Personalized Medicine: Are We There Yet?

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I am privileged to still be seeing patients in our primary care practice within the Division of Internal Medicine at Sidney Kimmel Medical College (formerly Jefferson Medical College). Parenthetically, I am also the oldest physician in the group. Like many primary care physicians, I have recently seen an increase in the number of patients who bring results of proprietary genetic testing to the office. These results, often from companies such as 23andMe, a DNA analysis service, represent a sea change in at least one aspect of the doctor–patient relationship. In what some have called the “democratization” of information (see Eric Topol’s wonderful book, The Creative Destruction of Medicine), genetic typing is potentially the first step toward our realization of personalized medicine.

As of now, however, I do not believe we are quite there yet. In other words, I am unable to thoroughly interpret the results of testing from companies such as 23andMe, and the opportunities to modify a medication regimen, make solid evidentiary-based recommendations for changes in behavior, or for future clinical testing for patients are limited.

Let us first examine the public’s view of personalized medicine, and then review some examples of where we currently are, and where we may be in the future.

According to a March 2014 survey of public opinion conducted on behalf of the Personalized Medicine Coalition by KRC Research, a reputable public opinion research consultancy based in Washington, DC, a large majority (62%) of the 1024 American adults polled on the topic had not heard of personalized medicine, but they reacted positively when it was described to them. Among the surveyed adults who had heard the term (38%), only 2 in 10 believed they were very informed about personalized medicine. Furthermore, only 11% said that their doctor had discussed or had recommended any aspect of personalized medicine to them.

First, let us define our terms. The investigators at KRC Research used the following description of personalized medicine when conducting the survey: “Personalized medicine is an emerging field that uses diagnostic tools to identify specific biologic markers, often genetic, to help determine which medical treatments and procedures will be best for each patient. By combining this information with an individual’s medical records and circumstances, personalized medicine allows doctors and patients to develop targeted prevention and treatment plans. The goal is to provide the right treatment in the right dose to the right patient at the right time.”

The KRC Research investigators further noted that the majority of the survey participants were “excited about the potential benefits of personalized medicine, including choosing a treatment that is most likely to work for them and the potential to prevent illness.” A large majority of those surveyed “also recognize the value of these technologies and that they should be covered by insurance.” Finally, “the idea that personalized medicine can provide useful prevention and treatment information, help avoid or reduce side effects, avoid trial-and-error medicine, and give more control to prevent or treat illness are very compelling benefits.”

One could quibble slightly with KRC Research’s definition of personalized medicine, but my hunch is that the results truly reflect the positions of the survey responders. Who could argue with treatment that avoids trial and error, is more focused on the individual, and that has long-term benefits when done correctly? So, yes, parts of these results are dependent on how we ask the question; however, although the public is not currently well informed, this situation will very likely change in the very near term.

Where are we now regarding the implementation of personalized medicine? Clearly, this is a complex issue. I have written about this complexity elsewhere, but it is fair to say that personalized medicine has not yet delivered on its “hype.” I certainly expected that by late 2014 we would be doing a buccal smear on our primary care patients, assessing their genotype quickly in the office, and making very specific, evidence-based recommendations for their future health and well-being. We have not yet realized this dream.

For example, findings from a recent meta-analysis by Stergiopoulos and Brown show that a “genotype-guided dosing strategy [for warfarin] did not result in a greater percentage of time that the INR [international normalized ratio] was within the therapeutic range, fewer pa-
patients with an INR greater than 4, or a reduction in major bleeding or thromboembolic events compared with clinical dosing algorithms.\textsuperscript{5}\textsuperscript{6} In other words, despite the availability of pharmacogenomic testing to determine who may benefit from therapy with warfarin and appropriate dosing, this meta-analysis of randomized clinical trials revealed no difference between our current standard of care and care complemented by genetic testing. In an editorial accompanying the meta-analysis, Kazi and Hlatky state that the “routine use of genetic testing to guide warfarin management cannot be recommended.”\textsuperscript{95}

Warfarin is just one example. There are now a score of drugs that have been assessed in the literature based on genetic testing, and the take-home message is very mixed. Kazi and Hlatky conclude that “evidence of improved clinical outcomes, not biological causability or hype, should drive the adoption of genetic tests into practice.”\textsuperscript{95}

Although the example of warfarin is not compelling, evidence in psychiatric care (and other clinical areas, such as cancer care) may present a different story. In an article on pharmacogenomic testing, Winner states that “given that the current strengths of pharmacogenomics testing align directly with the common pharmacologic challenges in the elderly and the need for better outcomes with lower costs, the aging population may be the first large group of individuals to benefit from a paradigm shift in treatment with integrated pharmacogenomic testing.”\textsuperscript{4} Winner further suggests that within the burgeoning arena of geriatric psychiatry, pharmacogenomic testing will identify individual genetic differences as they relate to response to therapy, and that this can be used to personalize medication treatment for the large number of elderly patients with depression.

What about the future? In August, I had the opportunity to participate in a leadership panel program sponsored by Pennsylvania Bio (www.pabio.org), a large membership organization headquartered in suburban Philadelphia that represents more than 600 companies in the life sciences. At this leadership program entitled “From Personalized Medicine to Precision Prevention—What Will It Mean for You?,” the group of participating experts were very enthusiastic about the future of personalized medicine. Despite the regulatory and scientific challenges, these experts from across the state were very upbeat in their assessment of the future of personalized medicine. They also cited an increase in Wall Street’s interest in companies working in this arena.

With that in mind, I am personally intrigued by the work of companies such as Genelex Corporation and their YouScript system, a personalized prescribing system that uses genetic screening to reduce adverse drug events.\textsuperscript{7} For example, a description of YouScript’s services notes that “more than 75% of patients have detectable variations in their DNA that may increase their risk of unwanted side effects and adverse drug events.”\textsuperscript{8} YouScript brochures suggest that its testing is recommended for patients who take multiple medications, complain that their medications are not working or who are wary of standard dosing based on negative experiences, and are using complex drug treatment plans. This description applies to the vast majority of my own patients. So perhaps companies and services such as YouScript, 23andMe, and others are going to enjoy a very successful future.

We are certainly on the right road, but we’re not there yet. Although common therapeutic regimens involving drugs such as warfarin and tricyclic antidepressants are reporting variable outcomes within the personalized medicine arena, I am confident that with new technology, we will overcome any current limitations, and my dream of practicing personalized medicine will be realized in my own practice lifetime.

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