

SERIES INTRODUCTION

Personalizing patient care

THE CONCEPT AND PROMISE of personalized health care have been anticipated for decades. Yet in its breadth and in the way we would like it practiced, it is in its infancy.

Personalized health care aims to individualize care by integrating a person's unique clinical, molecular (ie, genetic, genomic), and environmental information. Applied not only when the patient is sick but also when he or she is well, it builds on and enhances our current standards of care.

As Sir William Osler recognized more than a century ago, "Variability is the law of life, and as no two faces are the same, so no two bodies are alike, and no two individuals react alike and behave alike under the abnormal conditions which we know as disease."¹

■ PREDICTING THE RISK OF DISEASE

For years, we have attempted to predict and stratify the risk of disease, and the Human Genome Project has given us a new set of tools to help understand the complexity of disease and its variability.

We know and have known for decades—and in some cultures, for centuries—that family history is the most clinically validated tool for predicting the risk of disease.

Nevertheless, evidence suggests that we physicians are not collecting adequate family histories, and because of this, we are missing opportunities to intervene and prevent diseases predicted by the family history. The current standard of care is to use family medical histories to hone genetic differential diagnoses, and based on the differential diagnoses, to target specific genes to test in the setting of genetic counseling. Current genetic testing is used for molecular diagnoses and predictive testing so that gene-specific clinical management can be subsequently tailored.

■ PREDICTING RESPONSE TO TREATMENT

The use of personalized health care to predict response to treatment is a novel and constantly evolving practice.

ABO blood typing is a form of genetics-based personalization of safe transfusion that dates back to World War II.

A prominent, recent success story is in cancer treatment. For example, the American Society of Clinical Oncology now recommends that tumors from patients with node-negative, estrogen-receptor-positive breast cancer be evaluated with the Oncotype DX assay.² This test measures the expression of 21 genes, and the score obtained identifies patients most likely to benefit from adjuvant chemotherapy. A similar 12-gene expression signature has been developed for colon cancer, and others have been developed for hematologic cancers.^{2,3} As with other new but apparently valid tests, the risk scores derived are sensitive at the extremes but ambiguous in the mid-ranges. We anticipate many more developments in this field.

In the field of pharmacogenomics, there is evidence to suggest that prior knowledge of *CYP2C9* and *VKORC1* genotypes enhances outcomes for patients starting treatment with warfarin. The US Food and Drug Administration revised the label on warfarin in February 2010, suggesting that genotypes be taken into consideration when the drug is prescribed.⁴

However, clinicians have been slow to adopt genotype testing when prescribing warfarin. Some cite the paucity of large, randomized, controlled trials demonstrating clinical utility of genotype-informed prescribing. Others cite concern that warfarin will soon become obsolete with the arrival of newer anticoagulants (such as factor X inhibitors) that do not carry warfarin's adverse effects, and these genotypes will therefore become moot. Perhaps, as we move forward and new drugs are developed, companion genotype tests could be developed at the same time to be used with them.⁵

■ IMPROVING CARE, SAVING MONEY, AND EMPOWERING PATIENTS

The goal of personalized health care, by customizing treatments (medication types and dosages) and preventive strategies, is to optimize medical care and improve outcomes for each patient. It could improve the quality of care by targeting interventions and reducing adverse events, topics that are important to all of us in the current environment of health care reform.

A personalized approach might also, in the long run, decrease the cost of health care by driving appropriate utilization of resources.

Lastly, the true value of personalized health care may be in its potential to improve patient satisfaction and to empower our patients to work with us towards better health.

■ WE LAUNCH A NEW SERIES

To keep physicians up-to-date on progress in personalized health care, the *Cleveland Clinic Journal of Medicine* will present a series of articles on the topic. The se-

ries, to run once a quarter, begins in this issue, on page 331, with an article on the importance of the family history as a piece of genetic information that can help to predict the risk of disease and inform preventive care plans. Future topics will include the role of genetics and genomics in personalized care of patients with breast and colorectal cancers; the genetic counselor as a part of the health care team; pharmacogenomics; and ethical, legal, and societal considerations.

Our goal in this series is to provide practical information to help our readers incorporate personalized approaches into daily practice. In addition, as patients become more interested in and informed about personalized health care, we hope this information will help clinicians to effectively coach them about its potential benefits and risks. We also hope this information will enable our readers to ask the right questions so that patient and health care provider can work together to help the patient grow old gracefully.

As the series unfolds, we ask you to send us feedback and to suggest other topics in personalized health care you would like us to cover in this series. ■

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■ REFERENCES

1. Osler W. *Aequanimitas, With Other Addresses to Medical Students, Nurses and Practitioners of Medicine*. 2nd edition. Philadelphia, PA: P. Blakiston's Sone & Co., 1906:348.
2. McDermott U, Downing JR, Stratton MR. Genomics and the continuum of cancer care. *N Engl J Med* 2011; 364:340–350.
3. Eng C. Microenvironmental protection in diffuse large-B-cell lymphoma. *N Engl J Med* 2008; 359:2379–2381.
4. Wang L, McLeod HL, Weinshilboum RM. Genomics and drug response. *N Engl J Med* 2011; 364:1144–1153.
5. Hamburg MA, Collins FS. The path to personalized medicine. *N Engl J Med* 2010; 363:301–304.