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SYMPOSIUM

The Personalized Medicine for Diabetes Meeting Summary Report

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Abstract

Personalized medicine for diabetes is a potential method to specifically identify people who are at high risk of developing type 2 diabetes based on a combination of personal history, family history, physical examination, circulating biomarkers, and genome. High-risk individuals can then be referred to lifestyle programs for risk reduction and disease prevention. Using a personalized medicine approach, a patient with already-diagnosed type 2 diabetes can be treated individually based on information specific to that individual. The field of personalized medicine for diabetes is rapidly exploding. Diabetes Technology Society convened the Personalized Medicine for Diabetes (PMFD) Meeting March 19–20, 2009 in San Francisco. The meeting was funded through a contract from the US Air Force. Diabetes experts from the military, government, academic, and industry communities participated. The purpose was to reach a consensus about PMFD in type 2 diabetes to (a) establish screening programs, (b) diagnose cases at an early stage, and (c) monitor and treat the disease with specific measures. The group defined what a PMFD program should encompass, what the benefits and drawbacks of such a PMFD program would be, and how to overcome barriers. The group reached six conclusions related to the power of PMFD to improve care of type 2 diabetes by resulting in (1) better prediction, (2) better prophylactic interventions, (3) better treatments, and (4) decreased cardiovascular disease burden. Additional research is needed to demonstrate the benefits of this approach. The US Air Force is well positioned to conduct research and develop clinical programs in PMFD.

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Personalized medicine is an emerging concept for treating diseases, which involves determining specific information about a particular patient and then prescribing a treatment that is specific for that patient. Personalized medicine represents an approach for defining disease subtypes and defining biomarkers that can identify patients who are most likely to benefit from a specific treatment and other patients who are unlikely to respond or likely to experience side events.[1]

Diabetes Technology Society convened the Personalized Medicine for Diabetes (PMFD) Meeting March 19–20, 2009 in San Francisco. The meeting was funded through a contract from the U.S. Air Force. Diabetes experts from the military, government, academic, and industry communities participated. The purpose was to reach a consensus about PMFD in type 2 diabetes to (a) establish screening programs to identify high-risk individuals and then prevent the disease, (b) diagnose cases at an early stage, and (c) monitor and treat the disease with specific measures. The participants focused primarily on three topics: (1) what is PMFD, (2) what are the barriers to developing PMFD programs, and (3) what are the solutions to the barriers that are impeding progress in PMFD?

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Abbreviation: (PMFD) Personalized Medicine for Diabetes

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The meeting was divided into four sessions: (1) genetics,[2-4] (2) pharmacogenomics and environmental factors,[5–9] (3) biomarkers,[10–13] and (4) translational research.[14–18] On the first day, each of the four sessions consisted of four lectures, a moderator summary, and questions to the speakers. On the second day, the entire group discussed the meeting topics and arrived at conclusions about PMFD.

The participants consisted of 25 endocrinologists, geneticists, bioengineers, physiologists, and epidemiologists from the following institutions: U.S. Air Force, U.S. Army, Centers for Disease Control and Prevention, National Institutes of Health, Food and Drug Administration, Personalized Medicine Coalition, Albert Einstein College of Medicine, Duke University, Harvard University, Indiana University, Mayo Clinic, University of Arkansas, University of California at Berkeley, University of California at Los Angeles, University of California at San Francisco, Mills-Peninsula Health Services, Children's Hospital of Oakland Research Institute, Big Sky Biosystems, Inc., Eagle Applied Sciences, Tethys Bioscience, and VeraLight.

The group defined what a PMFD program should encompass and what the benefits and drawbacks of such a PMFD program would be, as well as how to overcome the barriers. The group reached six conclusions regarding the current and emerging status of PMFD.

1. PMFD to predict risk entails more than genetic testing. PMFD also includes the measurement of phenotypic information such as weight, body mass index, body fat percentage/distribution, and circulating biomarkers, as well as family history.
2. PMFD must lead to specific interventions for preventing and diagnosing diabetes.
3. PMFD is not only for prevention and diagnosis but may also direct specific genetic-based treatments and predict favorable or unfavorable responses to medications.
4. The long-term benefit of PMFD is the prevention of not only diabetes, but also obesity and therefore cardiovascular disease.
5. The greatest barrier to the establishment of PMFD programs is insufficient research demonstrating benefits of this approach. This barrier will be overcome with well-designed studies that demonstrate added benefits of PMFD over conventional population-based risk reduction programs.
6. The U.S. Air Force is well positioned to conduct research on PMFD and develop clinical programs in PMFD because of its excellent medical personnel and large population of retirees who are at increased risk of developing type 2 diabetes.

Personalized medicine is intended to identify at-risk individuals and prevent diseases. The field is expanding rapidly with ongoing discoveries about genotypes and phenotypes linked to type 2 diabetes. A PubMed search by me on June 17, 2009 for the three words "personalized," "medicine," and "diabetes" revealed 66 articles and 65% of them were published in or after 2006. Many other articles in this field use different keywords for this database, but the rapid rise in interest in this field is evident by any measure of productivity. Increasing numbers of treatment guidelines are transforming the practice of medicine into template care, which is aimed at delivering the best and lowest cost care to groups of patients. Such computerized check-the-box management is known as template care. Recently, template care is starting to be challenged by the emerging field of personalized medicine, which is driven by rapidly increasing knowledge of human genes that can guide treatment designed for each individual patient.[19] Personalized medicine in the field of diabetes management is an important public health intervention worthy of public funding because of the current rapid rise in the incidence of diabetes and the skyrocketing costs of diabetes and its complications. Much of the economic burden is felt in higher taxes and insurance premiums for health benefits and replacement of lost income. For the military, the costs of providing diabetes care for dependents and retirees are becoming a serious economic concern. Any cost-saving intervention and many cost-effective interventions that can be developed will be seriously scrutinized by every payer of health care services. The impending public health and economic crises of type 2 might be mitigated by the rapid advancements being shown in genotyping and phenotyping of type 2 diabetes.

In this issue we are publishing a special set of peer-reviewed articles written by the speakers and moderators at the PMFD meeting. The articles in this symposium cover the topics that were discussed at this meeting. Personalized medicine for diabetes will be a useful paradigm for preventing and treating type 2 diabetes if the molecular and behavioral sciences can be better developed so that this approach will make clinical and economic sense. This PMFD meeting laid out important considerations for any policy maker in this field to take into account in developing an individualized prevention program for type 2 diabetes.

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