

Planning for US Precision Medicine Initiative underway

Officials expect to launch the US President's new health project later this year. But Congress has yet to decide whether to fully fund it. *The Lancet's* Washington correspondent, Susan Jaffe, reports.

For more on the Precision Medicine Initiative see <http://www.nih.gov/precisionmedicine>

While continuing to defend his besieged health-care reform law against lawsuits and repeal threats, US President Barack Obama is championing a new health initiative. This one also has a bold goal: to radically change the medical treatment patients receive in the USA.

"I want the country that eliminated polio and mapped the human genome to lead a new era of medicine—one that delivers the right treatment at the right time", the President said when he unveiled his Precision Medicine Initiative (PMI) in his annual State of the Union address to the nation in January.

The idea isn't entirely new Obama reminded top medical and scientific experts at a White House meeting 10 days later. "Doctors have always recognised that every patient is unique, and doctors have always tried to tailor their treatments as best they can to individuals", he told the gathering. "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 standard?"

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The effort to vastly expand the scope and practice of individually designed treatments based on genetic information could revolutionise medicine, supporters say. But the success of the PMI depends on whether Congress agrees to fund it.

"Trial and error" medicine

Precision medicine is already having an impact in cancer treatment, said Robert Diasio, director of the Mayo Clinic Cancer Center in Rochester, MN. "In the past, it was completely trial and error...there was no logic, no science", to determine whether a drug is going to work in a specific patient, he told *The Lancet*, after speaking to reporters attending a programme on precision medicine last month sponsored by the Mayo Clinic and the National Press Foundation. "With the genomic revolution, we have a basis for why we use a drug."

For example, several rare cancers with similar genetic abnormalities can be treated with the same drug. That is an argument for off-label uses of drugs based on genomic typing, he said.

In addition to using genomic sequencing to find treatments for patients with difficult to diagnose diseases, it can also protect patients from genetically based adverse drug

reactions, said Alexander Parker, associate director at the Mayo Clinic for Individualized Medicine. Genetic interactions can range from making a drug ineffective to turning it into a potentially deadly poison, he said.

The leading pharmaceutical trade association in the USA welcomes the president's precision medicine project, said Randy Burkholder, vice President for policy and research at the Pharmaceutical Research and Manufacturers of America, which represents more than 100 drug and biotechnology companies.

Drug companies have nearly doubled their investment in precision medicines over the past 5 years, he told *The Lancet*. "Fundamentally the sector we represent is science driven so they don't have a choice but to go where the science is leading them." And science is leading them to personalised medicine, he said.

"So much of the way we prescribe medicine is based on the average patient and we know that's very imprecise", said Eric Green, National Human Genome Research Institute director at the National Institutes of Health (NIH). "It is striking how many non-responders or poor responders there are to most medications", he told *The Lancet*. "It's hit or miss."

"Part of precision medicine is coming up with more precise ways to subclassify diseases whether it's cancer, Alzheimer's, Parkinson's, or diabetes", he said. In diabetes, for example, there could be more than 20 sub-diseases that can produce a blood value of glucose that indicates diabetes.

Although Congress has not yet considered the President's 2016 budget request made in February, which includes US\$215 million for the PMI, planning has begun to launch the project this autumn.



Barack Obama speaking about the Precision Medicine Initiative in January

Associated Press

A 16-member working group has been meeting to advise the NIH director on how to implement it. They include medical researchers from leading academic and private research institutes, foundations, and companies as well as representatives from the US Food and Drug Administration, Department of Health and Human Services, Veterans Affairs, Department of Defence, Office of the National Coordinator for Health Information Technology, and the White House Office of Science and Technology Policy.

1 million volunteers

Nearly two-thirds of the President's funding request, or \$130 million, would be earmarked for the 1 million-member research cohort. One of the tasks facing the working group is deciding how to incorporate existing smaller cohorts established by some major US hospital health systems, including Minnesota's Mayo Clinic, the Cleveland Clinic in Ohio and Wisconsin's Marshfield Clinic.

"It's a very large group compared with anything we've done in the past", said Bray Patrick-Lake, co-chair of the NIH working group, and director of stakeholder engagement for the Clinical Trials Transformation Initiative at Duke University in Durham, NC. "And the timing is right in the sense that the cost of genetic data and sequencing has come down tremendously, and so this is really our opportunity to take that onto a large scale", she told *The Lancet*.

In the past decade, the cost of sequencing a human genome has dropped from \$22 million to under \$5000 and it takes less than a day, compared with 2 years previously, said Kathy Hudson, the NIH deputy director for Science, Outreach, and Policy and a working group co-chair, during a recent meeting of the working group.

The working group will design measures to ensure that the 1 million research cohort "is diverse

and inclusive", said Patrick-Lake. "Because it is very easy to include the few voices in this country that have the most resources and the highest access to technology, we are being very thoughtful about making sure that we are actually eliminating health disparities rather than creating them through this initiative."

The cohort will be established with input from participants to ensure that they are willing to share their data, that different needs for privacy are met, and that "they get something out of it that's useful", said Patrick-Lake. Promoting participant engagement will be the focus of the working group's next meeting in July, she said.

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The cohort is expected to also include both populations with diseases and those without. Healthy participants could have a genetic disease but not exhibit symptoms, said Green. Finding out why "they are so resilient" would yield important information about the mechanisms of genetic disease.

Digital tools

The latest technology will be essential to handling vast amounts of genomic data and health information. For example, Green said several companies are interested in testing their mobile devices to see how they can be used in clinical care. "We're hoping the private sector might be willing to help out by providing some of the devices", he said, so that at least some portion of the 1 million cohort can receive free mobile devices to record and transmit data.

Electronic health records will also be essential to communicate

crucial medical information among providers, patients, and researchers. Despite incentive payments from the federal government to encourage health-care providers in the Medicare and Medicaid programmes to adopt electronic record systems, the technology is hampered by interoperability—one company's system may not be compatible with a system manufactured by a different company. It is a problem that Senator Lamar Alexander, the Republican chairman of the Senate health committee, has said must be addressed.

"The government has spent \$30 billion trying to require people to do it [use electronic health records], and for some, like Vanderbilt [University], it works enormously well, for others, it doesn't work very well at all", he said at the NIH working group's meeting in May. "And it has to work well", he said, for the 1 million cohort and "for doctors and others to be able to use the information effectively".

Although the PMI is still in the planning stage, Ted Thompson, CEO of the Parkinson's Action Network, an advocacy group based in Washington, DC, is already worried about its future. It will need "adequate, long-term resources to ensure successful outcomes", he told *The Lancet*. "As we know for people with Parkinson's and so many other diseases, there are multiple variants of the disease and we will likely never have a one-size-fits-all therapy."

And he may have good reason to be concerned. Despite signs of bipartisan support in Congress, several NIH officials have said that without adequate funding the project may not fulfil its promise to the many patients who view it as their last hope. "Without support for the initiative, the full prospect of precision medicine may never be completely realised", an NIH spokesperson said.

Susan Jaffe

SJ received a Precision Medicine fellowship from the National Press Club, held at and funded by the Mayo Clinic