The Forum on Healthcare Innovation

REPORT & PROCEEDINGS

PRESENTED BY
THE JACKSON LABORATORY

OCTOBER 15 – 16, 2015
FARMINGTON, CONNECTICUT

The Forum on Healthcare Innovation

Executive Summary

The second annual Forum on Healthcare Innovation was held at The Jackson Laboratory for Genomic Medicine in Farmington, Conn. on October 15 – 16, 2015. Nearly 200 leaders of the insurance, healthcare, investment, policy and research sectors met to explore a new approach to innovation in biomedicine.

In 2015, The Jackson Laboratory convened representatives of five national health insurers and asked them to identify the medical conditions and organizational issues that drive the majority of cost in the healthcare system, and for which outcomes are generally suboptimal. The selections of the payers were validated by the chief medical officers from five leading healthcare providers.

The top issues identified in this process were 1) chronic disease management, 2) implementing personalized and precision medicine, 3) behavioral health management, and 4) better connectivity and interoperability among information systems. These became the defining topics that shaped the Forum.

In the typical biotech innovation cycle, innovators originate ideas, investors capitalize them, and the healthcare system tests them — all before the payers become involved.

However, payers' judgments about reimbursement often determine which innovations will be adopted by care providers, and few innovations survive this process.

According to a recent study, about 74 percent of all the drugs, medical devices and diagnostic tests that enter the American healthcare marketplace fail the ultimate test of approval for reimbursement. That represents a massive risk on the part of investors, and a terrible waste of R&D effort and human capital. At the same time, payers and providers are struggling to increase the effectiveness of treatments and to slow the growth of medical costs. Clearly, the traditional approach to biomedical innovation is not working.

At the Forum, stakeholders from across the healthcare system were introduced to specific examples of emerging science and technology that can lower costs and improve outcomes. These emerging solutions included more nuanced and powerful applications of genomic analysis, remote monitoring and treatment for chronic conditions, online interventions for behavioral problems, and patient information shared across the system in a secure but accessible manner.

At the Forum, it was agreed that:

- The pace of innovation is extraordinary. The major departures from the past are the scale, comprehensiveness and speed of the technologies that provide unparalleled interconnectivity. Genomics is revolutionizing diagnostics and therapeutic discoveries. The computational power to interrogate massive databases has major ramifications for the optimization of healthcare systems in the delivery of care.
- The delivery of care will be progressively patient-centric, as opposed to hospital-centric. Approaches to deliver elements of care direct to the patient will be needed. These approaches include information technologies, personal devices and direct access diagnostics.
- The key to systems optimization is data: both at the systems and at the individual level there is movement toward instantaneous access and interoperability across institutions and platforms. Data will drive clinical decision-making and IT tools will make this information accessible to clinical decision makers.
- Insurers and healthcare systems are the key institutions that generate and hold this data. Sharing of these data and/or the outcomes of their analyses will inform the health delivery system about which problems to attack for optimum benefit. Data analysis will provide a means of monitoring the effectiveness of any changes.
- Innovators and investors are interested in engaging insurers and healthcare systems early in the innovation cycle. Information on what would enhance health outcomes and reduce cost will direct innovators to the problems that when solved will have the greatest impact.

The next step will be to focus on more specific medical conditions and issues, and to shed more light on the reimbursement approval process used by payers. A goal should be a set of metrics for assessing the value of innovations in drugs, devices, applications and approaches.

Technology can lower medical costs and improve outcomes, but we must improve the innovation process to deliver innovative solutions in a more timely way. The answers won't come from the government, from the biotech sector or from the payers alone, but will be achieved through interactions among all the stakeholders. By coming together as an interconnected community, we can drive value, and successfully develop new and innovative approaches to healthcare.

Opening remarks

Edison T. Liu, M.D., President and Chief Executive Officer, The Jackson Laboratory, opened the Forum by describing that the models for biotech innovation and healthcare are dramatically changing. These changes are brought on by two factors. The first is that our healthcare finance system is too costly and is unsustainable. Operational inefficiencies, a growing population of patients and delivery based on volume rather than value are all driving medical costs higher without concomitant improvement in population health statistics. The second is that the technologies available today in IT, genomics, chemistry and molecular biology are so powerful that creating a product is no longer the major problem. Instead, discovering the precise problems to solve that would simultaneously reduce cost and improve care is the new value proposition. Whereas innovation has always provided pathways to improve treatments, innovation that would enhance efficiency and improve access to care may be as important to population health as finding cures.

In the past, biotech innovators focused primarily on generating a novel product. The question of who will pay for the innovation was considered late in the product cycle. Today, how a novel product will be reimbursed is a question that is asked early in the innovation cycle. Yet, payers/insurers and healthcare systems still are not involved until after a product is launched. These are the very institutions that, through their patient databases, can identify the problems that, if solved, would greatly augment outcomes — both in health and for financial well-being. We proposed that bringing impactful healthcare products to the market would fundamentally be more efficient if the payers and health systems are brought earlier into the innovation cycle to guide entrepreneurs to target their discoveries.

The Forum on Healthcare Innovation sought to bring all essential parties in the bioinnovation ecosystem — payers, innovators, investors and healthcare systems — together to explore how they can reconstruct their lines of interaction to maximize outcomes.

Forum Advisors

A great many people contributed to the planning for the 2015 Forum on Healthcare Innovation. Here are a few of our most dedicated advisors. We appreciate everyone who helped to make the Forum a success!

Jean-François Beaulé, Executive Vice President, Health Plan Design and Innovation, UnitedHealth Group

James Bedard, Chief Financial Officer, Northeast Region, UnitedHealthcare

Peter Bowers, M.D., Medical Director, Anthem Blue Cross and Blue Shield

Bruce Carlson, President and CEO, Connecticut Technology Council

Amy Cunningham, Executive Director, Connecticut Health Council

Christopher Dadlez, President and CEO, Saint Francis Hospital and Medical Center

Geoffrey Duyk, M.D., Ph.D., Managing Director and Partner, TPG Biotechnology

Jeffrey Flaks, Executive Vice President and Chief Operating Officer, Hartford HealthCare

Richard Foster, Ph.D., Yale University

Susan Froshauer, Ph.D., President and CEO, Connecticut United for Research Excellence

Martin Gavin, President and CEO, Connecticut Children's Medical Center

Oz Griebel, President and CEO, MetroHartford Alliance

David Ledbetter, Ph.D., Executive Vice President and Chief Scientific Officer, Geisinger Health System

Phillip Lerner, M.D., Vice President and National Medical Director, Aetna

Frank Marco, Partner, Wiggin and Dana LLP

Michael Matteo, Chief Growth Officer, Optum, a United Health Group Company

Thomas Meehan, M.D., Associate Medical Director, Harvard Pilgrim Health Care

Gregory Moore, M.D., Ph.D., Director, Institute for Advanced Application, Chief Emerging Technology and Informatics Officer, Geisinger Health System

Robert Patricelli, Founder, Chairman and CEO, Women's Health USA

Paul Pescatello, Ph.D., Connecticut Business and Industry Association

Edmund Pezalla, M.D., National Medical Director, Pharmacy Policy and Strategy, Aetna

Marc Reich, Chairman and CEO, Ironwood Capital

Stephanie Rich, Senior Vice President, Healthcare Management, ConnectiCare

Richard Salmon, M.D., Ph.D., Vice President for Performance Measurement and Improvement, Cigna

Michael Sturmer, Vice President, Consumer Health Engagement, Cigna

Kevin Tabb, M.D., President and CEO, Beth Israel Deaconess Medical Center

Personalized and Precision Medicine

PLENARY SESSION 1

SESSION CHAIR

Edison Liu, M.D.
President and CEO
The Jackson Laboratory

SPEAKERS

Steven Kafka, Ph.D.
COO
Foundation Medicine

Stephen Quake, D. Phil.
Prof.
Stanford University

Jill Hagenkord, M.D.
CMO
23andMe

David Ledbetter
Exec. VP and CSO
Geisinger Health System

THE PROMISE OF PRECISION MEDICINE.

The Forum's first plenary session described the powerful innovations being made in precision medicine and how these innovations are reshaping patient care. While the potential for these innovations to transform the healthcare system is clear, the challenge of gaining payer engagement and support remains significant. How might genomic testing be incorporated into the standard-of-care? What are the challenges associated with creating, managing and leveraging genomic data? What are the benefits to all stakeholders? These are the overarching questions that presenters sought to address.

Steven Kafka, Ph.D., Chief Operating Officer, Foundation Medicine, described an array of information-based solutions being developed to integrate — and maximize the utility of — cancer genomic data in the clinic. Foundation Medicine's clinico-genomics database, FoundationCore, comprises more than 50,000 aggregated and de-identified genomic profiles from cancer patients in real time in real treatment settings, including those actively participating in clinical trials. This large and growing knowledgebase is the foundation for complex bioinformatic analyses from which patterns in cancer genomic profiles and new therapeutic targets can be identified. This is being leveraged against genomic results being generated clinically. Pathologists can compare patient tumor characteristics against curated genomic variants, research studies, and therapeutic and clinical trial information. The software then returns clinically actionable results to physicians quickly and in a simple and accessible format. Other information solutions being developed at Foundation Medicine offer a venue for connecting physicians who are treating patients with similar genomic profiles. All these efforts are designed to facilitate more informed treatment decisions, thereby optimizing the treatment and management of a patient's specific disease based on his or her individual genomic profile.

Stephen Quake, D. Phil., Professor, Stanford University, described the concept of the "molecular stethoscope." He provided an overview of this rapidly evolving area of genomic testing, offering several examples in which a simple blood test can be used to diagnose a patient's health status. A pioneering technology in this class is the non-invasive prenatal test, which screens for common fetal genetic abnormalities using cell-free fetal DNA present in maternal blood. This test has been rapidly adopted in the clinic as a screening tool that, when combined with other conventional screening methods, can potentially circumvent the need for amniocentesis. Dr. Quake went on to describe the serial innovations he has helped foster based on the concept of the blood-derived cell-free genome, including blood-based genomic screening for foreign cell-free DNA that can predict the risk for rejection in transplant patients, and screening for microbiome composition as a broad indicator of health and/or immune function. The cell-free genome thus has great potential to predict health outcomes that will impact the quantity and quality of healthcare a patient receives, replacing invasive and costly tissue sampling procedures in a manner that preserves and even enhances a physician's ability to treat a patient's specific condition.

Jill Hagenkord, M.D., Chief Medical Officer, 23andMe, contended that early research suggests that personal genomic testing may motivate people to improve their health. According to researchers, participating in a direct access genetic test may evoke a "health awareness moment" in which the process of reviewing the results of the test may lead to self-reflection on one's own health. As a result of this "health awareness moment," studies have shown that participants reported sustained changes to diet and exercise and/or a greater compliance with regularly scheduled health tests. In addition, when 23andMe consumers were asked what they do after taking the 23andMe experience, the number one answer is that they have a conversation with their family about their health history. Thus, the experience of taking a personal genetic test may identify activated patients who are more open to healthy lifestyle suggestions from their doctors, as well as help facilitate a more complete family history. 23andMe is eager to partner with the healthcare system to continue to foster the possible health and wellness benefits of personal genomic testing.

David Ledbetter, Executive Vice President and Chief Scientific Officer, Geisinger Health System, described how GHS is using genome sequencing as an integrated part of patient care in a way that maximizes benefits for patients. GHS, a nonprofit, physician-led health services organization, leverages the unique features of the population it serves — i.e., large, stable multigenerational populations — to conduct field studies with a focus on the genetic and genomic basis of disease. GHS nurtures strong and trusting relationships with patients that encourage participation in genomic research. Such participation ensures that clinically actionable discoveries can be addressed to improve an individual patient's health. This is made possible through GHS's unique clinical data "warehouse" in which electronic health records are maintained longitudinally and updated in near real time. As informative genomic data comes online, this information becomes integrated into their health records, allowing genomic results to rapidly be translated into patient care. As both provider and payer, GHS is validating the concept that early adoption of genomic medicine can, in the long term, lead to improved health, and lessen the burden of treating chronic conditions while providing insights into the genetic basis of disease that directly benefits patients, their families and the community at large.

The enthusiasm for genomic testing among innovators and consumers has yet to be matched by payers. All speakers agreed, however, that the significant benefits of predictive and/or diagnostic genomic testing laid out above, once realized, will be a force for cultural change.

Chronic Disease Prevention and Management

Plenary Session 2

SESSION CHAIR

Bruce Liang, M.D.
Dean, School of Medicine
University of Connecticut

SPEAKERS

Morris Birnbaum, M.D., Ph.D.
CSO for Cardiovascular and Metabolic Disease Research
Pfizer

Peter Bowers, M.D.
Medical Director
Anthem Blue Cross Blue Shield in Connecticut

Rick Weisblatt, Ph.D.
Chief of Innovation and Strategy
Harvard Pilgrim Health Care

Chronic disease is the costliest component of healthcare in the U.S., and the incidence of some chronic diseases such as type 2 diabetes/metabolic syndrome is increasing rapidly. While the costs are stressing the current healthcare system, better chronic disease management also provides the greatest potential for economic savings. New technologies and systems are making it easier to engage chronic disease patients and make them proactive participants in their care. Nonetheless, it is difficult to implement the new capabilities within a system that can be resistant to change. Leaders from all areas of healthcare presented ways to improve the chronic disease situation from a variety of perspectives.

Bruce Liang, M.D., Dean, School of Medicine, University of Connecticut, led off with a focus on cardiology. Heart failure costs $32 billion in direct and indirect costs within U.S. healthcare, with the majority spent on hospitalization and related costs. Hospital readmission is a significant issue, and UConn is working to reduce readmissions, keeping them below the Connecticut state average. Dr. Liang stressed the need to better understand the biology underlying heart disease and develop improved therapies. In the meantime, UConn is working on patient education and behavior modification, using a team approach to follow up after hospital discharge and enhance communications with patients and their families.

Offering perspective from the pharmaceutical industry was ***Morris Birnbaum, M.D., Ph.D.***, Chief Scientific Officer for Cardiovascular and Metabolic Disease Research, Pfizer, who spoke on challenges in the development of drugs for common conditions. His focus was metabolic disease, often manifested as a combination of obesity, type 2 diabetes and heart disease. Because these diseases are maladaptive — "overnutrition" is a recent environmental state for which we are not adapted — the body fights the desired response. What is more, the large population with low-level disease is not feasible to target, so they are looking for biomarkers that can predict progress to more severe disease states. Also, more effective partnerships are needed between academic institutions and pharmaceutical companies to improve drug failure rates in human trials.

Peter Bowers, M.D., Medical Director, Anthem Blue Cross Blue Shield in Connecticut, presented LiveHealth Online, a national telemedicine service developed and offered by Anthem in partnership with American Well. LiveHealth Online is available to 15 million Anthem members and provides 24/7/365 access to physicians via computer or mobile device. Care providers are dedicated staff, trained and experienced in telehealth, and they can issue prescriptions via ePrescribe to the patient's local pharmacy. Each use typically carries a flat $49 fee, offering substantial savings over "urgent care" or emergency room visits. Employers who adopt the system find it leads to increased productivity, less time away for care and higher employee satisfaction, and some worksites now provide employer branded kiosks and "medsuites."

Rick Weisblatt, Ph.D., Chief of Innovation and Strategy, Harvard Pilgrim Health Care, discussed best practices in healthcare management. Harvard Pilgrim employs data from several sources — referrals, claims, worksite biometrics, questionnaires — to stratify members into healthy, acute and chronic condition groups. Patient communications and engagement are tailored to their needs, such as periodic screening reminders to healthy members and active disease management outreach for those with chronic conditions. The program has led to higher patient participation in disease management programs. Subsequent program benefits include reduced inpatient and emergency room events for chronic disease patients and lower complication rates for oncology treatments. Harvard Pilgrim is also launching a program in New Hampshire to focus on the sickest (and most expensive) 5 percent of the patient population. To improve member experience and outcomes, and decrease expenses for this group, which add up to 64 percent of the annual medical spend. The program involves tailored, targeted, proactive work with those who need or will need the most help, with the goal of measurable and significant reductions in re-hospitalizations, complications and emergency room visits.

Behavioral Health Management

Plenary Session 3

SESSION CHAIR

Brendan Maher
Prof. of Law and Director
University of Connecticut
Law Center

SPEAKERS

Bill Bonfield, M.D., M.P.H.
CMO
Optum Behavioral Solutions

Seth Feuerstein, M.D., J.D.
Chief Medical/Innovation Officer
Magellan Healthcare

Richard Salmon, M.D., Ph.D.
VP and National Medical
Exec. for Performance
Measurement and Improvement
Cigna

Brendan Maher, Professor of Law and Director, University of Connecticut Law Center, commented that inadequate management of behavioral issues, ranging from mild depression and anxiety to complex chronic psychiatric conditions, is pervasive across the healthcare system. Treatment is often fractured, with providers frequently disconnected from one another and with little to no information following patients through the system. Patients and providers are often on a diagnostic and therapeutic odyssey, in which care is delivered by trial and error rather than evidence-based best practices and without data linking practices to outcomes. There is a chronic shortage of mental health professionals, particularly in non-urban centers, resulting in patients in need getting inadequate care or dropping out of the system. The repercussions ripple throughout the economy (due to lost productivity and healthcare waste) and even the law enforcement system (where many individuals with substance abuse, schizophrenia and other unresolved behavioral issues can end up).

Speakers during this session were united in their enthusiasm for — and belief that — information-based technologies can rescue this situation. Can we develop cost-effective technology-based screening tools and intervention strategies to provide more effective care? Can we do this while protecting patient confidentiality and at a price that insurers and patients can afford? These questions and more are those with which the field is grappling.

Bill Bonfield, M.D., M.P.H., Chief Medical Officer, Optum Behavioral Solutions, opened the session by providing the rationale for why insurance companies should invest in behavioral healthcare and why insurers and patients alike should value technology-based approaches for enhancing behavioral health. At the insurance level, companies are hired to manage benefits on behalf of customers and ideally support interventions with proven material results. Value is typically measured according to whether an intervention produces results higher than the alternative at the same or lesser cost and same or greater ease of use. At the patient level, he explained why patient commitment is challenging, owing to the discord between the onset of treatment benefit (late) versus treatment side effects (immediate) and frequent lack of access to trained mental health professionals. Thus, although many behavioral treatments exist, the requirement that patients persevere in face of barriers and challenges means that treatments are oftentimes ineffective, leading to waste. Dr. Bonfield stressed the importance of access to mental health providers and, by extension, the value of technology-based solutions to improve the quality, frequency and duration of access. Reminding the audience that the healthcare experience is personal, Dr. Bonfield stressed the ultimate importance of motivated patients sure of why treatment matters to them in order to sustain treatment adherence. Optum is an information- and technology-enabled health services platform that provides technology-based solutions for data-driven and integrated healthcare that empowers providers and patients alike.

Seth Feuerstein, M.D., J.D., Chief Medical/Innovation Officer, Magellan Healthcare, expanded on the problem of lack of coordination of care. He noted the complex interconnectivity between physiological and behavioral health issues — e.g., the 15 to 53 percent increase in cardiovascular costs associated with depression — and the poor outcomes that can result from addressing the former without the latter. Treating the whole patient, he noted, is thus essential to improve outcomes and lower costs. Magellan focuses on developing information-based screening tools for use by primary care providers that can identify and triage individuals in need of behavioral healthcare, alert providers to this need, and provide evidence-based guidance on management based on a patient's physiological and behavioral symptomatology. Technology, Dr. Feuerstein summarized, will allow us to solve big problems in healthcare delivery that result from the absence of a holistic view of the patient.

The insurer's perspective was provided by ***Richard Salmon, M.D., Ph.D.***, Vice President and National Medical Executive for Performance Measurement and Improvement, Cigna. He affirmed that insurers are indeed seeking solutions for better, more integrated behavioral health management. He noted not only the lack of efficacy in behavioral management relative to other chronic conditions, but also the acquiescence to this inefficacy across the healthcare system. Dr. Salmon used the example of ketoacidosis in diabetic patients — a treatment failure that is widely considered unacceptable — compared to the frequent relapses that occur among patients with psychiatric challenges, which are comparatively tolerated. These issues matter greatly to insurers, said Dr. Salmon, in part because of the extent to which they are required to cover the costs of treating behavioral conditions. Insurers, for example, must cover mental health illnesses at parity with other medical illnesses. Furthermore, the Affordable Care Act mandates enhanced coverage beyond what was previously required (for example, to children of insured patients up to the age of 26). A third issue Dr. Salmon noted was the particular challenge associated with treating substance abuse, a growing and costly epidemic in the United States for which prevention is likely to be the best cure. On the insurer's "wish list" are innovations that 1) can identify at-risk individuals and facilitate treatment at early, more treatable stages of illness; 2) monitor patients for risk of relapse and triage accordingly; 3) account for genetic factors that affect disease susceptibility and treatment success; 4) enhance the integration of care and account for a patient's personal mental and medical profile; and 5) address the challenges of access through a balanced peer treatment — professional treatment approach. Although the costs of developing these approaches are great, the costs of inaction are greater.

Connectivity and Interoperability

Plenary Session 4

SESSION CHAIR

Jack Reed
President and CEO
ProHealth Partners

SPEAKERS

David McCallie, Jr., M.D.
Sr. VP of Medical Informatics
Cerner

Peter DeVault
VP of Interoperability
Epic

Lawrence Markson, M.D., M.P.H.
CMIO and VP
Clinical Information Systems
Beth Israel Deaconess
Medical Center

The healthcare system traditionally relied heavily on paper charts as a single resource for all data related to each patient. The transition to electronic systems — usually called electronic health records (EHRs) or electronic medical records (EMRs) — has been slow and difficult, and many vendors now offer proprietary solutions, most of which do not connect with each other. In order for medical innovations to push forward, these systems will need to both handle more and bigger data, such as genomic data, as well as be interoperable so those data can be shared by healthcare professionals both within and between hospital systems. A recent report from the Office of the National Coordinator for Health Information Technology entitled "Connecting Health and Care for the Nation: A Shared Nationwide Interoperability Roadmap" succinctly notes, however, "barriers remain to the seamless sharing and use of electronic health information."

Jack Reed, President and Chief Executive Officer, ProHealth Partners, started the discussion by defining the need for connectivity and interoperability. According to him, the lack of access to information "hinders our ability to provide care." Mr. Reed advised that we should keep an eye on how interoperability will affect the next generation, then opened the floor to panelists to expand on these and other issues.

David McCallie, Jr., M.D., Senior Vice President of Medical Informatics, Cerner, a leading EHR vendor, led off his presentation with the roadmap and its short-, mid- and long-term goals. The ONC Interoperability Roadmap calls for a nationwide learning health system, with the patient at the center, complete interoperability and continuous real-time data access, to be created by 2024. Dr. McCallie expressed skepticism regarding some aspects of the roadmap, but he predicted that existing regional and state data repositories, as well as proprietary vendor networks, would yield to a mix of national health data exchanges with regional care provided by something similar to current accountable care organizations (ACOs).

Peter DeVault, Vice President of Interoperability, Epic, which is also a prominent EHR vendor, echoed aspects of Dr. McCallie's predictions. He discussed efforts to establish global patient data networks — so far Epic's CareEverywhere project has established networks between systems in Canada, the Netherlands and the United States — and to engage and expand the roles of patients in all aspects of their care. Epic is working on interoperability across national borders, as countries have their versions of the U.S. HIPAA constraints, but they are all different in important ways. Mr. Devault also stressed the importance of national governance of healthcare information technology (HIT) networks if there is to be true meta-interoperability.

Lawrence Markson, M.D., M.P.H., Chief Medical Information Officer and Vice President, Clinical Information Systems, Beth Israel Deaconess Medical Center, offered a different perspective. BIDMC constructed its own EHR system that began as, in essence, an electronic version of the paper record. And as such, the record still belonged to the clinician, without provisions for patient access. BIDMC constructed PatientSite for its system, however, one of the first patient portals that allowed patients to access their records. And they participated in a successful Open Notes pilot started in 2010 between healthcare systems, including Geisinger, that met with strong patient participation and satisfaction. The Open Notes system has now been expanded and is available to almost all BIDMC patients.

The challenges facing HIT and EHR interoperability include significant technical hurdles such as differing data formats and standards, isolated systems, privacy and security concerns exacerbated by HIPAA, and much more. Nonetheless, all three speakers stressed increasing patient engagement and data access as key concerns. Mr. DeVault noted that patients have already become by far the highest volume users of data within Epic systems, and Dr. McCallie predicted that mHealth apps will become useful for healthcare and health maintenance, particularly for managing chronic disease. Mobile systems also offer a hub through which providers and care coordinators can connect. Dr. Markson discussed BIDMC's foray into gathering patient-generated health data, including the development of an iPhone app, BIDMC@Home that uploads data directly to the patient portal. Dr. McCallie and Mr. Devault also identified telemedicine as an area of growth — though reimbursement can still be an impediment — and as a challenge to effectively fully integrate into interoperable systems.

Finally, precision medicine and particularly genetic and genomic data magnify many of the existing challenges to interoperability. Few current EHR implementations have the ability to handle genomic data sets, which can be massive, increase privacy and security concerns, emphasize the need for data formatting and annotation standards, and put added pressure on the need to share data between systems quickly, securely and efficiently. Dr. McCallie and Mr. DeVault made clear that the issue is high on the priority list for major commercial EHR vendors, who are working on workflow integration of genomic data within their EHRs. To achieve the vision set forth in the nationwide interoperability roadmap, however, much work remains to include genomics data as data sharing, and patient engagement becomes more and more important in healthcare.

Personalized and Precision Medicine

Innovation Exchange

SESSION CHAIR

Edward Abrahams, Ph.D.
President
Personalized Medicine Coalition

SPEAKERS

Tim Davenport
CEO
Consumable Science

Marcia Fournier, Ph.D.
CEO and Founder
BIOARRAY Therapeutics

Matthew Gevaert, Ph.D.
CEO
KIYATEC, Inc.

Praduman Jain
CEO
Vibrent Health

Jean-François Beaulé
Exec. VP
UnitedHealth Group

The Personalized Medicine Coalition (PMC) advocates for the implementation of personalized medicine and quicker realization of its benefits. The cause received a significant boost when President Obama launched the precision medicine initiative earlier this year. (***Edward Abrahams, Ph.D.***, President, Personalized Medicine Coalition, presented data on the semantics of individualized versus personalized versus precision versus stratified medicine, showing the general public far preferred the individualized or personalized medicine terms. Therefore his group will retain the Personalized Medicine name.) The pharmacogenomics field is accelerating, with 40 percent of all drugs in development providing targeted therapy, a figure that jumps to 73 percent in oncology. Nonetheless, Abrahams acknowledged that much more work is needed in all areas from research to public outreach, and he cited a survey that found 62 percent of patients didn't know what personalized medicine is, and that many of those who stated they knew didn't define the term accurately.

Tim Davenport, Chief Executive Officer, Consumable Science, is working to launch a service developed at Johns Hopkins University that seeks to gain biomarker information from annual blood tests — often part of workplace biometric screening — and to provide a "Bodyscore" based on those data that forecast future health and longevity. Unlike many biometric guidelines, the score, a three-digit figure that he likened to a credit score, takes into account age and gender based on data from 50,000 individuals followed longitudinally. The goal for the Bodyscore is that it will provide a simple health index that will encourage individuals to dig deeper and address the health problems that might be holding their score down.

Marcia Fournier, Ph.D., Chief Executive Officer and Founder, BIOARRAY Therapeutics, a startup company looking to personalize cancer treatment based on RNA biomarkers, previously worked at Dana-Farber Cancer Institute and GlaxoSmithKline's oncology center. Dr. Fournier is now working to improve upon the current trial-and-error approach in oncology that yields only a 25 percent robust initial response to the standard of care. BIOARRAY's biomarker panel predicted response to treatment, leading to a 68 percent improvement in response rate and more than 50 percent reduction in wasted treatment.

Matthew Gevaert, Ph.D., Chief Executive Officer, KIYATEC, Inc., is also seeking to predict cancer drug response more accurately through a different mechanism: growing patient tumors in a 3-D co-culture that better mirrors the tumor microenvironment in the patient. The tumor cell data gained is much more accurate than those grown in standard tissue culture, providing a new and effective drug and diagnostic development platform. The National Cancer Institute is supporting the product to help drive predictive cancer tests, and KIYATEC is now working through the regulatory process for clinical application.

Praduman Jain, Chief Executive Officer, Vibrent Health, discussed his company's efforts to help people benefit from precision health outside of the doctor's office. Only 100 out of the 525,700 minutes we have each year are spent with doctors — the rest is where health actually comes through. Vibrent uses mobile sensors that almost everyone carries — cell phones — to gather data in everyday settings that can provide significant insights into patient health and provide the basis for a diverse set of programs that assist patients with behavior modification, chronic disease maintenance, intervention strategies and more.

Jean-François Beaulé, Executive Vice President, UnitedHealth Group, provided a payer's perspective. Those in his industry have to ask the hard questions about personalized medicine. What exactly can it do? Who does it benefit? Who does it fail to benefit? Is it safe? How does it impact affordability? And it's being implemented in an environment where patients adhere poorly to medication regimes, there's a high incidence of mental illness, most people lack health literacy and so on. So what's practical for delivery? He also stated that there are opportunities for researchers and insurers to collaborate more together to advance innovation, including understanding protocols for coverage approvals as well as developing venues where carrier data could be shared for purposes of clinical research. UnitedHealth Group processes close to 4M patient claims a day as well as over 500B transactions per year across all system interactions.

The panel then discussed what startup companies want from insurers, given that reimbursement is a key element of any product's success in the medical marketplace. The panelists agreed that early engagement, transparency and uniformity of expectations for new products would be very helpful. Uniformity of standards by topic, which is common outside the U.S., would be particularly useful. Finally the panel considered whole genome sequence, which can provide treatment insight, but that insurance doesn't typically cover. Mr. Beaulé cited specific concerns regarding costs and patient anxiety, emphasizing that more research is needed to determine what patients will do with their genomic data and the information it provides.

Chronic Disease Prevention and Management

Innovation Exchange

SESSION CHAIR

Juan Salazar, M.D.
Physician-in-Chief
Connecticut Children's
Medical Center

SPEAKERS

Andrea Branch, Ph.D.
Prof. of Medicine
Mount Sinai Medical Center

Michael Sturmer
VP, Consumer Engagement
Cigna

Rick Altinger
CEO
Glooko

Brad Tritle
President and CEO
Vitaphone

Martin Kohn, M.D.
Chief Medical Scientist
Sentrian

Juan Salazar, M.D., Physician-in-Chief, Connecticut Children's Medical Center, provided the introduction to this session. He asserted that the challenges of chronic disease management are growing. This growth is due to three major driving forces: the success of modern healthcare in 1) transforming formerly lethal diseases, injuries and conditions, e.g., HIV and diabetes, into chronic conditions that require continuous treatment, 2) extending life span and reducing premature mortality but without concomitant increases in health span, and 3) the widespread adoption of behaviors, e.g., unhealthy diet, physical inactivity and tobacco use, that significantly contribute to many prevalent chronic diseases. "Today, we are barely scratching the surface of chronic disease challenges," he pointed out.

Dr. Salazar carefully outlined several new megatrends in managing chronic diseases: shift from specialization to integration; unclear future trends driven by Medicare as a result of disappointing recent demo projects; providers promoting the Chronic Care Model and the Medical Home; disease management in your home and on the go; and a shift from a medical to a social model with behavior change becoming the "Holy Grail."

Andrea Branch, Ph.D., Professor of Medicine, Mount Sinai Medical Center, presented compelling evidence that ovarian cancer and chronic hepatitis C (HCV) are two excellent examples of chronic diseases for which efficacious treatments are available but under-utilized. Four million Americans have HCV, a late-onset condition that can go undetected for long periods of time but, once discovered, is associated with costly care and often deadly outcomes. There is a highly effective antiviral therapy currently available to treat HCV; however, because many infections go undiagnosed the therapy remains under-utilized. The ovarian cancer situation is similar with only half of patients receiving a much more effective new intraperitoneal (IP) chemotherapy treatment than previously utilized.

Michael Sturmer, Vice President, Consumer Engagement, Cigna, offered comments on expanding consumer engagement beyond just a clinical orientation but expanding into wealth and life aspects of health. According to Cigna's recently published benchmark survey on Health and Financial Well-Being, shared by Mr. Sturmer, many see financial wellness as a part of overall health, and feel that physical health affects long-term financial security. He went on to submit that by engaging consumers "where they are" by aligning across the connected care ecosystem, leveraging the digital health movement, and embracing an empowered consumer we collectively can make health care beautiful for our mutual consumers.

The good news, as Dr. Branch from Mount Sinai pointed out, is that we are currently capable of completely curing some chronic conditions such as HCV using conventional approaches. We can already achieve this by: better utilizing drugs already available on the market, enhancing screening and adopting telemedicine to expand the number of providers and improve access. Along the same lines, we can substantially increase the life expectancy of ovarian cancer survivors indirectly by identifying the reasons for low IP chemotherapy adoption such as: lack of training by doctors; side effects not tolerated; cheaper treatment, therefore less promoted; and newer medications perceived as more effective.

A good metric according to Dr. Salazar for the shift toward high-tech solutions in chronic disease management is the recent rapid growth of healthcare unbound technologies. Healthcare unbound technologies are technologies on and around the body that free care from formal institutions, including tools such as wearable medical devices, platforms for telemedicine and healthcare delivery, and complex big data analytics, all with a focus on the individual patient. The market for these technologies has reached a cap of $27 billion after being almost nonexistent in 2008.

An innovative patient-centric technology was described by Glooko in the form of a unified diabetes management platform, powered by leveraging trusted data from partnerships and integrations with all major diabetes device manufacturers, to provide robust data analytics and decision support for improvements in patient diabetes outcomes. ***Rick Altinger***, Chief Executive Officer at Glooko, described how his company provides patient-level actionable information (e.g., blood glucose, insulin, diet, fitness, risk flags, biometric data, etc.) in near-real time to both patients and their healthcare providers. As a result, the patient is more engaged and proactively involved with his or her diabetes, which leads to lasting changes in behavior as well as health outcomes (e.g., reduced A1c, average blood glucose levels, instances of hypo events, etc.) and costs (e.g., reduced hospitalizations and emergency room visits). Glooko achieves these results by connecting all relevant constituents involved with the individual patient's chronic disease — patient, family, healthcare providers, clinicians, educators, nurses and case managers — to facilitate the right conversations and enable collaborations in care.

Another platform for chronic disease management was presented by ***Brad Tritle***, President and Chief Executive Officer, Vitaphone. The platform developed by Vitaphone provides devices, hubs, software, and a Telemedicine Service Center (TSC, a clinical call center) for remote monitoring of patients. The TSC approach, supported by technology, has proven to be effective in a variety of settings such as cardiac disorders, COPD, diabetes and post-operative conditions. It has succeeded in increasing patient adherence and activation, while at the same time reducing costs, physician calls, readmission rates and inefficiencies.

Martin Kohn, M.D., Chief Medical Scientist, Sentrian, believes that complex big data analytics are an essential component of this high-tech revolution, as they power the tools and platforms being developed. According to him, learning from daily experience, applying inductive thinking and detecting patterns through many dimensions of data are key elements of effective population-level chronic disease management. Sentrian has developed a complex, data-driven solution that "aspires to eliminate all preventive hospitalization by leveraging biosensors and machine learning." Dr. Kohn thinks that the current state of research with low result reproducibility can be overcome, and made more personalized, only by sophisticated data analytics on real-world data. His ultimate vision is to improve disease management by remotely identifying patients at risk that can be impacted, by measuring biometric and patient-reported parameters, detecting disease progression in early stages, notifying clinicians and family, and intervening in a way that will ultimately speed the path to health and reduce the need for costly healthcare.

In the end, the group agreed that in order to achieve optimal success in treating chronic diseases, we should start with the patient value first and then work toward empowering him or her with the right tools, platforms and support analytics necessary for maximum engagement and behavior change. Only when the patient value is defined and addressed properly can an alignment between payors, innovators and healthcare providers be achieved.

Behavioral Health Management

Innovation Exchange

SESSION CHAIR

Mark Friedlander, M.D.
CMO
Aetna Behavioral Health

SPEAKERS

Simon Budman, Ph.D.
CEO and Founder
Inflexxion

Allen Tien, M.D.
President
Medical Decision Logic

John MacPhee
CEO
The JED Foundation

Siobhan Bulfin
CEO
Melon Health

Innovators at this breakout session provided overviews of new tools, products and services designed to enhance the quality and reach of behavioral health services. Healthcare information technology was a prominent theme, with two of the four speakers describing new tools for behavioral health and healthcare assessment.

Mak Friedlander, M.D., Chief Medical Officer, Aetna Behavoial Health, discussed cost drivers as they relate to behavioral health conditions in today's commercial healthcare system. Drivers that have risen rapidly in the recent past include intensive outpatient care, and there is an urgent need for complex case management, care coordination, decision support, disease management and lifestyle coaching. He noted that 5 percent of the population with poly-chronic conditions drives 45 percent of costs. He stressed that the focus needs to be on wasted care (e.g., wrong care, uncoordinated care, overtreatment), rather than *necessary* care. He noted that accountability and quality improvement will be the characteristics of tomorrow's healthcare ecosystem. He also stressed that adopting innovations in clinical practice is not easy; it requires a culture shift, investments in IT infrastructure, tools that enable clinicians to identify and manage high-risk patients and reduce ER visits and admissions; team-based care; and a management structure that supports these changes. For entrepreneurs, he noted that many innovations are not services eligible for payment under current claims systems and benefit designs that underscores that it is critical that they consider "how does your product get paid for?"

Simon Budman, Ph.D., Chief Executive Officer and Founder, Inflexxion, opened the session by describing the paradigm shift necessary for improved mental health services delivery, focusing on the need for structured assessment tools to measure efficacy of process, performance and outcomes in the behavioral treatment setting. He stressed how the lack of structured assessment has led to either "one-size-fits-all" delivery that does not meet the needs of an individual patient or to delivery in the proverbial vacuum, with providers administering care without sound evidence for its utility. Inflexxion's range of cloud-based tools for assessing addiction severity, behavioral health and pain management rely on real-time, patient-centered data, providing tailored feedback to the care provider that is clinically actionable in keeping with patient needs.

Allen Tien, M.D., President, Medical Decision Logic, described BH-Works, a comprehensive web-based screening, triage, tracking and education platform. To assess risk behavior and psychiatric symptoms, patients are guided online through a series of questions designed to capture behavioral health indicators across a range of domains. The computerized self-report provides confidentiality to patients that encourages disclosure of undesirable behaviors that can be otherwise difficult to discuss face-to-face. Clinicians receive an electronic report that can be used to guide patient care and be incorporated into the patient's electronic medical record.

John MacPhee, Chief Executive Officer, The JED Foundation, next explained his organization's innovative model for promoting emotional health in young adults in the college setting. JED works with institutions of higher learning to implement programs, policies and procedures for mental health promotion and suicide prevention in college students. Its research-based model is designed to assess ongoing efforts being made on college campuses, enabling academic administrators to identify existing strengths in emotional health management and areas for improvement. Such an approach could be implemented in broader healthcare systems and/or communities to create mental health "safety nets" that capture vulnerable individuals and enhance coordination of behavioral healthcare.

Siobhan Bulfin, Chief Executive Officer, Melon Health, talked about a series of mobile mental health applications delivered via their platform to promote patient empowerment and behavioral change. Melon Health works with its clients to create condition-specific self-management tools leveraging peer support, access to clinicians, goal-setting, symptom tracking, personalized contextual information, medication reminders and early warning signs alert. The result: reduction in re-admissions and ED visits by extending care and services, beyond the traditional setting.

When asked to describe their biggest frustrations, Drs. Tien and Budman concurred that changing the culture of behavioral healthcare delivery is among the greatest challenges they face. Resistance to new approaches such as those discussed here is strong and pervasive. As noted by Ms. Bulfin, innovators must be "delusional" in their optimism and that being a force for positive change, while hard, is rewarding. Measuring interim success of behavioral treatment was posed as another issue from the audience. How does one measure whether an intervention is moving toward its long-term goal? Are subjective measures, such as self-report questionnaires, enough? Presenters responded that, in fact, self-reports and similar tools are indeed quantitative and robust, but just need to be utilized effectively in the course of treatment.

The Foundation of Healthcare Transformation

KEYNOTE ADDRESS, Dr. Paul Grundy

Paul Grundy. M.D., M.P.H., F.A.C.O.E.M., Global Director of Healthcare Transformation, IBM, began where the healthcare conversation all started 10 years ago. He briefly described the requirements at that time of moving to a value-based delivery from a volume-centered approach, and the role IBM played in this shift. Then, he focused his talk on the need, driving factors, principles and future of the PCMH.

Dr. Grundy pointed out the pressing need to move away from episodes of care, where each medical event is managed individually, to a data-fueled population management approach. "The problem is that we have a healthcare system that does not know how to deal with data," he said. There is no single place where all data pertaining to the individual is stored. Patients need a home for their medical data. Once consolidated, the data can serve as a catalyst for an integrator system that glues together all the pieces of patient health management. This system integrator, in its turn, will create a partnership across the medical community, drive PCMH primary care redesign, and offer a utility for population health and financial management.

According to Dr. Grundy, PCMH will strengthen the relationship between the patient and the physician for continuous and comprehensive care. The physician will be responsible for providing the patient's healthcare needs or arranging care with other qualified professionals in an integrated and coordinated environment. Quality and safety will be achieved as evidence-based medicine and clinical decision support tools guide decision-making. As a result, access to care will be enhanced and payment will be based on the value added. Some of the benefits of this transformation are already being recognized by the drop in hospital days, emergency room costs and the increase in chronic medication adherence.

Unsustainable healthcare costs, big data and communication are the driving factors for PCMH, Dr. Grundy said. Currently, U.S. healthcare costs per capita almost double those of other developed countries, according to a recent study. At the same time, the quality of service provided is lagging behind that achieved in peer nations. Data-driven insights can close our translational knowledge gap and enable new personalized and population health insights leading to better health decisions. Thus, we will be able to prevent the 20 percent of the health events that account for 80 percent of healthcare costs. Patient engagement will be improved through effective communication backed by smart integration and customization of solutions based on better processes and technology. As a result, the overall health and vitality of our employees and their families will improve.

Dr. Grundy concluded his speech by emphasizing his vision of the future of data-driven healthcare, where every person has a plan, every patient is treated by a team of healthcare professionals and population health is managed down to the individual. This future will be characterized by superb access to care, patient engagement, advanced clinical information systems, comprehensive registries, team care, free flowing communication and on-the-go available information. Everyone will be a part of the future PCMH — starting with family and friends, and ending with payers and providers.

The Emerging Role of Technology in Medical Care

Panel Discussion

MODERATOR

Bonnie Anderson
President and CEO
Veracyte

PANELISTS

Ranga Krishnan, M.D.
Dean
Rush Medical College

David Shaywitz, M.D., Ph.D.
CMO
DNAnexus

Mostafa Ronaghi, Ph.D.
Sr. VP and CTO
Illumina

Stephen Bloch, M.D.
General Partner
Canaan Partners

Healthcare has been lagging behind other industries when adopting new technologies mostly due to a complex and multi-player environment. Thus, new technologies will have to provide utility, appeal to users, draw clinician support, bring capital for further development, generate payer coverage and at the end provide return on investment. The goal of this panel was to address why new technologies fail or are slow to penetrate the healthcare system, as well as to discuss the changes currently happening in the healthcare arena in support of new tools.

Bonnie Anderson, President and Chief Executive Officer, Veracyte, outlined the areas for discussion: 1) drivers of change and adoption of new technology in the healthcare system; 2) upcoming technological trends and their effect on patients, providers and payers; and 3) the role of the patients and payers in adopting new technologies.

Ranga Krishnan, M.D., Dean, Rush Medical College, believes that patients will drive the change in the healthcare system, as well as the adoption of new technology. According to him, today's patients are much more engaged and involved than in the past. "They (patients) will go out and get what they want," Dr. Krishnan said. As medicine by nature is conservative, the problem is not in the technology, but in the current mindset where the burden of interpreting data falls on the physicians. As more and more information accumulates in the healthcare system, a need arises for technology tools that can help interpret that information and present it to patients and clinicians without damaging their ability to think. Change will not come suddenly. It will be driven by the health span and the overall value of healthcare. The health span, according to Dr. Krishnan, is the healthy life span of an individual, which ultimately will have the largest impact on costs and society.

According to ***David Shaywitz, M.D., Ph.D.***, Chief Medical Officer, DNAnexus, the key challenge for emerging technologies is the robust, "palpable" demonstration of clinical utility. When this happens — as in the case of NIPT testing — the adoption can be rapid, and supported (as in the case of NIPT testing) by members of the payor community. It remains vitally important, Dr. Shaywitz believes, to evaluate emerging technologies in a fashion that is both intellectually receptive and scientifically critical; he says we must be open to thinking about existing problems in new ways, but also not suffer from "neomania," and embrace an alluring technology simply because it is new. Fundamentally, Dr. Shaywitz argues, technology may enable medical progress, but innovation will be driven by a small group of inquisitive people, passionate to answer questions and improve health.

Mostafa Ronaghi, Ph.D., Senior Vice President and Chief Technology Officer, Illumina, believes that healthcare change can be attributed to more accessible education and the emergence of patient networks. According to him, change comes also with the fast adoption of new technology driven by ease of use, price and how pleasant it is to the patient. Dr. Ronaghi pointed out that WGS faces challenges in adoption despite the fact that it will be economical to sequence the genome and have that in patient profile but some other tests have amazingly had fast adoption. The latter category of tests are not only faster, better and cheaper but also have been demanded by the patients as it is safer, more pleasant and making inaccessible, accessible. NIPT is a good example from this category of tests. Although new genomic testing is relatively cheap, it can still cause downstream increases in healthcare costs, he cautioned. This can be illustrated by genomic tests performed later rather than earlier during disease onset, when test-instructed prevention can no longer be an option, and application of expensive drugs with limited effect on the health or life span of the patient are prescribed as a result of the test. In addition, the information collected through WGS is often far greater than the one required for the next step of treatment of the patient. On the positive side, one could always go back and re-analyze WGS rather than run a separate test.

Stephen Bloch, M.D., General Partner, Canaan Partners, sees the future in the convergence of health devices, drugs, healthcare delivery and the use of data as an integrator and driver of change. According to him, there are two main obstacles in front of new technology adoption: 1) utility necessary for clinicians to embrace; and 2) payment reform needed as incentive for physicians to apply it. As there are still areas where new high tech does not save time and/or money, providing utility will lead to coverage of new technology and thus make it easier for investors to build companies around it. A payment reform will help the doctors go against the current pressure to continue using older, more invasive and expensive procedures in the hospital environment. Some of the regulatory change will come with the Affordable Care Act, which will cause a shift in patient behavior. People will become increasingly responsible for their healthcare costs when paying more out of pocket for costlier treatment options. The reason why healthcare is so expensive today, concluded Dr. Bloch, is that nobody sees the costs, except the subsidizer.

At the end, the group agreed that integration of data into technology is going to be a key driver of the change in healthcare. Change promotion will involve all players — patents and patient networks, payers, physicians, innovators, as well as device and drug manufacturers.

Changing Roles in the Healthcare Industry

Panel Discussion

MODERATOR

Jeffrey Flaks
Exec. VP and COO
Hartford Healthcare

PANELISTS

Benjamin Heywood
Co-Founder and President
PatientsLikeMe

Christopher Hocevar
President
Select Segment and Pharmacy
Management Cigna Corporation

Jill Hummel
President
Anthem Blue Cross and
Blue Shield of Conn.

Gregory Moore, M.D., Ph.D.
Director
Institute for Advanced Application
Chief Emerging Technology and
Informatics Officer
Geisinger Health System

Healthcare is still largely subsidized for most patients through health insurance. Nonetheless, people using healthcare services are paying an increasing amount for them. Premiums for family coverage have increased 27 percent over the past five years, and deductibles are rising at a rate more than seven times faster than wages. The increases, and the emergence of activated consumers of healthcare in response, are driving changing roles in the system.

The wide-ranging discussion touched upon pharmaceutical development pipelines and drug costs, how to improve efficiencies in healthcare, the effect of mergers between insurers and healthcare systems, the need to innovate based on improving care quality, not driving down up-front costs, data sharing and the empowerment of the patient, telemedicine, and the painful transition time as the industry shifts from volume-based to value-based healthcare.

Benjamin Heywood, Co-Founder and President, PatientsLikeMe, emphasized the growing role of the patient in both the healthcare delivery process and data access. The fragmentation of healthcare can make it difficult to construct information frameworks that center on the patient and involve them in the decision-making processes. He views access to coordinated care as a key to a more holistic view of the patient, to the benefit of all, and telemedicine will reduce geographical barriers to access for many populations. Ultimately, Mr. Heywood sees patient access and investment as providing a significant opportunity for more innovation in the system, but with the onslaught of added data the system will have to change, with doctors taking a more coach-like rather than dictatorial role.

Christopher Hocevar, President, Select Segment and Pharmacy Management, Cigna Corporation, commented at length on the cost of pharma, and how it is being talked about based on an old model. How pharma costs are managed over the next five years must change from the previous five. Creating a workable economic system with the advent of targeted drugs for stratified patient populations will require pharma accountability and perhaps policy makers stepping in to reframe the debate. He also observed that any time there's a major regulatory change (ACA), the market will try to become more efficient, as with the current mergers across the healthcare industry. Nonetheless there's an imperative to monitor the impact on effectiveness during the times of transition. The same imperative is true with the growth of telemedicine, which he sees as being driven by consumer choice and the impression of economy. But a lower cost channel will fail if it's not linked to the data ecosystem and provide the same insights and outcomes as in-person interactions.

Jill Hummel, President, Anthem Blue Cross and Blue Shield of Connecticut, spoke about healthcare's need to change from a volume-based payment system to a value-based one based where providers are rewarded for outcomes and receive payment for important interventions that occur outside of the traditional office visit. This change will require a fundamental shift between payer/provider relationships and new capabilities to more effectively manage population health. Specifically, this will require a migration away from a transaction based relationship to a more collaborative, independent one, where payers and providers leverage each other's unique assets for the benefits of the patient/consumer. For instance, providers will want to leverage the wealth of data from across the continuum that payers can provide while payers will want to leverage clinical data that providers can share in order to create an integrated longitudinal view of the patient's experience across the system. She noted, however, that the investments required to build these new capabilities are considerable, making scale increasingly important. She stated that payers are launching healthcare initiatives that take into account both quality and cost knowing that improving health is key to the triple aim.

Gregory Moore, M.D., Ph.D., Director, Institute for Advanced Application/Chief Emerging Technology and Informatics Officer, Geisinger Health System, considers Geisinger to have already created an integrated payer/provider system that emphasizes value and patient satisfaction. Physicians within its system are not incentivized to perform more medical procedures, but instead are supported in providing medical care as they think it should be done. He sees data access for patients as a fundamental disruptor based on experience with OpenNotes, which provides transparency and encourages new patient-provider interactions. When he first moved to Geisinger he was amazed at how far medicine was behind the tech curve, and that lag is not only breaking the bank economically, it is hurting patients. For them, as both provider and payer, every dollar invested in better data flow yields a three-to-one return on investment, which fuels further innovation. In the end, putting patient data into action allows the doctor to begin a patient visit by saying "I see that you are …" instead of asking "How are you?"

Jeffrey Flaks, Executive Vice President and Chief Operating Officer, Hartford Healthcare, summarized the discussion by describing the current transitions in healthcare as both incredibly exciting and very difficult. Patients are more engaged, data is beginning to flow more rapidly, and medicine is shifting from care based on population averages to more personalized, targeted therapies. Nonetheless, transition is never easy, and it's challenging to survive in the short term as healthcare systems, delivery channels and roles all change.

New Business Models in Healthcare Delivery

Panel Discussion

MODERATOR

Catherine Smith
Conn. Commissioner
Department of Economic and
Community Development

PANELISTS

Kush Parmar, M.D., Ph.D.
Partner
5am Ventures

David Sabow
Head
Life Science and Healthcare
Silicon Valley Bank

Anthony Evnin, Ph.D.
Partner
Venrock

Andrew Lo, Ph.D.
Prof.
MIT Sloan School
of Management

As federal and local government sources of funding diminish, innovation in healthcare delivery will depend on financial support from the private sector. Although there is actually ample money in the private system for later stage development, a disconnect exists between private investment and innovators, particularly at early stages of development when financing is needed the most. Thus, investors and payers are trying to navigate through this disjointed environment by balancing profit/benefit, respectively, against financial risk. The goal of this panel was to share its insights about emerging business models and new investment criteria when redefining the ways in which healthcare is delivered.

In the panel discussion "New business models in healthcare delivery," private investors and thought leaders in biotechnology venture capital discussed ways in which these gaps can be bridged. ***Catherine Smith***, Commissioner, Connecticut Department of Economic and Community Development, opened the session by framing the discussion around three key themes: 1) opportunities and approaches for investment in healthcare delivery; 2) the increasing role of the payer in influencing investment decisions; and 3) the implications of decelerating the National Institutes of Health (NIH) and angel funding on the venture capital environment. The session provided a valuable overview of the key barriers and emerging opportunities to the ultimate goal — innovation that improves health outcomes and lowers healthcare costs — from the perspective of investors, who seek to support discoveries that nurture the private sector towards more innovation while providing return on investment.

According to ***Kush Parmar, M.D., Ph.D.***, Partner, 5am Ventures, investments in healthcare delivery should be consistent with the shift from volume- to value-based healthcare. A major unmet need is in technologies that leverage the effectiveness of standard treatments to shift the point of care away from the costly hospital setting. To conform with this shift in the market, 5am Ventures is focused on tools at the interface of drugs and devices, where the therapeutic agent is layered on top of technology for a more profound health delivery outcome. As an example, Dr. Parmar described a recent 5am investment in devices for administering IV medicines in a simple pod that can be picked up at any pharmacy and applied by the patients themselves rather than by healthcare professionals. Another unmet need is for "single-shot" therapies that can cure and/or replace chronic treatments that only mitigate the effects of disease. Dr. Parmar and Anthony Evnin, Ph.D., agreed that, although such therapeutics are expensive at the outset and thus difficult to justify to payers, the ultimate price is likely to be entirely reasonable when the costs of managing disease over years are considered. Such investments, it was agreed, could provide transformational clinical value to patients and payers alike.

Panelists also described a general concern within the investment community of the consequences of reduced federal funding for basic research. Congressional budget allocations to the NIH have steadily declined in recent years while the costs of biomedical research have steadily increased. Lower grant success rates are pushing talented academic investigators out of the pipeline. Reduced purchasing power among the funded few means that grant dollars may not stretch far enough to support the high-risk, high-reward research that can feed private sector innovation. Research institutions, hedging their bets, are pushing translational and/or applied research over basic research, a trend that some panelists felt was misguided. The greatest burden of consequences has yet to be met, but the risk to the global competitiveness of the U.S. biomedical market is real.

Despite these challenges, ***David Sabow***, Head, Life Science and Healthcare, Silicon Valley Bank, believes we live in an exciting time at the confluence of technology and healthcare. According to him, in an environment where NIH and other grant funding remains tenuous, leveraging technology and new digital health models to drive innovation in a capital efficient manner will be increasingly important. This situation forces the entire biomedical complex to innovate and places increased importance on corporate accelerators / incubators to curate and support these new models. Athena Health's More Disruption Please and Illumina's Accelerator are two good examples of these new sources of support for emerging companies. Scarce grant dollars requires the increased efficiency that only technology can bring. We are seeing this manifested across every segment of healthcare, from robotic labs enabling cloud-based genetic research, to digital therapeutics supporting sustainable disease management.

Anthony Evnin, Ph.D., Partner, Venrock, spoke about the sharp increase in investments in healthcare information technology utilizing big data that will impact on the provision and efficiency of healthcare delivery. Improved access for and utilization of complex data: 1) enables better decisions on care for providers and patients with potentially significant cost reductions; 2) permits detection and measurement of key biological molecules enabling improved diagnoses, targeted therapies and personalized medicine; and 3) can define and potentially justify the long-term benefits of expensive therapies, especially those with high upfront price tags. These benefits will help in developing increased coverage and encourage additional investment in healthcare. Dr. Evnin concurred with the other panelists that attracting great talent is essential for success in new ventures. According to him, that is why innovation hubs will almost always be located next to great universities; successful companies in those hubs spawn additional ventures. With the decline in NIH funding of early stage research, there has been an increase in large, upfront, venture investments in key technology-based companies, angel funding and crowd sourcing. None of those, however, can fill the gap from NIH.

Andrew Lo, Ph.D., Professor, MIT Sloan School of Management, started by introducing the "Valley of Death" characterized by the gap between inventors who need the financial support and investors who have the resources. Despite a tremendous amount of money ready to be invested currently in the healthcare market and a number of healthcare innovators in need of capital, productivity is declining. Dr. Lo proposed a few solutions that can potentially resolve some of the most challenging roadblocks in health delivery: 1) Structuring securities in the life sciences to free capital for other activities. Thus, debt financing options similar to mortgages and car loans can help address the high upfront drug costs, such as those of the new HCV medications which come with six-digit price tags. 2) Bringing payers early in the investment process to increase the chances of coverage and success of the newly developed technology. Case studies based on predictive analytics can present cost-saving opportunities to payers and thus help incentivize the biopharma industry to create new therapies. Development of cryptographic technologies for sharing data by protecting individual privacy can facilitate information sharing between systems. 3) Securitizing institutional intellectual property to create early stage funding options. As a result, a $1B to $5B national investment fund will be sufficient to greatly accelerate biomedical innovation while creating enough hits to yield attractive returns for investors.

The session thus provided a valuable overview of the key barriers to the ultimate goal — innovation that improves health outcomes and lowers healthcare costs — from the perspective of investors, who seek to support discoveries that nurture the private sector toward more innovation while providing return on investment.

Thank you *to all who attended*

Closing remarks

Edison Liu, M.D., President and CEO, The Jackson Laboratory, characterized the theme of the Forum as "disruption." Disruptions are occurring throughout the healthcare complex, but these dramatic shifts are necessary to drive positive change. One disruption, "the major mantra in healthcare," is the shift from volume- to value-based healthcare delivery; from transaction- to outcomes-determined reimbursement. Another is the move from competitive approaches to collaborative delivery of healthcare. This phenomenon is reflected in the process of technology convergence where coordinated product roll outs and aggregation of a cluster of technologies become more common. Yet another disruption is the shift in clinical decision making from reliance on human expertise to the incorporation of big data interpretation. These disruptions are completely and irrevocably transforming healthcare delivery.

Personalized medicine provided the foundational solution to the problems of this disruption.

Dr. Liu also noted that personalized medicine requires a new approach to research that accounts for the uniqueness of each person's genome. For example, The Jackson Laboratory (JAX) is identifying multiple mutations via whole-genome sequencing and generating *in vivo* systems in the mouse that provide precise genetics model of disease. That is how JAX recently recreated amyotrophic lateral sclerosis (ALS) in complex mouse strains to model for an individual patient's disease, and created individualized mouse models for several patients with congenital defects in their families. Using such models, "N of 1" oncology clinical trials can be conducted, supported by sophisticated genomic analytics.

In conclusion, Dr. Liu said that innovative solutions to the most pressing problems in healthcare will not arise from policymakers, providers, technologist or the payers acting alone. Real change will be achieved through cooperation and communication among all the stakeholders. He hope that the Forum on Healthcare Innovation will help ignite this new wave of healthcare solutions.

FORUM ATTENDEE LIST
AS OF OCTOBER 6, 2015

Kathleen Adams, Director, Clinical Services Business Development, The Jackson Laboratory for Genomic Medicine
Edward Abrahams, President, Personalized Medicine Coalition
Susan Adams, VP Alliance Integration, Masonicare
Susie Airhart, Senior Director, Strategic Opportunities & Product Development, The Jackson Laboratory
Rick Altinger, CEO, Glooko
Robert Amatuli, Principal, Tecton Architects, PC
Bonnie Anderson, President and CEO, Veracyte
Kirsten Anderson, Chief Clinical Officer, CareCentrix
Timothy Anderson, VP, General Manager, Beckman Coulter Genomics
Andrey Antov, Associate Director, Office of COO, The Jackson Laboratory
Walter Ausserer, Associate GM, Clinical & In Vivo Service, The Jackson Laboratory
Frank Baitman
Daniel Barchi, CIO, Yale New Haven Health System & Yale School of Medicine
Amber Batata, FORUM Pharmaceuticals
Jean-François Beaulé, EVP, Health Plan Design & Innovation, UnitedHealth Group
James Bedard, CFO, Northeast Region, UnitedHealthcare
Scott Berns, SVP & Deputy Medical Officer, March of Dimes
Robert Bettigole, Elm Street Ventures
Morris Birnbaum, SVP-CSO CVMED, Pfizer
Stephen Bloch, General Partner, Canaan Partners
Mark Boguski, Precision Medicine Network
William Bonfield, CMO, Optum
Mark Borton, Co-Founder & President, Hartford.Health.Works., Inc.
Peter Bowers, Medical Director, Anthem Blue Cross and Blue Shield
Gregory Boyko, Attorney
Andrea Branch, Professor, Icahn School of Medicine at Mount Sinai
Simon Budman, CEO, Inflexxion
Victor Budnick, Managing Director, Ironwood Capital
Siobhan Bulfin, CEO, Melon Health
John Burch, CEO, JLB Associates
Cameron Burns, Executive Vice President, Bradley Foster & Sargent, Inc
Janet Campbell, Software Developer, Epic
Gayle Capozzalo, Exec VP/Chief Strategy Officer, Yale New Haven Health System
Bruce Carlson, President & CEO, Connecticut Technology Council
Margaret Cartiera, VP & Fund Manager, CT Innovations
Donata Ceretto Giannone, Senior Project Manager, Tecton Architects, PC
Joseph Chambers, Assistant Attorney General, Connecticut Office of the Attorney General
Beth Chaty, Hartford HealthCare
Elaine Cheung, Director of Strategic Partnerships, Illumina
Sharon Chiang, Senior Technology Consultant, IPI
Scott Cleary, SMC PARTNERS, LLC
Jodi Cook, VP Operations and Strategic Alliances, Agilis Biotherapeutics LLC
Kathleen Corbet, Founder & Principal, Cross Ridge Capital, LLC
Michelle Cote, Managing Director, Connecticut Center for Entrepreneurship and Innovation, UConn
Colleen Cuffaro, Associate, Canaan Partners
Amy Cunningham, Executive Director, Connecticut Health Council
Tim Davenport, Consumable Science
Allen DeGraw, CEO, Post-n-Track Corporation
Peter DeVault, Epic
Anna Dongari, UCHC School of Dental Medicine
Mark Driscoll, Co-founder, Shoreline Biome
David Elliman, Chairman, Elmrock Capital, Inc.
Tim Elwell, CEO, Qualidigm
Anthony Evnin, Partner, Venrock
Peter Farina, Executive in Residence, Canaan Partners
Ken Fasman, VP for Strategic Initiatives, The Jackson Laboratory
Rachael Felberbaum, Senior Director, Business Development, Protein Sciences Corporation
Mary Kay Fenton, Achillion Pharmaceuticals, Inc.
Barbara Fernandez, Department of Economic and Community Development
Seth Feuerstein, Chief Innovation Officer, Magellan Health
Jeffrey Fisher, Director, Center for Health, Intervention, and Prevention (CHIP), University of Connecticut
Timothy Fisher, Dean, UConn School of Law
Jeff Flaks, Executive Vice President and Chief Operating Officer, Hartford Hospital
Paul Fletcher-Hill, Co-Founder, CEO, PatientBank
Timothy Folta, Faculty Director, Connecticut Center for Entrepreneurship and Innovation, UCONN
Marcia Fournier, BIOARRAY Therapeutics Inc
Richard Freeman, Sr. VP & CTO, EMHS
Mark Friedlander, Aetna Behavioral Health
Susan Froshauer, President and CEO, CURE
Carolyn Galiette, Senior Managing Director, Ironwood Capital
Donna Galluzzo, President, The Corridor Group
Josh Geballe, CEO, Core Informatics
Paul Genecin, Yale Health
Matt Gevaert, CEO, KIYATEC, Inc.
John Gibbons
Lile Gibbons

Merton Gollaher, Partner, Wiggin and Dana
Kevin Grassi, PatientBank
Oz Griebel, President, MetroHartford Alliance
Paul Grundy, Director, Healthcare Transformation and PCPCC President, IBM
Eminet Gurganus, Office for Community Child Health, Connecticut Children's Medical Center
Jill Hagenkord, Chief Medical Officer, 23andMe
Marie Hayes, CEO, Professor, www.activas-diagnostics.com
Victor Hesselbrock, Senior Associate Dean of Research, UConn Health
Charles Hewett, Executive Vice President, The Jackson Laboratory
Ben Heywood, Co-Founder, President and Chief Privacy Officer, PatientsLikeMe
Chris Hocevar, President, Select Segment & Cigna Pharmacy Management, Cigna
Paul Hughes, Partner, Wiggin and Dana
PJ Jain, CEO, Vibrent Health
Jason Jakubowski, Vice President of External Relations, Hospital for Special Care
Thomas Jarvie, Shoreline Biome
Bryte Johnson, Director of Govt. Relations, American Cancer Society Cancer Action Network
Charles Johnson, EVP & CFO, Hartford HealthCare
Steven Kafka, President & Chief Operating Officer, Foundation Medicine
Michelle Kalis, Provost, University of Saint Joseph
Wendy Keppy, Novo Nordisk
Ed Klonoski, President, Charter Oak State College
Martin Kohn, Chief Medical Scientist, Sentrian
Ranga Krishnan, Professor, Duke University Medical Center
George Kuchel, Director, Center on Aging, UConn Health
Michael Kurs, Attorney, Pullman & Comley, LLC
Marc Lalande, University of Connecticut
Michele Lauria, VP and CMIO, EMHS
David Ledbetter, Geisinger
Charles Lee, Director and Professor, The Jackson Laboratory for Genomic Medicine
Chun Li, Chief Data Scientist, Diameter Health
Bruce Liang, Dean, School of Medicine, UConn Health
Thomas Litwin, Vice President for Education, The Jackson Laboratory
Edison Liu, President and CEO, The Jackson Laboratory
Andrew Lo, Massachusetts Institute of Technology - Sloan School of Business
Sandra Lobo, WCHN Research Institute
Christopher Loose, Executive Director, Yale University
Jason Madrak, Vice President, CT Regional Market, Harvard Pilgrim Health Care
Brendan Maher, Associate professor of law, UConn Law
Christina Mainelli, General Manager, CareCentrix
Teri Manolio, Director, Division of Genomic Medicine, National Human Genome Research Institute
Lesley Mara, Senior Project Director, CT Health and Life Sciences Career Initiative
Frank Marco, Partner, Wiggin & Dana
Lawrence Markson, CMIO, Beth Israel Deaconess Medical Center
Jeffrey Marlough, Managing Director, ORIX Healthcare Capital
Thomas Marrion, Hinckley Allen
Daniel Marshak, Advisor, 5AM Ventures
Ellen Matloff, Founder, CEO, My Gene Counsel, LLC
Michael Matteo, EVP, Optum
David McCallie, Senior Vice President, Cerner Corporation
Matt McCooe, CEO, Connecticut Innovations
Gerry McDougall, Partner, PwC
Thomas Meehan, Associate Medical Director, Harvard Pilgrim Health Care
Arnold Menchel, Partner, Halloran & Sage LLP
Steve Merz, VP & Exec Director, Behavioral Health, Yale-New Haven Hospital
Gregory Moore, Geisinger
Pieter Muntendam, President & CEO, scPharmaceuticals
Ben Muskin, Advisor, Hartford Healthcare
Auro Nair, General Manager, The Jackson Laboratory
David Nichols, Nichols Management Group
Marta Nichols, Executive Director, Partners in Performance Excellence
Christopher O'Connor, EVP, COO, Yale New Haven Health System
Scott Orsey, Connecticut Children's Medical Center
Kush Parmar, Partner, 5AM Ventures
Sarit Patel, Grove Hill Medical Center
Robert Patricelli, Chairman and CEO, Women's Health SA
Adelene Perkins, Chair, President, and CEO, Infinity Pharmaceuticals
Paul Pescatello, Chair, CBIA CT Bioscience Growth Council
Douglas Peterson, Professor, School of Dental Medicine
Casey Pickett, Director of Innovation, State of Connecticut, Dept. of Economic and Community Development
Mike Posner, Department of Surgery, Grove Hill Medical Center
Stephen Quake, Stanford University/HHMI
Amit Rastogi, Interim CEO, Northeast Medical Group/YNHHS
Jack Reed, President and CEO, ProHealth
Marc Reich, President, Ironwood Capital
Lynn Ricci, President, Hospital for Special Care
Lisa Ricciardi, SVP, Foundation Medicine
Stephanie Rich, SVP, Healthcare Management, Connecticare, Inc. and Affiliates
Annabelle Rodriguez, UConn Health
Mostafa Ronaghi, SVP & CTO, Illumina, Inc.
Michael Rosen, Senior National Medical Director, Optum Consumer Solutions Group
Eric Rosow, Chief Executive Officer, Diameter Health
Dave Roux, The Jackson Laboratory
Kristen Rozansky, VP Development and Communications, The Jackson Laboratory
Marc Rubenfield, Sr. Manager, Development Science, Beckman Coulter Genomics
Jill Rubin-Hummel, President, Anthem Blue Cross and Blue Shield
William Rudolf, Trustee Emeriti, The Jackson Laboratory
David Sabow, Head of Life Science & Healthcare, Silicon Valley Bank
Juan Salazar, Physician-in-Chief, Connecticut's Children Medical Center
Richard Salmon, Cigna
Steven Sandor, Vice President, Market Access, Acorda Therapeutics
Mark Santos, Aetna
Phil Satow, Chairman, The Jed Foundation
Mark Schaefer, Director, Healthcare Innovation SIM Program Management Office
Peter Schulam, Chair of Urology, Yale University
Jeff Seemann, Vice President for Research, University of Connecticut
Timothy Shannon, General Partner, Canaan Partners
David Shaywitz, Chief Medical Officer, DNAnexus
Ellen Skinner, Consultant, Connected Healthcare Strategies
Catherine Smith, Commissioner, Dept. Economic and Community Development
Stephanie Spangler, Deputy Provost for Health Affairs and Academic Integrity, Yale University
Cynthia Sparer, Executive Director, Yale-New Haven Children's Hospital
Pramod Srivastava, Professor of Immunology and Medicine, UConn Health
John Strahley, Managing Director, Ironwood Capital
Michael Sturmer, Vice President, Cigna
Tim Sullivan, VP Development, Idera Pharmaceuticals
Roopashree Suryanarayana, Allscripts
Robert Taber, Senior Advisor, Duke University Medical Center
Nancy Taylor, Dir., Corporate Recruitment, Charter Oak State College
Martha Temple, Senior Vice President, Optum
Glendowlyn Thames, Director of Small Business Innovations, CT Innovations, Inc.
Allen Tien, President & Director of Applied Research, Medical Decision Logic, Inc. ("mdlogix")
Minakshi Tikoo, UConn
Andrew Trister, Senior Physician, Sage Bionetworks
Brad Tritle, President/CEO, vitaphone e-health solutions
Petros Tsipouras, CEO, Gene Praxis, LLC
Sean Tunis, President & CEO, Center for Medical Technology Policy
Chris Ulbrich, CEO, Ulbrich Stainless Steels and Special Metals Inc.
Shalini Vallabhan, Vice President of Government Relations, American Cancer Society Cancer Action Network
Victoria Veltri, State Healthcare Advocate, Office of the Healthcare Advocate
James Wadleigh, Chief Executive Officer, Access Health CT
Maureen Weaver, Partner, Wiggin and Dana
Rick Weisblatt, Chief of Innovation & Strategy, Harvard Pilgrim Health Care
Garry Welch, Chief Scientific Officer, betweenMD
Nancy Wheeler, MetroHartford Alliance
C. Michael White, Professor and Department Head of Pharmacy Practice, University of Connecticut
Michael Wise, President, ConnectiCare
Karen Woodward, UConn Health
David Wurzer, EVP & CIO, Connecticut Innovations
Barbara Yates, Hartford Healthcare
Rita Zangari, Director, Innovation Programs and External Relations, UCONN, Office of VP for Research
Andrew Zebrak, Executive Director, Government Affairs & Public Policy, Boehringer Ingelheim

Thank you

SPONSORS

SUPPORTING ORGANIZATIONS

Connecticut Business & Industry Association
Connecticut Technology Council
CURE
MetroHartford Alliance
Personalized Medicine Coalition
Yale University

Special thanks to our meeting recorders Andrey Antov, Mark Wanner and Anna Lisa Lucido; photographer Marie Chao; and on-site support staff Tammy Brink, Amy Carlough, Caroline Cushman, Carol Lamb, Auria Mauras and Janet Zesut.

The Jackson Laboratory

Leading the search for tomorrow's cures

CONTACT

Michael Hyde
Vice President, External Affairs
and Strategic Partnerships
The Jackson Laboratory
207-288-6049
mike.hyde@jax.org