PMC PERSONALIZED MEDICINE COALITION

PERSONALIZED MEDICINE IN BRIEF

VOL. 7, FALL 2016

Developments in Brief

2016

PRESIDENT'S BRIEF

A Mid-Year Review

by Edward Abrahams, Ph.D., PMC President

In its strategic plan for 2016, PMC defined three overarching goals: (1) highlight the issues facing personalized medicine, (2) identify the best strategies to integrate personalized medicine into health care and (3) promote public policies that encourage investment in personalized medicine, including regulatory reform, supportive reimbursement and increased funding for research.

So, how are we doing?

Although the year is not over and much of our work is still in development, we can discern certain themes.

They are outlined in this newsletter.

First and foremost, President Obama and Vice President Biden have focused unprecedented attention on the power and promise of personalized medicine. The Precision Medicine Initiative launched in 2015 and the Cancer Moonshot Task Force organized in the spring of this year have galvanized the research community to uncover and potentially share data that might reveal the secrets of individual variation so that more effective therapies may be developed to, in the President's words, "give us the tools to better understand, prevent and treat everyone's health needs."

President Obama recently announced a new round of programs that will support his Precision Medicine Initiative. See page six for more details.

But, as Christopher Wells writes in his review of the White House's programs, these initiatives, as important and as promising as they are, do not address outdated regulatory and reimbursement policies that continue to slow progress. PMC has written to the Centers for Medicare and Medicaid Services (CMS) to object to the downward pressure it continues to place on personalized medicine diagnostics. PMC contends that CMS' recently proposed preliminary gapfill payment determinations, for example, will chill new investment in diagnostics and limit patient access to the kinds of treatments the President envisions.

And, as Amy M. Miller, Ph.D., explains in her policy brief, "What ICER is Missing," personalized medicine is not even an afterthought when it comes to developing the value assessment tools CMS proposes to use to evaluate what pharmaceutical companies may charge for their products. With reference to non-small cell lung cancer, she shows how one-size-fits-all conceptions can and will limit access to new treatments for selected sub-populations that can clearly benefit from them. Recognizing a danger to both innovation and patients in these emerging health technology assessment tools, PMC is working on a white paper to remind policymakers, to paraphrase the President, that just because we can understand individual variation does not mean we will treat it accordingly.

Nevertheless, despite skepticism about personalized medicine in some quarters, progress continues, and PMC is pleased to track and encourage it. Last year, for example, 28 percent of all drugs approved by FDA had biomarker information in their labels. And, as Wells notes on page eight, clinical trial results continue to demonstrate the importance of stratifying patient populations in cancer care.

Despite skepticism about personalized medicine in some quarters, progress continues.

We know, however, that patients, providers and payers lag in their knowledge of the developments in personalized medicine. According to a PMC-commissioned survey published in 2014, only a third of patients are familiar with the principles of personalized medicine and only 11 percent have discussed it with their doctors. As noted in "Beyond the Promise: A Clinical Adoption 'Road Map,'" developing strategies to integrate personalized medicine into health care has been one of PMC's highest priorities. Based on insights from a task force that studied the problem for a year, PMC will publish a paper, "Strategies for Integrating Personalized Medicine into Health Care Practice," before the end of the year. The paper, previewed in these pages, outlines potential solutions to overcome the challenges in integrating personalized medicine into health care, which relate to topics like education and awareness, patient empowerment, value recognition, infrastructure and information management, and access to care.

In brief, in both education and advocacy, we have our work cut out for us.

The challenges and, most notably, the opportunities for overcoming them will be the focus of the next Personalized Medicine Conference at Harvard Medical School, scheduled for November 15–17 in Boston. We hope you will join us for what we know will be spirited discussions of the latest trends in research and development; updates from the respective executive directors of the Moonshot and Precision Medicine initiatives; a discussion of the challenges facing the diagnostic industry; an effort to find consensus among the multiple definitions of "value" in health care; the presentation of examples of the kinds of evidence appropriate for coverage and payment; an examination of the best practices to integrate personalized medicine into health care; and a discussion of the promise and pitfalls of sharing data for research, not to mention a look at what the future of medicine might look like from those who propose to fund and build it.

POLICY BRIEF

What ICER is Missing

by Amy M. Miller, Ph.D., PMC Executive Vice President

Personalized medicine challenges all aspects of health care, from the way discoveries are made to how they are regulated, covered, paid for and delivered in the clinic.

Since the mapping of the human genome more than 20 years ago, we have seen many efforts to alter, update and improve these processes to accommodate personalized medicines, innovative and novel diagnostic tests, and new approaches to care. Excitement is palpable throughout the world, and personalized medicine's proponents are no longer being accused of hyping a future that does not exist.

FDA's new drug approvals demonstrate that about one in four new drugs are now targeted, a ratio likely to remain the same or increase in coming years. As tech company NextGxDx's count of genetic tests shows, there has also been an explosion of personalized medicine diagnostic tests on the market. Encouraged by the incredibly fast work of the National Institutes of Health (NIH) and FDA, U.S. policymakers in both chambers of the Republican-controlled Congress and the Democratic-controlled White House have expressed enthusiasm for the field's potential.

Yet, some groups question the value of these advances.

Take non-small cell lung cancer (NSCLC) for example. This disease exemplifies how a personalized approach can provide more for patients than the standard of care. Over a few short years, several new drugs and diagnostic tests for NSCLC have come to market, changing the trajectory of treatment for the disease. The first-generation ALK drug, for example, did not cross the blood-brain barrier. The second-generation therapy does. Diagnostics for NSCLC began with one-mutation tests, moved to panel tests for multiple mutations and are now moving into the realm of next-generation sequencing tests that reveal an even more comprehensive array of valuable information about the tumor. Thanks to immuno-oncology, we now have a new class of drugs to fight the disease, though we still need to learn more about those drugs.

Based on discoveries in clinical medicine, FDA regularly updates labels to move drugs from the second or third line to the front line when paired with a diagnostic test. Teams of practitioners are learning about these new tools and putting them into practice.

But then we have critics, who are seemingly comfortable with a one-size-fits-all approach. In NSCLC, that is chemotherapy, which, for patients, means a shorter life of lower quality as well as severe toxicity consequences.

The Institute for Clinical and Economic Review (ICER), which has evaluated two classes of NSCLC drugs, may not share our excitement about these recent advances. The organization's value assessment process has, by design or perhaps inadvertently, no mechanism for capturing the value of targeted medicines, since its model is built on population averages.

ICER does, however, seem open to dialogue. In June, PMC met with ICER Director of Health Economics Rick Chapman, Ph.D., during a PMC policy committee meeting. The Coalition suggested in a follow-up comment letter that ICER provide a 30 - 60 day window for public comments. Three days later, ICER extended its deadline for comments on its NSCLC scoping document, and soon after the organization released a call for suggestions on how to improve its evaluation process.

ICER is not the only value-assessment model that needs our attention, but it is one. We encourage advocates for personalized medicine to engage the organization and, as a first step, outline how ICER can evolve, like so much of the health care system already has, by treating personalized medicines and companion diagnostics differently than traditional therapeutics.

THE PATH TO PROGRESS

FDA routinely recognizes the impact of personalized medicine, which presents unique opportunities to extend the lives of patients with diseases like lung cancer. ICER's value assessment process has no mechanism for capturing these benefits.

"FDA believes it is crucial for cancer patients to have many safe and effective treatment options available to them in their battle against this disease. With the approval of Tarceva, thousands of patients with lung cancer will not only have access to another treatment option, but **one that extends life**."

Lester M. Crawford, D.V.M., Ph.D., former FDA Commissioner, on the approval of Tarceva for certain patients with locally advanced or metastatic non-small cell lung cancer (November 19, 2004)

"Today's approval illustrates how **a greater understanding of the underlying molecular pathways of a disease can lead to the development of specific therapies aimed at these pathways**."

Richard Pazdur, M.D., Director, Office of Hematology and Oncology Products, FDA, on the approval of Zykadia for certain patients with late-stage non-small cell lung cancer (April 29, 2014)

"Lung cancer tumors can be varied, so **treatment options need to be tailored to the specific type of lung cancer in the patient.** Today's approval provides certain patients with squamous cell lung cancer a new option that **may extend survival**."

Richard Pazdur, M.D., Director, Office of Hematology and Oncology Products, FDA, on the approval of Portrazza for certain patients with advanced squamous non-small cell lung cancer (November 24, 2015)

"This approval will provide patients and health care providers **knowledge of the survival advantage associated with Opdivo** and will help guide patient care and future lung cancer trials."

Richard Pazdur, M.D., Director, Office of Hematology and Oncology Products, FDA, on the approval of Opdivo for patients with advanced squamous non-small cell lung cancer with progression on or after platinum-based chemotherapy (March 4, 2015)

"**Drugs aimed at a specific molecular target generally have greater effectiveness in a specific population** and may generally have a more favorable benefit-risk profile."

Richard Pazdur, M.D., Director, Office of Hematology and Oncology Products, FDA, in a blog titled "From Our Perspective: Expedited Oncology Drug Approvals" (January 19, 2016)

NEWS BRIEF

White House's Latest Efforts in Personalized Medicine No Substitute for Comprehensive Policy Reform, Advocates Say

by Christopher Wells, PMC Communications Director

Personalized medicine's stakeholders have welcomed the Obama administration's efforts to advance personalized medicine through both the Precision Medicine Initiative (PMI) and the Cancer Moonshot Task Force, but these efforts have not allayed the community's concerns regarding regulation and reimbursement policies, which many believe are also critical to the field's progress.

The administration's most recent actions in personalized medicine are designed to support the PMI. They include the National Institutes of Health (NIH)'s awarding $55 million to health care provider organizations, technology developers and community health centers to establish the necessary infrastructure to build and leverage a cohort of one million volunteers and FDA's releasing draft guidance documents on the oversight of next-generation sequencing (NGS) tests. These initiatives, stakeholders say, do not address ongoing regulatory and reimbursement concerns that continue to inhibit progress.

Those ongoing concerns include an uncertain regulatory environment for laboratory-developed tests (LDTs), which represent a large portion of the diagnostics that make personalized medicine possible. In its initial response to the draft guidance documents on the regulation of NGS tests, the American Clinical Laboratory Association (ACLA) reiterated that it does not consider LDTs medical devices, regardless of whether or not they rely on NGS technology. The organization is calling on FDA to work with Congress on comprehensive regulatory reform for LDTs.

"ACLA continues to assert that LDTs are not medical devices, including those LDTs that utilize NGS technology," said ACLA President Alan Mertz. "While we recognize the FDA is looking for innovative solutions, these proposals show the inherent difficulty of attempting to shoehorn LDTs into medical device standards. We respectfully call on the administration to engage fully and transparently in this process so that we can achieve true statutory reform that benefits patients."

Reimbursement challenges also remain evident. CareDx, for example, recently announced that it will no longer be able to offer AlloMap, a personalized medicine blood test, to Medicare patients if a 74 percent payment rate for the product from Novitas, a Medicare contractor, stands. AlloMap allows doctors to determine whether heart transplant patients are at risk for organ rejection without doing an invasive biopsy. Of the 129 heart transplant centers in the U.S., 111 use the test.

"If Novitas' proposal is adopted, we won't be able to offer AlloMap to Medicare patients anymore because the proposed rate is less than our cost," said CareDx President and CEO Peter Maag, Ph.D.

The Precision Medicine Initiative is designed to "enable a new era of medicine through research, technology and policies."

Industry representatives are not alone in their pursuit of policy changes. Commenting on the PMI and the Moonshot Task Force, Harold Varmus, M.D., former Director of the National Cancer Institute, recommended in an editorial published by *Science* in April of this year that the administration "exercise its regulatory authority—most potently, to direct the Centers for Medicare and Medicaid Services (CMS) to allow reimbursement for molecular profiling of cancers." Varmus argued that doing so would "vastly increase the data available for analysis, accelerate interpretation of genetic profiles, provide a test bed for true sharing of clinical information and allow future coverage determinations by CMS to be made more quickly and sensibly."

Despite these calls for action, the administration remains focused on using the PMI and the Moonshot initiative to accelerate progress in research.

During a webinar FasterCures organized in July, Greg Simon, Executive Director, Cancer Moonshot Task Force, said the decentralized nature of medical research creates cultural challenges that make it hard to capitalize on recent developments in areas like personalized medicine.

"The first problem we have is how we can change the culture," Simon said.

Both Simon and PMI Cohort Program Director Eric Dishman will provide updates on their work at the 12th Annual Personalized Medicine Conference in November.

THE PRECISION MEDICINE INITIATIVE'S NEXT STEPS

The Obama administration has announced the next steps for the Precision Medicine Initiative, which include:

1. The National Institutes of Health (NIH) awarding $55 million to health care provider organizations, technology developers and community health centers to establish the necessary infrastructure to build and leverage a cohort of one million volunteers
2. FDA's releasing draft guidance documents on the oversight of next-generation sequencing (NGS) tests
3. The development of tools and technology to make data accessible to researchers and patients

FEATURE STORY

Immunotherapy Trial Results Billed as Win for Personalized Medicine Business Model

by Christopher Wells, PMC Communications Director

The failure of Bristol-Myers Squibb (BMS)'s Opdivo® (nivolumab) as a first-line therapy for advanced lung cancer has revived interest in the business model for personalized medicine. Observers at *The Wall Street Journal* and elsewhere had begun to question that model in March, as BMS' decision to market Opdivo without a companion diagnostic was believed to be the driving force behind the drug's ability to outsell Merck's Keytruda® (pembrolizumab) in the market for previously treated patients.

Both Opdivo and Keytruda are so-called "immunotherapies." The drugs are remarkably similar, and work by blocking a protein on white blood cells called PD-1. PD-1 binds to a protein called PD-L1 that is expressed by cancer cells. White blood cells are unable to attack cancer cells once that happens.

Following the drugs' 2014 approvals for use in previously treated patients, both BMS and Merck pursued the much larger market for first-line treatment. Merck required that patients enrolled in its clinical trial for first-line use of Keytruda have tumors that express levels of PD-L1 equal to or exceeding 50 percent, while BMS required a level of only 5 percent. Keytruda's first-line trial was successful. Opdivo's was not.

Pasi Janne, M.D., Ph.D., a lung cancer specialist at the Dana-Farber Cancer Institute, said these results demonstrate the importance of diagnostic tests for the PD-L1 biomarker. Janne said he believes immunotherapy will now be used as initial treatment only for the one-third of lung cancer patients who express PD-L1 at the levels Merck studied in its successful clinical trial.

"[These results] will force us to think and identify which patients will get this," Janne said.

But some believe the effects of the failed trial will extend beyond immunotherapy. In a piece published shortly after the announcement, Matthew Herper of *Forbes* speculates that the financial consequences of Opdivo's failed trial will make drug companies more fearful of running trials for targeted therapies aimed at patient populations that are too broadly defined.

According to *The New York Times,* analysts had projected that Opdivo would generate annual sales of around $12 billion in 2021, which would make it one of the best-selling drugs in the world. Mark Schoenebaum, M.D., Fundamental Research Analyst, Evercore, estimates that $7 billion to $8 billion of that would have come from first-line lung cancer.

"[BMS] is paying dearly for being too cocky about the need to pair its cancer drugs with diagnostic tests," Herper wrote. "Other drugmakers will be loath to repeat that mistake."

The battle for market share in the immunotherapy market is not over. Herper notes, for example, that payers could still decide to cover Opdivo for first-line indications if a retrospective analysis demonstrates a benefit in patients with higher PD-L1 levels. BMS is also still studying the effectiveness of combination therapy with Opdivo and its other immune system-booster, Yervoy® (ipilimumab).

But for many, the results of these early trials are a reminder that in medicine, one size does not fit all.

"There's been a temptation to portray immune system-boosting drugs as different from other gene-targeted medicines," Herper explains. "But the goal still has to be to get patients the right medicine for them."

"There's been a temptation to portray immune system-boosting drugs as different from other gene-targeted medicines. But the goal still has to be to get patients the right medicine for them."

Matthew Herper, *Forbes*

THE JOURNAL OF PRECISION MEDICINE

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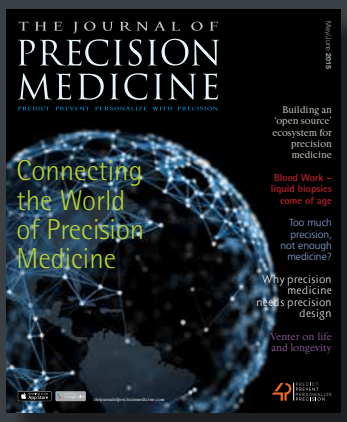

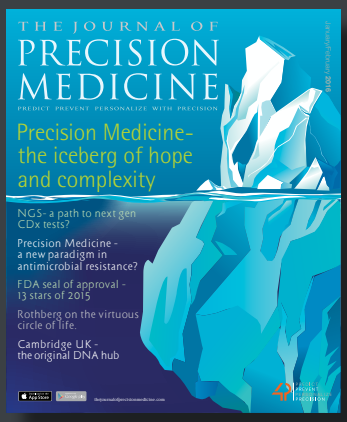

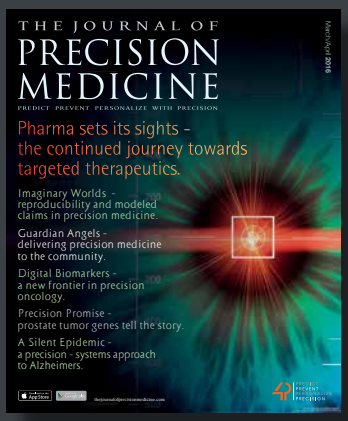

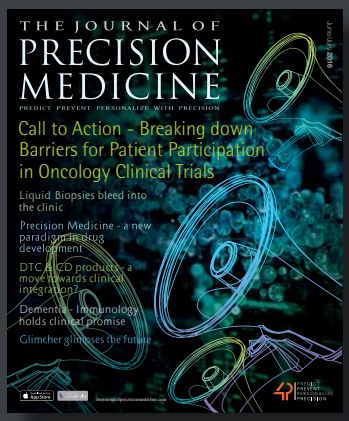

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PREDICT
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FEATURE STORY

Beyond the Promise: A Clinical Adoption 'Road Map'

by Daryl Pritchard, Ph.D., PMC Vice President, Science Policy,
& Christopher Wells, PMC Communications Director

"My dad just got back from his diagnostic appointment," a friend recently told PMC. "He handed his oncologist the FoundationOne® papers to get the biopsy sent to them, but the doctor said he was not familiar with 'precision medicine.' When you hear your dad's doctor is 'not familiar with precision medicine,' it's an odd day for you."

"Odd" as it may be, in the context of health care in the U.S., conversations between a patient who is interested in personalized medicine and a physician who is unfamiliar with it are all too common. That is, if they discuss personalized medicine during the appointment at all. And that doesn't happen much.

According to a representative survey of Americans that KRC Research conducted in 2014, albeit before the President's Precision Medicine Initiative (PMI), which may have increased awareness, only about a third of patients are familiar with "personalized medicine," and only 11 percent of patients have had discussions about it with their doctor. Meanwhile, PMC's most recent analysis shows that personalized medicines now account for more than 25 percent of all medicines FDA approves, and a recent study from Tufts University shows that 42 percent of all medicines and 73 percent of cancer medicines in development are associated with biomarker strategies, meaning they are potential targeted therapeutics.

Fortunately, we now have some insight for addressing the disconnect between the rapid pace of technological advancement in personalized medicine and the comparatively slow pace of clinical adoption, which many experts believe is due to novel challenges that health care delivery systems are encountering as medicine moves from a one-size-fits-all, trial-and-error world toward one that is predictive, preventive and personalized.

In a manuscript titled "Strategies for Integrating Personalized Medicine into Health Care Practice" recently submitted for publication in the journal *Personalized Medicine*, PMC's Health Care Working Group presents a set of strategies to overcome the challenges in integrating personalized medicine into health care systems. The paper offers potential solutions to problems in five strategic areas, including education & awareness, patient empowerment, value recognition, infrastructure and information management, and access to care.

The team said it hopes that the results, which are based on surveys, interviews, focus group discussions and a national summit on the topic co-hosted by PMC and the Biotechnology Innovation Organization (BIO), will help health care administrators and other stakeholders as they design and implement personalized medicine programs that enhance patient care.

"Paradigm shifts requiring cultural change typically happen slowly and often face resistance," they write. "We offer this report as a road map for the implementation of integration strategies to add more momentum toward effecting cultural change and a paradigm shift toward personalized medicine."

A summary of the insights from the manuscript is presented here.

> "We offer this report as a road map for the implementation of integration strategies to add more momentum toward effecting cultural change and a paradigm shift toward personalized medicine."
>
> From "Strategies for Integrating Personalized Medicine into Health Care Practice," submitted for publication in *Personalized Medicine*

INTEGRATING INSIGHT

A Guide for Facilitating the Clinical Adoption of Personalized Medicine

1. EDUCATE STAKEHOLDERS

- Develop and publish freely available and accurate information about personalized medicine on websites and social media platforms
- Organize collaborative forums to agree upon the language used to describe personalized medicine
- Update current medical and pharmacy school curricula to include personalized medicine
- Incorporate personalized medicine into new and existing continuing medical education (CME) programs
- Organize regional events at which physicians, pharmacists and community leaders raise awareness for personalized medicine

2. EMPOWER PATIENTS

- Include patient representatives when developing policies and practices related to the use of molecular information
- Include persons of various ethnicities, races, ages and genders in personalized medicine clinical trials
- Provide counseling and other supportive services to patients before, during and after they are confronted with ethical dilemmas related to molecular information
- Put in place and regularly update state-of-the-art cyber-security measures to protect patients' data
- Incorporate patient-reported outcomes into all decision-making processes

3. DEMONSTRATE VALUE

- Organize forums at which payers, providers and the diagnostic and biopharmaceutical industries discuss health technology assessment processes and the requirements necessary for coverage
- Design clinical studies to serve multiple purposes, including regulatory approval and demonstration of clinical utility
- Establish universally accepted standards for comparative effectiveness studies and coverage with evidence development programs
- Establish policies that reward health care providers for optimizing treatments based on molecular characteristics
- Develop a universally accepted, user-friendly process to collect and share treatment and outcomes data
- Prioritize studies on the costs and benefits of positive and negative coverage determinations for personalized medicine products and services
- Focus on improved outcomes and the science underlying personalized medicine technology when communicating about the topic

4. MANAGE CLINICAL INFORMATION

- Ensure that medical, clinical support and outcomes information is interchangeable across information technology platforms
- Develop user-friendly platforms for inputting and accessing personalized medicine data in the clinic; platforms should be a net time-save for clinicians and should be capable of keeping pace with scientific advancements
- Include molecular information and clinical support information such as previously failed treatment classes and contra-indications in electronic health records
- Coordinate inter-program communications that allow clinicians to incorporate molecular information into decision-making
- Incentivize data sharing

5. ENSURE ACCESS

- Identify strategies for encouraging payers to cover novel technologies
- Regularly update clinical guidelines and decision support tools to ensure that they reflect best practices in personalized medicine
- Agree on an approach to enroll patients in "basket studies" and other clinical trials focused on personalized medicine
- Develop appropriate coverage and payment policies for personalized medicine services and analyses
- Remove disincentives for using high-value services that are provided outside of network laboratories
- Incorporate personalized medicine principles into alternative payment and delivery models

Dana-Farber's MatchMiner to Tackle Trial Recruitment in Oncology

by Christopher Wells, PMC Communications Director

The oncology community has established that cancer researchers often have a hard time recruiting patients for clinical trials. According to a study published in *The Journal of the National Cancer Institute*, for example, nearly 20 percent of cancer trials funded by the National Cancer Institute close with less than 50 percent of their target participation numbers three years or more after their start. That does not bode well for the robust pipeline of personalized cancer medicines now in development.

Fortunately, the Dana-Farber Cancer Institute (DFCI) is doing something about it. DFCI hopes to improve patient participation in personalized medicine trials with MatchMiner, an open-source computational platform for matching patient-specific genomic profiles to personalized cancer medicine clinical trials.

The software, which is still in development, will allow researchers to search a database of patients' genomic information to identify potential participants in clinical trials. MatchMiner will also alert researchers when newly sequenced patients match specific genomic criteria and allow clinicians to view matching clinical trials for a specific patient. The solution won first prize in the Harvard Business School (HBS) Kraft Precision Medicine Accelerator's Precision Trials Challenge (PTC).

HBS Professor Robert Huckman, Ph.D., who helped spearhead the initiative as faculty chair of the HBS Health Care Initiative, said his team believes MatchMiner can accelerate progress in personalized oncology.

"Among the many impressive applications, MatchMiner's stood out as an innovative approach for collecting patient-specific genomic data at the outset of treatment in order to match patients to trials that may be most promising for them," Huckman said.

A team led by Ethan Cerami, Ph.D., Director, Knowledge Systems Group, and Lead Scientist, Department of Biostatistics and Computational Biology, is developing the MatchMiner platform to support multiple personalized medicine initiatives at DFCI. DFCI intends to pilot the platform in stages before making it fully open source and available to other institutions. Doing so, Cerami said, will help ensure that inefficient patient recruitment processes do not continue to hinder personalized medicine trials.

"The recruitment (or matching) of patients to genomically driven clinical trials is often a manual process, resulting in overall inefficiencies and missed opportunities," Cerami explained in his contest submission. "The MatchMiner platform aims to aid clinicians in automating this process, with the overall goal of increasing clinical trial enrollment in precision cancer medicine clinical trials and maximizing clinical trial options for all cancer patients."

The PTC was the first research pilot for the HBS Kraft Precision Medicine Accelerator, which New England Patriots owner Robert Kraft launched with a $20 million gift from the Kraft Family Foundation at last year's Personalized Medicine Conference. Cerami will join representatives from Merrimack Pharmaceuticals and the University of Florida, whose proposals were runners up in the PTC, for a question-and-answer session about improving the clinical trial process in the era of personalized medicine at this year's Personalized Medicine Conference, which will take place in Boston from November 15–17.

Chris Sander, Ph.D., Director, cBio Center, Dana-Farber Cancer Institute (left) and Ethan Cerami, Ph.D., Director, Knowledge Systems Group, Department of Biostatistics and Computational Biology, Dana-Farber Cancer Institute, are developing MatchMiner to help clinicians automate the matching of appropriate patients with personalized medicine trials.

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Director, Precision Medicine Initiative Cohort Program, National Institutes of Health

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INTERNATIONAL BRIEF

Catalonia Crafts Strategic Framework for Personalized Medicine

by Antonio L. Andreu-Periz, Director General, Research and Innovation in Health, Department of Health, Catalonia, Spain

The sequencing of the human genome has opened up a new body of knowledge to help prevent, diagnose and treat human diseases. It is redefining medicine in the 21st century, anticipating a new paradigm that will change health care.

The Catalan government firmly believes that personalized medicine will be at the forefront of health systems in the future. Catalonia is one of the most important European regions for medical research and innovation. Catalan society benefits from a universal public health system and a wide range of services wholly supported by taxes. Public health administrators have made it their priority to incorporate innovation into services provided throughout Catalonia, and Catalonia strongly supports personalized medicine. That is why at the end of 2015 the Catalan government approved the drafting of a personalized medicine strategy for the whole country. A wide range of scientists, doctors and medical administrators contributed to the *White Paper on Personalised Medicine*, with the intention of presenting it before the end of 2016.

In the coming months, a pioneering personalized medicine program will be set up, the objective of which is to create a network of processes involving medical centers, genomic analysis centers, platforms for data analysis and university research centers. This network will define processes, standards of quality and systems of codification, and, significantly, set up a program that provides critical personalized medicine training to attending doctors.

Catalonia boasts several important characteristics that make its efforts in personalized medicine possible. It has an extensive network of university hospitals with a great research tradition and international reference centers in the area of cancer medicine. In addition, in spite of having only seven million inhabitants, the autonomous region of Spain has a large network of research centers, among which are two infrastructures of great strategic importance for personalized medicine: the National Centre for Genome Analysis (one of the top five sequencing centers in Europe dedicated to the output of data of the highest quality) and the Barcelona Super Computer Centre (one of the most powerful data analysis centers in Southern Europe). This combination will ensure that Catalonia's personalized medicine strategy yields proof of concept and cost-effectiveness studies that can be extended to the whole health system.

A good example of this "energy" in the field of personalized medicine in Catalonia is its strategy on hepatitis C. High-resolution hepatitis C virus (HCV) subtyping developed in Vall d´Hebron Research Institute—Vall d´Hebron Hospital allows classification of HCV into seven genotypes and 67 subtypes. It can also determine whether a patient is infected by more than one subtype (mixed infections). At present, more than 1,500 patients have been tested.

The same methodology is being used to identify mutations associated with resistance to treatment with new antivirals (RAS=resistance associated virus). Correct HCV subtyping and testing for the presence of RAS are essential to selecting the optimal treatment for each patient. The challenge is to achieve the highest rate of antiviral response with the first treatment, since the failure to respond to antiviral therapy is usually accompanied by the selection of viral mutations associated with resistance, making a second rescue treatment more difficult and expensive.

Thanks to these efforts and many others, Catalonia is getting closer to an era of personalized medicine.

BREAKING NEWS

AT YOUR FINGERTIPS

Stay Informed with the latest personalized medicine headlines from the gw newsroom

GenomeWeb's newsroom delivers in-depth, real-time reporting on the biggest stories in life science and molecular diagnostics.

5 Premium Articles from the newsroom

THERANOS' EMERGENCY AUTHORIZATION BID FOR ZIKA ASSAY RAISES QUESTIONS ABOUT STRATEGIC DIRECTION

BROAD INSTITUTE REFUTES CLAIMS IN LEAKED EMAIL SUGGESTING CRISPR PATENT MALFEASANCE

AGGRESSIVE ACQUISITION STRATEGY FILLS OUT ROCHE'S PIPELINE OF DX TESTS AND PLATFORMS

GENETIC TESTS REVEAL ROLE FOR PREVENTIVE CARE, BUT INSURANCE DOESN'T ALWAYS COVER

QUEST AIMS TO IMPROVE CARE OF DEMENTIA PATIENTS IN PROGRAM INTEGRATING DIGITAL TOOLS, GENETIC TESTS

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PMC Adds Representation From Patient Advocate, Pharmaceutical, Media Publishing Communities to Board of Directors

by Christopher Wells, PMC Communications Director

PMC is pleased to announce the addition of three new representatives from the patient advocate, pharmaceutical and media publishing communities to its board of directors: Bonnie J. Addario, Founder, Chair, Bonnie J. Addario Lung Cancer Foundation, and Founder, Addario Lung Cancer Medical Institute; William Chin, M.D., Chief Medical Officer, Executive Vice President, PhRMA; and Susan McClure, Founder, Publisher, *Genome* magazine.

"Addario, Chin and McClure each represent important and diverse parts of the health care system," said William Dalton, Ph.D., M.D., PMC Board Chair, and CEO, M2Gen. "Leaders in the field, each has demonstrated extraordinary commitment to personalized medicine and will help the Coalition realize its mission."

The new members also bring valuable expertise in education and advocacy. Addario has been an activist, educator and advocate for personalized medicine on behalf of lung cancer patients since receiving a stage 3B lung cancer diagnosis more than a decade ago. Chin, who was formerly the Executive Dean for Research at Harvard Medical School, has led PhRMA's advocacy efforts in science and regulatory affairs since June of 2013. And as the publisher of *Genome*, McClure spearheads the award-winning magazine's efforts to inform patients, family, caregivers and health care professionals about the science behind personalized medicine and its significance for patient care. McClure is the first media publisher to serve on the Coalition's board.

"Each of these individuals brings expertise and experience that can help inform PMC's educational and advocacy efforts," Abrahams said. "The Coalition looks forward to working with them."

Left to right: Bonnie J. Addario, Founder, Chair, Bonnie J. Addario Lung Cancer Foundation; William Chin, M.D., Chief Medical Officer, Executive Vice President, PhRMA; Susan McClure, Founder, Publisher, *Genome* magazine

"I learned SO MUCH! I never even knew that the microbiome existed. I did not know that testing could differentiate the degree of metabolization (poor-ultra-rapid) … This conference was truly life changing for me."

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MEDIA BRIEF

From the PMC News Desk

FDA Releases Draft Guidance on Codevelopment of Drugs, Diagnostics

Following FDA's release of a draft guidance document on the principles for codevelopment of drugs and diagnostics in July, *Regulatory Focus* cited PMC's analyses of personalized medicine approvals at FDA to demonstrate the agency's growing interest in therapies linked to diagnostics. PMC Executive Vice President Amy M. Miller, Ph.D., noted that codevelopment has become increasingly common since FDA approved Herceptin alongside HercepTest in 1998.

"Since that time, interest in identifying biomarkers that could be used as biological targets for therapeutic product development, prognostic indicators or predictors of patient response to specific therapeutic products has grown tremendously," an FDA spokesperson said. *Regulatory Focus* (July 2016)

Administration Offers Research Funding, Draft Guidances on NGS to Advance Precision Medicine Initiative

Politico noted PMC's call for reimbursement reforms in support of personalized medicine after the Obama administration announced a new round of research funding and published draft guidance documents on next-generation sequencing (NGS) as part of its Precision Medicine Initiative (PMI) in July. PMC President Edward Abrahams said in a statement that the administration's research efforts are "important but insufficient to advance personalized medicine as fast as patients wish." *Politico* (July 2016)

Personalized Medicine Community Turns Attention to Draft Guidances on NGS

Shortly after FDA released its draft guidance documents on next-generation sequencing (NGS) in July, *GenomeWeb* quoted PMC Science Policy Vice President Daryl Pritchard, Ph.D., saying that PMC applauded FDA for working collaboratively to develop its approach to the topic. Pritchard said PMC looks forward to working with groups like the American Clinical Laboratory Association (ACLA), which is encouraging Congress to engage with FDA on comprehensive regulatory reform for diagnostics, to develop the Coalition's comments on the documents. *GenomeWeb* (July 2016)

Stakeholders Express Ongoing Concerns About Medicare Part B Proposal, ICER Value Framework

In May, *Politico* cited PhRMA President & CEO Steve Ubl's remarks at PMC's 12th Annual State of Personalized Medicine Luncheon Address to spotlight the personalized medicine community's ongoing concerns about a proposal to test new ways to pay for drugs administered under Medicare's Part B program as well as the Institute for Clinical and Economic Review (ICER)'s assessments of the value of certain drugs.

Ubl said the Part B proposal could introduce a "bias toward older, cheaper medicines" while value assessments like ICER's, if improperly designed, could superimpose "arbitrary" cost thresholds on the health care system.

"What gets lost," he said, "are patients." *Politico* (May 2016)

PMC Critiques Medicare Part B Proposal

In a piece published in May about the Centers for Medicare and Medicaid Services (CMS)' proposal to test new ways to pay for Medicare Part B, *STAT News* highlighted PMC's letter to the agency to illustrate the health care community's concerns about the project.

"Avoiding political overtones," the article reads, "the Personalized Medicine Coalition, a group of drugmakers, insurers, patient groups and other institutions, wrote to CMS that the 'most innovative medicines, including advanced, personalized medicines targeted to smaller patient populations, (are) facing the deepest payment cuts … Payment policies that institute one-size-fits-all mechanisms for assessing value and determining coverage … may reverse advances for patients.'" *STAT News* (May 2016)

Regulatory Environment for Laboratory-Developed Tests Remains Uncertain

Amid ongoing uncertainty regarding the regulatory environment for laboratory-developed tests (LDTs), *The Gray Sheet* quoted PMC Executive Vice President Amy M. Miller, Ph.D., as she encouraged labs to start reaching out to FDA about the agency's proposed approach to LDT oversight, which FDA maintains it will finalize this year.

"Now might be the time to begin considering what the community may ask of FDA in the event that a final guidance is published," Miller wrote on PMC's blog, *Education & Advocacy*. *The Gray Sheet* (April 2016)

Genetic Testing Firm's Decision to Make Data Public Fuels Ongoing Debate Around Implications of Public Data

Following Ambry Genetics' decision to publish a database of customers' genetic information in March, *The New York Times* quoted PMC President Edward Abrahams saying that Ambry's decision "should be applauded." *The New York Times* (March 2016)

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SEPTEMBER 2016

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MISSION: The Personalized Medicine Coalition (PMC), representing innovators, scientists, patients, providers and payers, promotes the understanding and adoption of personalized medicine concepts, services and products to benefit patients and the health system.

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