Pharmacy Automation and Technology

Precision Medicine: Considerable Potential Combined with Important Challenges

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While not necessarily a new idea, precision medicine has recently gained traction as the future of health care. The potential benefits are almost difficult to believe, while the challenges are multifaceted. We provide an overview of the current state of precision medicine.

We were recently contacted for comments on the current status of incorporating precision medicine into electronic health records (EHRs). The concept has the potential to bring together promising innovations that we are excited to watch mature. The challenge is that we are largely still talking about the *potential* benefits.

Precision medicine? Personalized medicine? What's the difference? You likely read or saw reports about the White House Precision Medicine Initiative earlier this year. According to the National Library of Medicine, the term *personalized medicine* is older than *precision medicine*, but they are often used interchangeably. The difference is found in the terms' connotations. *Personalized medicine* suggests the development of individual therapies for individual patients, whereas *precision medicine* suggests using available information to precisely select therapies based on patient characteristics such as genetics, lifestyle, and environment. We prefer the term *precision medicine*; it suggests that treatment decisions should start with what we know about the patient, not what we know about the various available therapies.

The advancement of precision medicine is closely tied to “omics.” As the field of biology advances toward the use of large-scale datasets, “omics” is added to the end of commonly used words to reflect data-intensive practices. For example, a proteome is an individual organism's complete set of proteins, whereas proteomics is the study of organisms' proteomes. The more commonly encountered terms in the field are *genomics* and *pharmacogenomics*. The Human Genome Project brought considerable visibility to this

rapidly advancing field of science. The project resulted in the production of a representative human genome sequence that is freely available to researchers. One research application is to study genetic sequences and how they influence the risk of certain diseases. Pharmacogenomics is closely related and is the study of how a person's genetic makeup influences their response to medications. Other terms you may encounter include *transcriptomics* and *metabolomics*.

Lifestyle and environment make up the other components of precision medicine. Lifestyle includes the behavioral factors that can influence health and disease. These include diet, exercise, mental health, smoking status, and social support. Environment includes the exposures that we all experience each day, like chemicals, air, and sun. If you take a moment to consider these 3 broad components of precision medicine, the complexity of the envisioned endeavor is quickly apparent.

Fortunately, the technical and logistic challenges of determining an individual's DNA profile have largely been addressed through services that are fast, accessible, and relatively affordable. An individual's ability to collect lifestyle and environmental data has experienced unbelievable progress. At-home point-of-care testing devices, mHealth tools, and online services that enable even technology-naïve individuals to collect data are mostly reliable and address the challenges associated with collecting these types of data. We say “mostly,” because recent research has found that popular step-counting wearables are not as accurate as marketed. Despite this important shortcoming, consumers have access to tools that support data collection related to lifestyle and environment for precision medicine.

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Our hospitals, pharmacies, and other locations of care also hold important data to support precision medicine—the data found in their health information systems. The data found in these systems provide the picture of the patient’s experience from the perspective of treatments experienced, response to therapy, and medical history. As you have likely experienced, however, the challenge of interoperability between disparate systems continues to hamper information sharing. This same challenge exists for incorporating genetic, lifestyle, and environmental information that comprise precision medicine.

Federal efforts toward widespread adoption of certified EHRs did not include a central focus on precision medicine. Therefore, the technical infrastructure is not widely available to incorporate and present the data to end users, like you. We anticipate that the significance of this challenge will grow as Internet of Things (IoT) devices rapidly increase the rate of collection of data that characterize an individual’s lifestyle and environmental experiences. The technical challenge of incorporating all of these data in a useable manner for clinicians is a reality.

The challenges are not only technical in nature. As mentioned, patients are rapidly incorporating wearables into their daily lives. Use of these devices can help prompt healthy behaviors, such as walking. Those patients who want to share data with their providers may be disappointed when they learn that their providers are not interested in the data because of concerns over validity. Regardless of concerns

overs accuracy, these devices help individuals make healthy lifestyle decisions.

The logical thought sequence is that genetic, lifestyle, and environmental data that comprise precision medicine will be incorporated into clinicians’ decision-making processes. Pharmacists, nurses, and physicians currently use clinical decision support (CDS) systems as a core tool to support daily patient-care activities. From a technical perspective, current CDS systems are not able to manage these data and incorporate them into actionable messages to clinical end users. This leads to another challenge. Are clinicians adequately trained to understand genetic implications for treatment selection and modification? Genetics is a core component of many pre-professional education programs, but clinicians may need additional training to help apply genomic-based CDS recommendations to their patients.

The promise of precision medicine is truly fascinating. As a patient, wouldn’t you prefer to know before a medication is given to you whether it likely will (or will not) effectively treat your condition? Would you like to know your chances of developing a chronic disease during your lifetime? As a pharmacist, how powerful would it be to be able to select medication therapy with confidence that it will work for your patients? Despite the technical, workflow, and education challenges, we believe the continued maturation of precision medicine will fundamentally change our approach to medication therapy. We welcome your comments (Brent at foxbren@auburn.edu and Bill at felkebg@auburn.edu). ■