 6 survey respondents missing data on their demographic features. Responses from a further 13 respondents with missing data on our syndemic health variable were dropped. The remaining 317 responses were retained in the analytical sample.

Inclusion criteria were as follows; willingness to take part in the study, completing the questionnaire, actively working as a clinician, and having internet access.

Statistical Analysis

The distribution of numerical data was analyzed with the Kolmogorov-Smirnov test, and the Independent samples t-test was used for group comparisons. Categorical variables were analyzed using Pearson chi-square or Fisher-Freeman-Halton tests. Numerical variables were summarized as mean and standard deviation and categorical variables were summarized as numbers and percentages. Statistical analyses were made with the IBM SPSS v.22 package program and the significance level was taken into account as 0.05.

Results

In this study, 317 physicians who returned to the survey were included. While the mean age of the physicians participating in the study was 41.00 ± 10.10 (24-58), 173 of the physicians were female and 144 were male. Physicians who participated in our study, 53.3% (n=169) were working in a state hospital, 21.8% (n=69) were working in a university hospital, 20.8% (n=66) were working in a private hospital, and 4.10% (n=13) were working in their own private office. Of the physicians participating in the study, 42% (n=133) were specialist physicians, 24.3% (n=77) were general practitioners, 13.2% (n=42) were academicians, and 20.5% (n=65) were physicians.

According to the results of the study, no significant difference was found between male and female physicians in terms of being aware of the concepts of personalized medicine, genomic medicine, and precision medicine and their willingness to receive training on these subjects ($p=0.850$, $p=0.687$, $p=0.925$, $p=0.386$). It was determined that as the ages of the physicians decreased, the desire to receive training on these subjects was significantly higher ($p<0.001$). Significant differences were found between the institutions where the physicians work and their awareness of the concepts of personalized medicine, genomic medicine, and precision medicine. Physicians working in their own private offices were significantly more aware of personalized medicine, genomic medicine, and precision medicine than physicians working in state and university hospitals, respectively ($p<0.011$, $p<0.001$, $p<0.001$). There was no significant difference was found between the institutions of physicians and their willingness to receive training on these subjects. No significant difference

was found between the academic titles of physicians and their knowledge of personalized medicine ($p=0.733$). However, significant differences were found between the academic titles of physicians and the knowledge of the concepts of genomic medicine and precision medicine ($p<0.001$). Physicians, who are academics and specialists, had significantly more information about genomic medicine and precision medicine than general practitioners and resident physicians. A significant difference was found between the academic titles of physicians and their willingness to receive training in these subjects. Resident doctors were found to be significantly more willing to receive training on these subjects ($p<0.012$).

In the study, 36.9% ($n=117$) of the physicians participating in our study most frequently referred to their own clinical experience and knowledge when making clinical decisions, 31.9% ($n=101$) consulted the knowledge of their specialists and instructors, and 31.2% ($n=99$) of them applied for diagnosis. and stated that he used treatment guidelines (Figure 1). 43.2% ($n=137$) of the physicians participating in the study were open to new drugs and applications in their profession and could use them in a short time, 21.4% ($n=68$) could apply them after observing for at least one year, 20.1% ($n=64$) stated that they can apply it after entering the diagnosis and treatment guides (Figure 2).

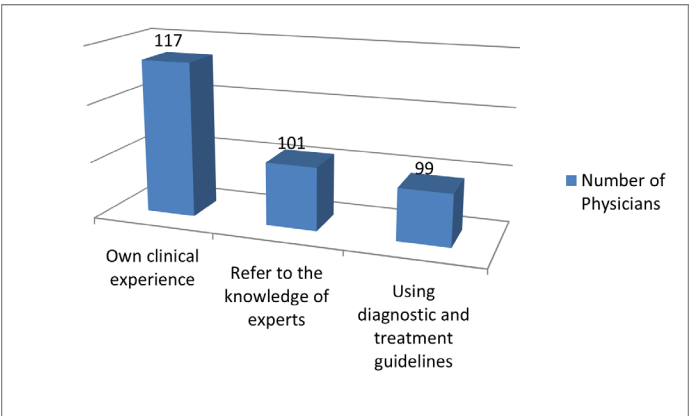


Figure 1. The most frequently used method by physicians when making clinical decisions

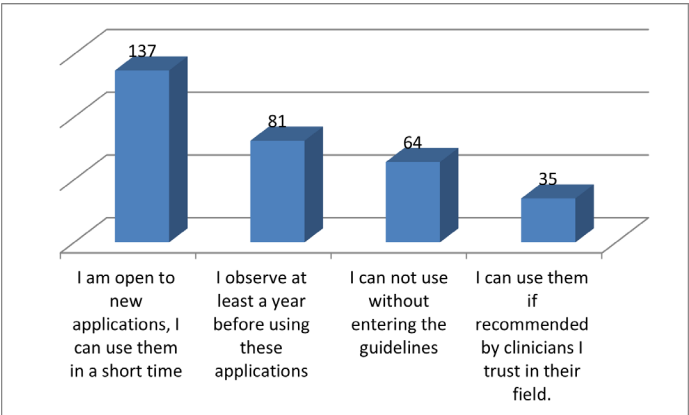


Figure 2. Physicians' perceptions of personalized, genomic, and precision medicine applications

In the study, 58.7 ($n=186$) of the physicians participating in the study thought that planning treatment according to genetic medicine would solve many problems and that the medicine of the future would advance in this direction. In the study, 49.5% ($n=157$) of the physicians participating in the study stated that there is no objection to genomic and precision medicine applications. It has been stated that 39.1% ($n=124$) of the physicians have concerns that a new area of exploitation may occur in the medical profession. On the other hand, 20.1% ($n=64$) of the physicians stated that such practices would distract the medical profession from evidence-based practices (Table 1).

On the other hand, 68.5% ($n=217$) of the physicians stated that they wanted to receive training on personalized, genomic, and precision medicine.

Table 1. Physicians' opinions about personalized medicine, genomic medicine and precision medicine applications

Physicians' opinions	Number	Percentage (%)
I think that genomic medicine will solve many problems and medicine of the future will move in this direction	186	58.7
It should be done by the decision of a council when the indications occur	174	54.9
I think there is no harm in genomic and precision medicine applications	157	49.5
I think that genomic and precision medicine applications are a new area of exploitation in the medical profession	124	39.1
Anyone who wants to take advantage of these opportunities should be able to do so without any hindrance	83	26.2
I think such practices will move the medical profession away from evidence-based practices	64	20.1
I think these applications have some moral drawbacks	60	18.9

*Physicians were able to give more than one answer to these questions

Discussion

In this study, clinical decision-making rituals and perception of personalized medicine, genomic medicine, and precision medicine concepts of clinicians working in different institutions were evaluated. In the study, it was observed that the majority of physicians used their clinical experience as the first choice when making clinical decisions. One-third of the physicians stated that they use the diagnosis-treatment guidelines as the first choice in their clinical decisions. According to the results of the study, it is seen that physicians do not have a complete consensus on the approach they use most in making their clinical decisions. It is thought-provoking that physicians do not prefer diagnosis-treatment guidelines as the first choice in their clinical decisions. Similarly, studies have shown that diagnostic and treatment guidelines are a preferred method after physician experience. In

a study conducted in an academic medical center in 2018, 1150 clinical decisions made by pediatric surgeons were examined and the first choice of the physician was determined as clinical experience. The authors emphasize that while standardizing health care through evidence-based practice and reducing variability in medical decision-making is an effective method, many common conditions encountered on a daily basis influence clinical decision [17]. Brown et al, in their study with a large patient population, found that many patients were not treated in accordance with the guidelines, although it was proven to reduce cardiovascular risk and mortality and was included in the guidelines [18]. In yet another coverage study, the authors state that despite the improvement in the quality of evidence-based guidelines, they have not been fully implemented in a large number of cases [19]. Evidence-based guidelines are created by in-depth evaluation of existing clinical studies through meta-analyses and systematic reviews and presenting the best fold. In line with the prominent results in our study results, we propose a concept that will cover the experience and demands of clinicians when establishing commissions for guideline creation. In addition, the method used by a physician in diagnosing and arranging treatment is not one. Of course, the use of evidence-based guidelines, in theory, is always an emphasized requirement. However, in practice, a physician may also prefer their own clinical experience and the knowledge of experts on the subject.

When we asked about the attitudes of physicians towards emerging applications such as genomics and precision medicine within the framework of the search for a new paradigm in medicine, almost half of the physicians stated that they can implement these practices in a short time. Only one-fifth indicated that they would not implement these new practices without adapting to evidence-based guidelines. It is thought that the use of precision and personal approaches planned for various diseases will increase with the creation of evidence-based guidelines [20,21]. The entry of medical applications provided by technological developments into the health system before the rules are established may cause physicians to be caught unprepared. We think that giving the genomic and precision medicine applications course, which gradually entered the guidelines, in medical education is important in terms of preparing young physicians for the future. The recommendation to include advances in genomic medicine and precision medicine in the education of physicians is also emphasized in the literature [22,23].

In our study results, we see that more than half of the physicians think that personalized, genomic and precision medicine applications are the future of medicine. However, a significant majority of physicians state that they still have some reservations about approaching these practices. Nearly half of the physicians stated that they were concerned about the emergence of a new area of exploitation in the medical profession. Although developments in genomic medicine are well-intentioned for the development of drugs for many diseases, it is said that genomic medicine is still a system of possibilities due to issues such as too

many genomic variants and limited availability [24]. Physicians in our study, expressed their concerns that these practices may lead to alienation from evidence-based medicine and may lead to some moral problems. In many studies, the authors note that certain aspects of precision and genomic medicine are positive, but emphasize that the perceived risks are still high [25-27]. Although as it is stated in many studies, physicians accept the positive benefits of these new practices, it is emphasized that they feel unprepared to use them [28-30].

Despite all kinds of reservations, we see that more than half of the physicians want to receive training in the field of personalized, genomic, and precision medicine. The fact that resident physicians, who are still at the beginning of their profession, have a significantly higher education desire than other physician groups provides an idea about the direction of future medicine. As a result of a multicenter study, it is stated that young physicians with less experience can request genetic tests more easily [31]. In our study, it has also been determined that physicians work in private practice (via a hospital or private clinic) are more prone to these applications and tests. Similarly, in a comprehensive physician survey study, it was found that physicians working in private clinics adapted to new applications such as genomic tests earlier [15].

As we mentioned in the introduction, where we drew the conceptual framework of our research, these new approaches in medicine will continue to be increasingly applied due to the unstoppable nature of technological developments. Precision medicine and genomic medicine are considered highly used and successful approaches to improve the understanding, diagnosis, and treatment of many diseases.

Limitations

This study has several limitations. First, since this study is a descriptive-cross-sectional study, the results cannot be considered as the approach of all physicians. Secondly, this study has limitations of survey studies. Especially, only quantitative data were analyzed and the results were discussed. A qualitative data collection could not be made in which physicians could express their thoughts more clearly. In this respect, it would be beneficial to support similar studies with qualitative data. In some questions, physicians may be limited because they can only tick one option.

Conclusion

Our study has shown that especially young clinicians are eager to receive training in genomic medicine, precision medicine, and personalized medicine. In addition, according to the results of the study, although physicians think that new practices are the medicine of the future, most of them have reservations about these applications. Before these applications become widespread in all medical fields, their theoretical, practical, and moral frameworks should be established.

Conflict of Interests

The authors declare that there is no conflict of interest in the study.

Financial Disclosure

The authors declare that they have received no financial support for the study.

Ethical Approval

Ethical Approval was obtained from the ethics committee of Düzce University Faculty of Medicine (Approval no: 2019/105).

References

- Ramaswami R, Bayer R, Galea S. Precision medicine from a public health perspective. *Annu Rev Public Health*. 2018;39:153-68.
- Russell C, Champion M, Grove ME, et al. Knowledge and attitudes on implementing cardiovascular pharmacogenomic testing. *Clin Transl Sci*. 2024;17:e13737.
- Ho TT, Gift M, Alexander E. Prioritizing pharmacogenomics implementation initiates: a survey of healthcare professionals. *Per Med*. 2022;19:15-23. Erratum in: *Per Med*. 2022;19:165.
- Erdmann A, Rehmann-Sutter C, Bozzaro C. Patients' and professionals' views related to ethical issues in precision medicine: a mixed research synthesis. *BMC Med Ethics*. 2021;22:116.
- Conti AA. Historical evolution of the concept of health in Western medicine. *Acta Biomed*. 2018;89:352-4.
- Garner AS. Thinking developmentally: the next evolution in models of health. *J Dev Behav Pediatr*. 2016;37:579-84.
- Quasinowski B, Assa S, Bachmann C, et al. Hearts in their hands- physicians' gestures embodying shared professional knowledge around the world. *Sociol Health Illn*. 2023;45:1101-22.
- Djulgovic B, Guyatt GH. Progress in evidence-based medicine: a quarter century on. *Lancet*. 2017;390:415-23.
- Vere J, Gibson B. Evidence-based medicine as science. *J Eval Clin Pract*. 2019;6:997-1002.
- Madden K, Bhandari M. Can evidence-based medicine and personalized medicine coexist? In: Riviere C, Vendittoli PA, eds. *Personalized Hip and Knee Joint Replacement* [Internet]. Cham (CH): Springer; 2020;Chapter 1.
- Fernandez A, Sturmberg J, Lukersmith S, et al. Evidence-based medicine: is it a bridge too far?. *Health Res Policy Syst*. 2015;13:66.
- Hamet P, Tremblay J. Artificial intelligence in medicine. *Metabolism*. 2017;69S:S36-40.
- Patch C, Middleton A. Genetic counselling in the era of genomic medicine. *Br Med Bull*. 2018;126:27-36.
- Goetz LH, Schork NJ. Personalized medicine: motivation, challenges, and progress. *Fertil Steril*. 2018;109:952-63.
- Stanek EJ, Sanders CL, Taber KA, et al. Adoption of pharmacogenomic testing by US physicians: results of a nationwide survey. *Clin Pharmacol Ther*. 2012;91:450-8.
- Lee KH, Min BJ, Kim JH. Personal genome testing on physicians improves attitudes on pharmacogenomic approaches. *PLoS One*. 2019;14:e0213860.
- Nathan K, Uzosike M, Sanchez U, et al. Deciding without data: clinical decision-making in pediatric orthopedic surgery. *Int J Qual Health Care*. 2020;32:658-62.
- Brown LC, Johnson JA, Majumdar SR, et al. Evidence of suboptimal management of cardiovascular risk in patients with type 2 diabetes mellitus and symptomatic atherosclerosis. *CMAJ*. 2004;171:1189-92.
- Gómez Doblas JJ, Rodríguez-Padial L. Implementation of clinical practice guidelines: wishful thinking or reality. Decision algorithm. *Clin Investig Arterioscler*. 2021;33:33-9.
- Chung WK, Erion K, Florez JC, et al. Precision medicine in diabetes: a Consensus Report from the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD). *Diabetologia*. 2020;63:1671-93.
- Hallek M, Cheson BD, Catovsky D, et al. iwCLL guidelines for diagnosis, indications for treatment, response assessment, and supportive management of CLL. *Blood*. 2018;131:2745-60.
- Rubanovich CK, Cheung C, Mandel J, et al. Physician preparedness for big genomic data: a review of genomic medicine education initiatives in the United States. *Hum Mol Genet*. 2018;27:R250-8.
- Swandayani YM, Cayami FK, Winarni TI, Utari A. Familiarity and genetic literacy among medical students in Indonesia. *BMC Med Educ*. 2021;21:524.
- Shendure J, Findlay GM, Snyder MW. Genomic medicine-progress, pitfalls, and promise. *Cell*. 2019;177:45-57.
- Oellerich M, Schütz E, Beck J, Walson PD. Circulating cell-free DNA-diagnostic and prognostic applications in personalized cancer therapy. *Ther Drug Monit*. 2019;41:115-20.
- Ioannidis JPA, Khoury MJ. Evidence-based medicine and big genomic data. *Hum Mol Genet*. 2018;27:R2-7.
- Lemmen C, Simic D, Stock S. A vision of future healthcare: potential opportunities and risks of systems medicine from a citizen and patient perspective-results of a qualitative study. *Int J Environ Res Public Health*. 2021;18:9879.
- Amara N, Blouin-Bougie J, Bouthillier D, Simard J. On the readiness of physicians for pharmacogenomics testing: an empirical assessment. *Pharmacogenomics J*. 2018;18:308-18.
- Raccor BS, Thompson DK, Thomas C, et al. Assessment and clinical utility of pharmacogenomics by healthcare practitioners in North Carolina. *Pharmacogenomics*. 2021;22:13-25.
- Brittain HK, Scott R, Thomas E. The rise of the genome and personalised medicine. *Clin Med (Lond)*. 2017;17:545-51.
- Owusu Obeng A, Fei K, Levy KD, et al. Physician-reported benefits and barriers to clinical implementation of genomic medicine: a multi-site IGNITE-network survey. *J Pers Med*. 2018;8:24.