



Delivering on the Promise of Precision Medicine

Bay Area Council Economic Institute

Spring 2016



The Promise of Precision Medicine

The Bay Area is one of the world's biggest hubs for innovation in research and development of precision medical approaches that hold great promise for fields from oncology to infectious disease to diabetes care. The federal Precision Medicine Initiative, the Cancer Moonshot, and California's Initiative to Advance Precision Medicine have put the spotlight squarely on this "emerging approach for disease treatment and prevention that takes into account individual variability in genes, environment, and lifestyle for each person," according to the National Institutes of Health.

In conjunction with partners Genentech and Oracle as well as the members of its active and diverse healthcare committee, the Bay Area Council convened a summit on exciting recent advances in precision medicine. In addition to showcasing the scientific progress in this field, the summit included a serious high-level conversation about how to best deliver and pay for precision medicine with the objective of creating maximum benefit to patients within the context of a healthcare system that is financially sustainable for the country, businesses and individuals. The following are the key takeaways from the conference.

Doctors have always recognized that every patient is unique, and doctors have always tried to tailor their treatments as best they can to individuals. You can match a blood transfusion to a blood type — that was an important discovery. What if matching a cancer cure to our genetic code was just as easy, just as standard? What if figuring out the right dose of medicine was as simple as taking our temperature?

– President Obama, January 30, 2015



Precision Medicine for More than Cancer

Originally seen by many as a revolutionary therapy primarily beneficial for the field of oncology, we now know precision medicine holds promise for many more conditions and diseases. One such example is HIV. HIV is seen as an excellent case study for evaluating the promise of precision medicine because not all HIV viruses are identical, and therefore react differently to treatment. By sequencing the genome of both the virus and the individual, clinicians can avoid making one of the worst mistakes in medicine, applying a treatment that doesn't help, or worse, does harm.

Everybody's virus was sequenced and then the relation between that sequence and the responsiveness to drugs was built, which then allowed us to build regimens that had higher likelihood of success and then in a short period of time that disease was taken from a death sentence into a chronic disease. So this revolution in many respects is happening in the cancer arena right now. Now of course, cancer is more complex; it is a eukaryotic cell, it has a genome that's roughly 1,500 to 2,000 times the size of the HIV virus, but all of the same things are going on. – Michael Varney, Executive Vice President, Genentech



Beyond rare conditions and difficult to treat cancers, precision medicine might also be a key tool in the treatment of unknown infectious diseases. As genetic sequencing becomes quicker and more cost effective, it can be leveraged in this field in new ways. A sample taken from the patient can be sequenced within 48 hours and examined for non-human DNA. The outliers can be compared against growing databases to find a match and identify the disease. Proper treatment can then be administered in a timely manner, all without the traditional trial and error method of treating unknown diseases.



The problem with precision medicine and sequencing a patient that has often been leveled at us is that you can't do it fast. Are you going to sequence them and give me the results a month later? This is an ICU [Intensive Care Unit] case, we need it now and we showed in this case and others that we can do it in 48 hours or less. – Joseph DeRisi, PhD, Chair of the Department of Biochemistry & Biophysics at the University of California San Francisco

Precision medicine has also provided us with a new understanding of cancer. We now know that every instance of cancer is unique, and every patient is unique and therefore responds to treatments differently. Precision medicine is allowing us to dive deeper into cancer cells and understand them from the inside out.



One of the things we also got is a new definition of cancer and that is the importance of genomics. We are moving cancer from a 1850s definition that involved histology, to a 21st century definition that involves histology and genomics. – Otis Brawley, MD, Chief Medical Officer at the American Cancer Society

Scientific Innovation Drives Precision Medicine

Precision medicine is made possible by cutting-edge scientific research in the fields of medicine, biotechnology, software, and hardware. As techniques advance, precision increases and costs fall. DNA sequencing has now become sensitive enough to use DNA fragments in patients' blood to identify tumors based on their molecular alteration, saving time, money, and most importantly avoiding invasive procedures.



Thankfully next generation sequencing is so sensitive if you sequence the same fragment of DNA thousands and thousands of times, you will find that tumor's specific DNA. And almost all of the cases in which we can do that the molecular alteration found in blood matches the molecular alteration that is found in the tumor. That is why people are starting to refer to this as 'liquid biopsies' – Garret Hampton, Vice President of Oncology Diagnostics at Genentech

With the information made available with these tests, there is also a need to tie the data back to clinical outcomes. Without the right structures in place to the necessary context to clinicians, the promise of precision medicine can't be fully realized.

It isn't all about the "omics" in precision medicine. Unless you have the clinical context that sits around these samples, then it's actually of very limited value. What I mean by that is you need to be able to integrate the genomic data with the EMR [Electronic Medical Record] data with the claims data with the self-reported patient data remote patient monitoring wearables [and] images. –Jonathan Sheldon, Global Vice President for Oracle Health Sciences



Forging Partnerships Between Innovators and Payers

With advances in precision medicine being made daily, payers must develop processes and datasets to evaluate their effectiveness and value. Precision medicine holds great promise in care and delivering value for spending if utilized effectively, but could layer on additional costs if not. New incentive structures must be developed for precision medicine to live up to its potential without bankrupting the healthcare system. Initiatives like the California Data Exchange are attempting to build these foundations, but significant thought, time, and money must be invested before it can be deployed throughout the healthcare system.



We know what we pay for, but we don't necessarily know what is happening when the diagnosis happens, when the decision happens. So I can't necessarily go and tie a payment [to value] although I would potentially love to do that in the right circumstances with the right dataset. – Paul Markovich, CEO of Blue Shield of California

Precision Medicine in the Community Hospital Setting and Vision and Strategies for California's Initiative to Advance Precision Medicine

Oftentimes new techniques and treatments are pioneered at leading academic medical centers. However, implementing these complex and expensive therapies in community hospitals can be difficult. The effective use of big data can help make the promise of precision medicine a reality by making databases developed at research institutions available to hospitals everywhere.

We need to optimize our SOPs [Standard Operating Procedure(s)] at the beginning, we need to have transparency with our oncologists, and our pathologists, and the diagnostics labs all of this needs to be done, which is improvement upstream and then when you get the result you get a result that has many mutations, but how does that affect what your patient needs and how do you provide that information? – Manoja Lecamwasam, PhD, Executive Director of the Dignity Health Intellectual Property Strategic Innovation Office



Outlook on Precision Medicine

I'm delighted that we have had a huge success in breast cancer and have moved to colon cancer and prostate cancer. We really just have to do better, though, before I would say, 'we are really committed to precision medicine' because the map I just outlined wouldn't suggest we are putting our money where our mouth is as a country. – Kimberly Popovits, CEO of Genomic Health



Realizing the promise of precision medicine will require tremendous effort. California has recognized this and is doing its part with the creation of the California Initiative to Advance Precision Medicine. Still, much still needs to be done to advance value-based, delivery of these advanced diagnostics and treatments. Collecting the right data on outcomes will be essential. Providers in all settings will need to work together to share the right data on outcomes to facilitate better decision-making and interoperability into the future.



For precision medicine we are thinking beyond cancer, really thinking about the opportunity with asthma, obesity, diabetes, really broadly. That ends up bringing more types of data that we need to be thinking about interoperability. – Dr. Elizabeth Baca, Senior Health Advisor at the Governor's Office of Planning Research

Acknowledgments

Micah Weinberg, PhD, President of the Bay Area Council Economic Institute, and Patrick Kallerman, Research Manager at the Institute co-authored this brief. Camila Mena, Research Analyst at the Institute, also contributed to the brief.

This brief was generously supported by Genentech and Oracle.

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