

Personalized Medicine: An Overview

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OPINION

Personalized medicine, also known as precision medicine, is a medical approach in which people are divided into groups and medical decisions, practices, therapies, and/or products are personalized to each patient's projected response or risk of disease. Although various writers and organizations use these phrases independently to convey unique nuances, the terms personalized medicine; precision medicine, stratified medicine, and P4 medicine are all interchangeable terminology to represent this notion. While the practice of tailoring treatment to individual patients dates back to Hippocrates, the word has gained in popularity in recent years as a result of the development of novel diagnostic and informatics tools that provide insight into the molecular basis of disease, notably genomics. This provides a solid evidentiary base for stratifying (grouping) patients. Personalized medicine has been identified as a key and prospective approach to “achieve optimal individual health decisions,” thus overcoming the challenge of “engineer better medicines” as one of 14 Grand Challenges for Engineering, an initiative sponsored by the National Academy of Engineering (NAE). Diagnostic testing is frequently used in personalized medicine to determine appropriate and optimal medications based on a patient's genetic content or other molecular or cellular studies. Genetic information has played a significant part in certain aspects of customized medicine (e.g., pharmacogenomics), and the term was first defined in the context of genetics. Every person has a different human genome variant.

Although the majority of individual variation has no effect on health, an individual's health is determined by genetic variation combined with behaviors and environmental effects.

Modern customized medicine relies on technology that confirms a patient's fundamental biology, DNA, RNA, or protein, which leads to illness confirmation. Personalized approaches such as genome sequencing, for example, can identify DNA abnormalities that influence diseases ranging from cystic fibrosis to cancer. Another technique known as RNA-seq can reveal which RNA molecules are linked to specific disorders. RNA levels, unlike DNA, can fluctuate in reaction to changes in the environment. As a result, sequencing RNA can provide a more comprehensive picture of a person's health. Individual genetic differences have been connected to RNA expression, translation, and protein levels in recent research. Personalized medicine concepts can be applied to new and transformative health-care techniques.

Customized health care is built on the dynamics of systems biology and employs predictive techniques to assess health risks and create personalized health plans to assist patients in mitigating risks, preventing disease, and treating it precisely when it occurs. With the Veterans Administration committing to customized, proactive patient-driven care for all veterans, the concept of personalized health care is gaining traction. In some cases, rather than the patient's genetic markup, personalized health care might be customized to the markup of the disease-causing agent; examples include drug-resistant bacteria or viruses.

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