



## Are Futuristic Scenarios for Medicine Realistic?

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### Dear Editor,

Many years ago, I was literarily asked about the future of medicine and innovations in this field. Although medical predictions have come to reality in recent decades, the whole picture seems inevitable at least for upcoming years. Indeed, this issue apparently reminded me of the science-fiction genre. Predictions in this genre are usually overestimated. In general, modern medicine or orthodox medicine has been popular for the last few centuries. Traditional medicine was previously used for millenniums, which was later replaced by modern medicine. However, none of these medical knowledge treasures included perfect proficiencies for enhancing public health, decreasing the costs, and increasing patient relief. Therefore, medical bodies have concerns about establishing novel protocols in order to elevate current medical settings. Numerous ideas are available although they are mostly raw and need supporting activities to become applicable. On the other hand, the lack of sufficient resources such as funds, scientists, and training programs has slowed down the process. Personalized medicine (i.e., AKA personal medicine, precision medicine, stratified medicine, and P4) is considered as one of the most important novelties in medicine (1). Since the mid-90s and by marketing next-generation sequencing (NGS) platforms, significant steps have been taken in mapping the human genome. The huge body of data from such studies clarifies hidden gene functions that were previously unknown (2). Furthermore, other cell function fields such as transcriptome and metabolome help better understand cell metabolism. Recent developments in NGS (3<sup>rd</sup> and 4<sup>th</sup> generation sequencings) have decreased the total cost and the required time while increasing accuracy and efficiency. However, technical limitations such as relatively small numbers of sequencers and expert operators have faded its multiple advantages. Another great medical advancement by NGS belongs to microbiome studies. Microbiome

(alternatively microbiota) includes a majority of human and animal body cells (3). In other words, this accounts for approximately 900% of somatic cells. Nowadays, various fundamental regularity roles in body organs are described for microbiota. Moreover, essential axes are demonstrated between body organs, associating to their microbiome contents and microbial metabolites. Some examples of these axes include gut-brain, gut-liver, and liver-brain axes. Given that the microbiome of every person is specific to that person, its analysis for different people (both healthies and patients) is necessary as is genome analysis.

Additionally, other interdisciplinary sciences are essential for the successful use of analysis results. Microbiology, physiology epidemiology, and particularly bioinformatics can be listed among these sciences. Bioinformatics can help analyze and visualize raw data, thus the information is ready to be summarized by the physicians although this discipline is still developing. Another pitfall of developing personalized medicine refers to the lack of medical consultants in general practices. Considering that personalized medicine is a multidisciplinary field of science, the diagnosis process should be progressed based on suggestions from various medical specialists. Although this scenario does not match the current scenario in medical centers, it seems necessary for further efficient diagnosis. A major reason for this idea is directly linked to highlighted axes between body organs mostly due to their microbial populations. A possible expert board combination includes a general practitioner, an internal medicine specialist, a medical specialist (based on the patient's symptoms or the involved organ), a microbiologist, and a geneticist. This idea can avoid repetitive visits of medical centers/offices by patients and hence decrease treatment costs. Other prerequisites for popularizing personalized medicine include microarray analysis and microchip implant trackers. Fortunately, advancements

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in other medical fields such as robotic surgery and rapid diagnostic methods seem promising as well. However, the digital filing of medical records is the base of taking every innovation in medicine. In conclusion, innovations can revolutionize medical sciences when addressing these issues. I, personally, believe that this novel generation of medicine, which I call the third-generation medicine, will dominate current protocols in the future. However, it is just a matter of time. Large-scale legislating, funding, and equipping will facilitate transformation processes. This is how these so-called “sci-fi” scenarios are changed to simple documentaries!

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