artificial intelligence

APRIL 23–25, 2018 | BOSTON

WORLD MEDICAL INNOVATION FORUM

worldmedicalinnovation.org

2017 WORLD MEDICAL INNOVATION FORUM

1:1 Fireside Chat: Michael Mahoney, CEO, Boston Scientific

Moderator | **Meg Tirrell**
Reporter, CNBC

Michael Mahoney
CEO, Boston Scientific

contents

The Dawn of AI in Health Care Has Arrived

dear colleagues.

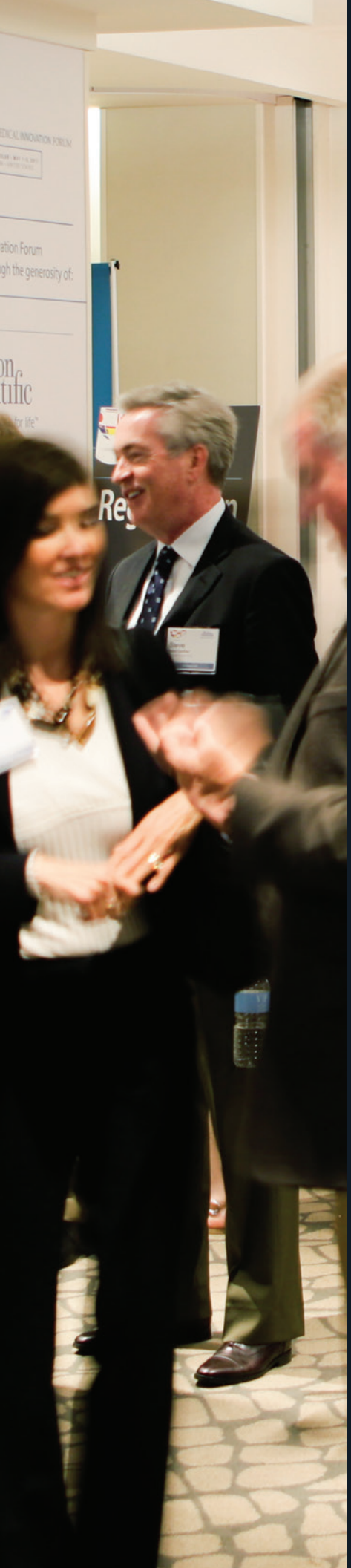
Thank you for attending this 4th annual World Medical Innovation Forum. We gather to examine how artificial intelligence will affect the delivery of care. More than two dozen sessions will discuss in detail how machine intelligence will touch on a range of issues including hospital operations, drug discovery, clinical fields and physician empowerment.

The World Medical Innovation Forum was established to reaffirm the importance of collaborative innovation—academia, industry and government working jointly to create new solutions to medicine's great challenges. Our goal is to provide actionable insights that audience members can use to improve care in their field.

We are grateful to the more than 140 senior executives, investors, clinicians and investigators who will speak at the Forum including Governor Baker who will kick off our proceedings. We welcome attendees from around the globe as well as colleagues from the Massachusetts Eye and Ear who are joining us as new members of Partners HealthCare System.

I thank our many sponsors representing some of the most innovative companies in health care and the Steering Committee and Planning Team for their outstanding contributions. I recognize co-chairs Anne Klibanski, MD, Chief Academic Officer and Gregg Meyer, MD, Chief Clinical Officer as well as Chris Coburn, Chief Innovation Officer for their leadership. We hope that many of you will join us next year, April 8–10, 2019 when we will reconvene the World Medical Innovation Forum and focus on Neuroscience.

David Torchiana, MD
President and CEO, Partners HealthCare



we welcome you.

Thank you for joining us. Over the next three days you will be part of a gathering tailored to maximize the exchange among speakers, attendees and hosts. The unique structure of the Forum enables in depth conversations among expert panelists and audience members. Our goal is to provide actionable relationships and insights.

AI will have profound effects throughout healthcare—for patients, caregivers, hospitals, companies, researchers and entrepreneurs. Among the many ways AI may disrupt the current environment is by improving patient outcomes and substantially lowering the cost of care—some estimate that it could reduce total healthcare spending in the United States by $450 billion annually.

The Forum is brought to you by Innovation, the global business development arm of Partners HealthCare. Its mission is the commercial application of the breakthroughs and unique capabilities of its Harvard affiliated faculty and staff—bringing benefits to patients worldwide and generating more than $130 million in revenue to further the Partner's research enterprise.

Many individuals and organizations worked collaboratively to make this Forum possible. Our speakers bring first hand insights wrought from their senior leadership positions. Generous support by our leading sponsors—GE, Nuance, Nvidia, Bayer, Bristol-Myers Squibb, Cisco, Dell Technologies, Siemens Healthineers, Wolters Kluwer, Amgen, Boston Scientific, MGH & BWH Center for Clinical Data Science, Mintz Levin, Northern Light Venture Capital, Persistent, Philips, Pure Storage and Vertex—made staging this unique gathering and including many early career faculty possible. To all we are grateful.

We want to also thank the Steering Committee for their vision of what an AI focused Forum could achieve. We are also grateful to the Planning Committee that worked over 18 months to shape every aspect of this undertaking.

Enjoy this global gathering!

Anne Klibanski, MD
Chief Academic Officer, Partners HealthCare;
Laurie Carrol Guthart Professor of Medicine,
Academic Dean for Partners, Harvard Medical School

Christopher Coburn
Chief Innovation Officer, Partners HealthCare;
President, Partners HealthCare International

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1. Source: Case Study – Helimed Diagnostic Imaging Case study March 2014

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information and events

registration

MONDAY, APRIL 23
7:00 am – 5:30 pm

TUESDAY, APRIL 24
7:00 am – 4:30 pm

WEDNESDAY, APRIL 25
7:00 am – 11:00 am

name badges

Name badges will be provided at registration. On-site registration is available on the 4th Floor outside the NVIDIA Ballroom during the hours noted above. Name badges must be worn during all events including meals and receptions. Please return your badge to the registration desk prior to your departure for recycling.

event locations

Registration Desk and Information (Daily)
Nuance Foyer, 4th Floor

Continental Breakfast (Daily)
Nuance Foyer, 4th Floor

MONDAY

First Look Presentations
Partners HealthCare Ballroom, 3rd Floor
Continental breakfast will be available in the meeting room
See pages 12–13 for presentation details

Discovery Café Workshops
3rd and 7th Floors
See pages 16–17 for luncheon room locations

Opening Reception
Nuance Foyer, 4th Floor

TUESDAY

Forum Luncheon
GE Ballroom, 3rd Floor

Attendee Networking Reception
GE Foyer, 3rd Floor

WEDNESDAY

2nd Annual Innovator's Recognition Dinner
Essex Ballroom, 3rd Floor | 5:30 pm
By Invitation

VR SUITE

Visit the interactive VR Suite on the 3rd floor on Tuesday, April 24 from 8am–6pm to experience live demo from the following companies:

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speaker bios

A complete list of speakers and their bios are available online via the Agenda page of our website at: worldmedicalinnovation.org/speakers

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emerging technologies

First Look

The Next Wave of AI Breakthroughs in Health Care

Monday, April 23, 2018 | 8:00 am

PARTNERS HEALTHCARE BALLROOM, 3RD FLOOR

Early career Harvard Medical School investigators kick-off the World Medical Innovation Forum with rapid fire presentations of their high potential new technologies. Nineteen rising stars from Brigham Health and Massachusetts General Hospital will highlight the potential of their research in artificial intelligence, cognitive computation, machine learning, and big data in ten minute presentations. This session is designed for investors, entrepreneurs, investigators, donors and others who share a passion for accelerating the application of high impact technologies to the benefit of patients.

peter k. ranney innovation award

The Peter K. Ranney Innovation Award will be given April 25th to honor a Brigham Health and a Massachusetts General Hospital First Look participants. The winners will be selected by a panel of industry judges based on the potential impact of the technology and the quality of the presentation. The two $10,000 awards will be made at the April 25 Innovator's Dinner following the conclusion of the Forum.

Nathalie Agar, PhD
Research Scientist, Neurosurgery, BWH; Associate Professor, HMS
Mass Spectrometry Imaging for Surgical Pathology and Oncology

Omar Arnaout, MD
Co-Director, Computation Neuroscience Outcomes Center, Attending Neurosurgeon, Department of Neurosurgery, BWH; Member of the Faculty, HMS
Using Residual Convolutional Neural Networks to Improve Treatment of Brain Tumors

Jason Baron, MD
Medical Director, Core Laboratory, MGH; Assistant Professor, HMS
Machine Learning-Based Clinical Decision Support for Laboratory Test Interpretation

David Craft, PhD
Staff Scientist, MGH; Assistant Professor, Radiation Oncology, HMS
Leveraging Machine Learning for Personalized Cancer Treatments

Raúl San José Estépar, PhD
Co-Director, Applied Chest Imaging Laboratory, BWH; Associate Professor, Radiology, HMS
Identification of Healthcare Risks in COPD Patients Using CT and X-ray Images

Andrey Fedorov, PhD
Assistant Professor, Radiology, BWH; Assistant Professor, HMS
Data Standardization for Advancing the Role of AI in Radiology

Georg Gerber, MD, PhD
Associate Pathologist, BWH; Assistant Professor, Pathology, HMS
Machine Learning Tools for Microbiome Diagnostics and Therapeutics Development

Daniel Hashimoto, MD
Edward D. Churchill Surgical Education and Simulation Research Fellow, MGH
Surgical Fingerprints: Real-Time Analysis and Summarization of Intraoperative Events

Kasper Lage, PhD
Director of Bioinformatics, MGH; Associate Professor, Surgery, HMS
Leveraging AI and Biological Networks to Functionally Interpret Vast Genetic Datasets

William Lane, MD, PhD
Director of Clinical Lab Informatics, Assistant Director Tissue Typing Lab, BWH; Assistant Professor, HMS
bloodTyper: Blood Group Typing using Next Generation Sequencing

Quanzheng Li, PhD
Director, Center for Advanced Medical Computing and Analysis, MGH; Associate Professor, Radiology, HMS
Deep Learning-Enabled System for Prescreening

Maulik Majmudar, MD
Associate Director, Healthcare Transformation Lab, MGH; Assistant Professor, Cardiology, HMS
SmartRx: A Natural Language Processing-Based Software Platform that Enables Automated, Real-Time, Querying of the EMR

Thomas McCoy, MD
Director of Research, Center for Quantitative Health, MGH; Assistant Professor of Psychiatry & Medicine, HMS
Computable Pharmacology Through Drug Burden Scoring

Ziad Obermeyer, MD
Assistant Professor, Emergency Medicine, BWH; Assistant Professor, HMS
A Machine Learning Algorithm to Reduce Costs and Increase Quality

Michael Rosenthal, MD, PhD
Radiologist, BWH; Assistant Professor, Radiology, HMS
Extracting Muscle and Fat Metrics from Clinical CT Images Using Neural Networks

Hadi Shafiee, PhD
Director, Laboratory of Micro/Nanomedicine and Digital Health, BWH; Assistant Professor, HMS
AI-Empowered Optical System for In-Vitro Fertilization

Erica Shenoy, MD, PhD
Associate Chief, Infection Control Unit, MGH; Assistant Professor, HMS
Prediction as Prevention: A Data-Driven Approach to Identify Patients at Risk for Infection

Brandon Westover, MD, PhD
Director, MGH Clinical Data Animation Center, MGH; Assistant Professor, HMS
Artificially Intelligent Sleep Analysis with Deep Neural Networks

Sabine Wilheim, PhD
Chief of Psychology; Director, OCD and Related Disorders Program, MGH; Professor, HMS
Mobile Apps: Bridging the Mental Health Treatment Gap

Note: Speakers and content are subject to change.

cutting edge technologies

Discovery CAFÉ

a World Medical Innovation Forum Event

Monday, April 23, 2018 | 11:45 am

3RD FLOOR AND 7TH FLOOR

Lunch with Top Leadership from Across Partners HealthCare and Industry

Seven intensive workshops addressing cutting-edge artificial intelligence topics.

The Future of AI in Pathology and Laboratory Medicine

ESSEX NORTH | 3RD FLOOR







INTRODUCER

Rebecca Listfield, PhD, Director, Licensing, Innovation, PHS

MODERATORS

Jeffrey Golden, MD, Chair, Department of Pathology, BWH; Ramzi S. Cotran Professor of Pathology, HMS

David Louis, MD, Pathologist-in-Chief, MGH; Benjamin Castleman Professor of Pathology, HMS

PANELISTS

John Higgins, MD, Associate Pathologist, MGH; Associate Professor, HMS

Jochen Lennerz, MD, PhD, Associate Director, Center for Integrated Diagnostics, MGH; Assistant Professor, Pathology, HMS

Reiko Nishihara, PhD, Assistant Professor, Pathology, BWH; Assistant Professor, Pathology, HMS

Kun-Hsing Yu, MD, PhD, Harvard Data Science Postdoctoral Fellow, Department of Biomedical Informatics, HMS

Technology and AI in Anesthesiology

ST. GEORGE A-B | 3RD FLOOR








INTRODUCER

Emy Chen, PhD, Director, Licensing, Innovation, PHS

MODERATORS

James Rathmell, MD, Chair, Department of Anesthesiology, Perioperative and Pain Medicine, BWH; Leroy D. Vandam Professor of Anaesthesia, HMS

Jeanine Wiener-Kronish, MD, Anesthetist-in-Chief, MGH; Henry Isasiah Dorr Professor of Research and Teaching in Anaesthetics and Anaesthesia, HMS

PANELISTS

Christopher Connor, MD, PhD, Member of the Faculty of Anaesthesia, BWH; Assistant Professor, Anesthesiology, HMS

William Driscoll, Director, Perioperative Clinical Engineering and IT Systems, MGH

Dusan Hanidziar, MD, PhD, Anesthesiologist and Intensivist, MGH

James Philip, MD, Anesthesiologist and Director of Clinical Bioengineering, Department of Anesthesiology, Perioperative and Pain Medicine, BWH; Professor of Anaesthesia, HMS

Kyan Safavi, MD, Critical Care Fellow, MGH

The Future of AI in Neurosciences

ESSEX SOUTH | 3RD FLOOR

INTRODUCER

Glenn Miller, PhD, Market Sector Leader, Innovation, PHS

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David Silbersweig, MD, Chair, Department of Psychiatry, BWH; Professor of Psychiatry, HMS

Rudolph Tanzi, PhD, Vice-Chair, Neurology, Director, Genetics and Aging Research Unit, MGH; Joseph P. and Rose F. Kennedy Professor of Neurology, HMS

PANELISTS

Sydney Cash, MD, PhD, Epileptologist, Department of Neurology, MGH; Associate Professor of Neurology, HMS

Maurizio Fava, MD, Director, Division of Clinical Research, MGH; Associate Dean for Clinical & Translational Research & Professor of Psychiatry, HMS

Oliver Harrison, MD, CEO, Telefonica Alpha Health

Intelligence in Sight: How Machine Learning Will Impact Ophthalmology

ST. GEORGE C-D | 3RD FLOOR

INTRODUCER

Mehul Mehta, MD, Vice President, Strategy and Global Programs, Partners HealthCare International, PHS

MODERATORS

Joan Miller, MD, Chief of Ophthalmology, Massachusetts Eye and Ear and MGH; Chair, Department of Ophthalmology and David Glendenning Cogan Professor of Ophthalmology, HMS

Lucia Sobrin, MD, Director, Morse Laser Center, Massachusetts Eye and Ear Infirmary; Associate Professor of Ophthalmology, HMS

PRESENTER

Lily Peng, MD, PhD, Product Manager, Google

PANELISTS

Lloyd Aiello MD, PhD, Director, Beetham Eye Institute, Joslin Diabetes Center, MEE; Vice Chair, Department of Ophthalmology, Professor of Ophthalmology, HMS

John Miller, MD, Director, Retinal Imaging, MEE; Assistant Professor, Ophthalmology, HMS

Louis Pasquale, MD, Director, Glaucoma Service and Ophthalmology Telemedicine program, MEE; Professor of Ophthalmology, HMS

Data Security

PARLIAMENT/ADAMS | 7TH FLOOR

INTRODUCER

Andrea Messina, Director, Business Development, Innovation, PHS

MODERATOR

John Pyhtila, PhD, Chief Data and Analytics Officer, PHS

PANELISTS

Jigar Kadakia, Chief Information Security and Privacy Officer, PHS

Carl Kraenzel, VP, Chief Information Security Officer, IBM Watson Health

Stephen McHale, Managing Partner, 23Bell LLC

Innovation Fellows: A New Tool

ESSEX CENTER | 3RD FLOOR

MODERATOR / INTRODUCER

Seema Basu, PhD, Market Sector Leader, Innovation, PHS

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Raolat Abdulai, MD, Associate Director, AstraZeneca; former Clinical and research Fellow, BWH

Nathalie Agar, PhD, Research Scientist, Neurosurgery, BWH; Associate Professor, HMS

Paul Anderson, MD, PhD, Chief Academic Officer, BWH; SVP of Research, BWH; K. Frank Austen Professor of Medicine, HMS

Valerie Humblet, PhD, Head of Research and Development, Collagen Medical

Harry Orf, PhD, SVP, Research, MassGeneral Research Institute, MGH; Principal Associate, HMS

Workforce: Humans, Machines and the Future Delivery of Care

PARTNERS HEALTHCARE BALLROOM 3RD FLOOR

INTRODUCER

Meredith Fisher, PhD, Partner, Innovation, PHS

MODERATOR

Susan Hockfield, PhD, Board Member, PHS; President Emerita and Professor of Neuroscience, MIT

PANELISTS

Katherine Andriole, PhD, Director of Research Strategy and Operations, MGH & BWH CCDS; Associate Professor of Radiology, HMS

Robert Birnbaum, MD, PhD, Professional Development & Implementation Science, PHS; Assistant Professor of Psychiatry, HMS

Glenn Cohen, Faculty Director, Petrie-Flom Center for Health Law Policy, Biotechnology & Bioethics, Harvard Law School

Piyush Mathur, Global Head of Workforce Analytics, Johnson and Johnson

William Thorwarth, MD, CEO, American College of Radiology

Note: Speakers, content, and rooms are subject to change.

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WORLD FORUM

steering committee

Many thanks to the exceptional Co-Chairs and all the members of the Steering Committee for their leadership in shaping the Forum agenda, identifying speakers and securing sponsors.

2017 WORLD MEDICAL INNOVATION FORUM

1:1 Fireside Chat: John Lechleiter, PhD, Chairman, Eli Lilly

Moderator | **Susan Dentzer**
CEO, Network for Excellence in Health Innovation

John Lechleiter, PhD
Chairman, Eli Lilly and Company

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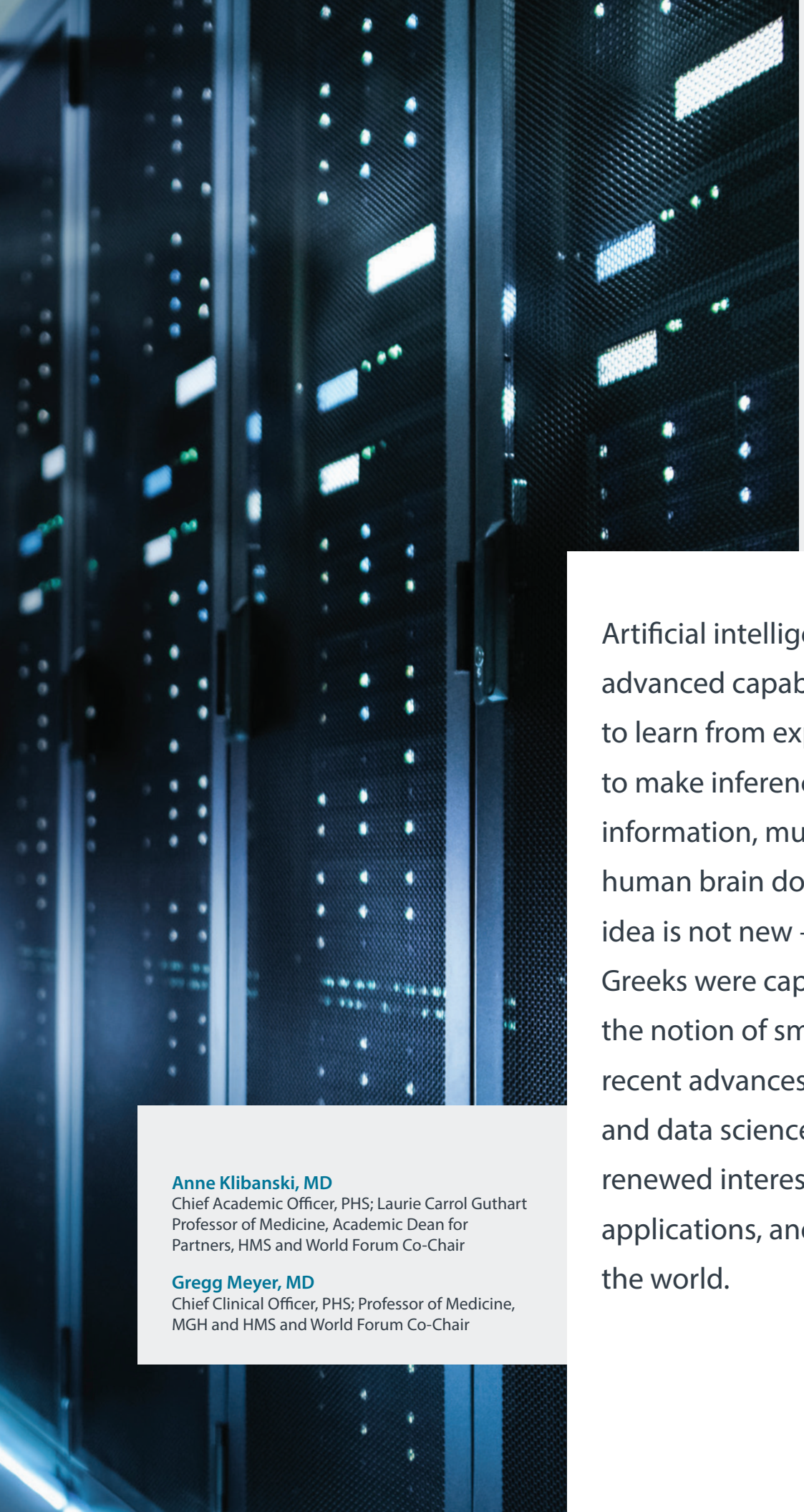
VP, Healthcare and AI Business Development, NVIDIA

Krishna Yeshwant, MD
Partner, Google Ventures; Instructor in Medicine, BWH

wielding the power of AI to improve health care



Anne Klibanski, MD
Chief Academic Officer, PHS; Laurie Carrol Guthart Professor of Medicine, Academic Dean for Partners, HMS and World Forum Co-Chair

Gregg Meyer, MD
Chief Clinical Officer, PHS; Professor of Medicine, MGH and HMS and World Forum Co-Chair

Artificial intelligence refers to the advanced capability of machines to learn from experience — to make inferences based on information, much like the human brain does. Although the idea is not new — the ancient Greeks were captivated by the notion of smart robots — recent advances in computer and data sciences have led to a renewed interest in AI, its many applications, and their impact on the world.

Today, AI is revolutionizing fields ranging from finance to astronomy. It is also emerging as a major disruptive force in health care with the potential to address myriad challenges — particularly those pertaining to cost, access, and quality. Indeed, it is projected that AI-based technologies could help the U.S. health care system save some $450 billion each year.

Recognizing the remarkable promise of AI, physicians and researchers throughout Partners HealthCare, including Brigham Health and Massachusetts General Hospital (MGH) are blazing new trails across the clinical landscape. This pioneering work in AI spans practically every aspect of hospital operations and clinical subspecialties, from population-level tools to better stratify patients by risk, to disease specific applications with the promise of improving the detection, diagnosis, and management of various conditions.

a bold new center

The MGH and BWH Center for Clinical Data Science (CCDS), a new cross-disciplinary center, comprised of 30 clinicians, researchers, data scientists, software engineers, and product development experts that was formally launched 18 months ago, seeks to create innovative tools and services to keep patients healthy, heal them when they are sick and to improve the delivery of care. Its primary focus is improving clinical practice. CCDS has grown rapidly during its start-up phase, forming partnerships with key industry players and launching game-changing collaborations with researchers in the Partners community.

CCDS inked its first major deal with NVIDIA, a world leader in designing powerful graphics processing units (GPUs), which provides the hardware needed to drive AI-based analyses. Now, the center boasts an enormous supercomputing infrastructure — one that is exceedingly rare, if not entirely unique, among academic medical centers. This extraordinary capability helps fuel the center's work; by combining it with the clinical expertise of Partners 3,600 Harvard faculty and the wealth of clinical data under the stewardship of the health care system, CCDS intends to engineer novel tools and solutions that will support clinicians — not render them obsolete.

In May, 2017 a 10-year strategic collaboration with General Electric was announced –

designed to rapidly develop, validate, and strategically integrate AI-based technologies across the entire continuum of patient care. That includes machine learning and deep learning, which are now driving much of the progress in the field. Initially, the collaborative effort is focusing on the development of new AI-based tools in diagnostic imaging to enhance clinician productivity and improve patient outcomes. Subsequently, their work will expand to other clinical domains, such as molecular pathology, genomics, intensive care medicine, and population health, and ultimately, drive new business models for applying AI to health care.

Most recently, in March of this year, CCDS announced a multi-year strategic relationship with Nuance Communications to integrate AI based tool sets directly into the radiology reporting workflow. Nuance is a major provider of workflow solutions for radiologists and, in collaboration with CCDS, is focused on helping to reduce repetitive tasks, improve report quality, and ultimately, make radiology reporting a more seamless and efficient process.

"For AI algorithms to be useful to clinicians and patients, it is critical that they are both clinically validated and accessible," says Keith Dreyer, Chief Data Science Officer at Partners HealthCare. "Through collaboration with the Center, clinicians will be able to access and leverage validated AI algorithms, intensive IT infrastructure and vast domain expertise."

Despite several distinctive and rapidly progressing industry relationships, "we're still in start-up mode and really just getting our sea legs," says CCDS executive director Mark Michalski, MD. "But already we've been able to create things that are useful and we're now beginning to integrate them into clinical practice."

One of the Center's flagship projects developed in collaboration with Gil Gonzales, MD, PhD from MGH neuroradiology, involves the development of an algorithm for evaluating stroke. Recently, there has been a major shift in the science surrounding stroke treatment; a paper published in the New England Journal of Medicine last November, based on data collected through the DAWN trial (DWI or CTP Assessment with Clinical Mismatch in the Triage of Wake-UP and Late Presenting Strokes Undergoing Neurointervention with Trevo) showed that a significant fraction of patients with ischemic stroke can be effectively treated up to 24 hours following the onset of symptoms. Previously, it was widely held that treatment must be administered in a much shorter window of just six hours.

The CCDS algorithm provides a data-driven method to help triage stroke patients and pinpoint those who require the most aggressive interventions. This approach will enable patients to be transferred to a tertiary care center for treatment to conduct basic imaging studies, provide clinicians with some insights about the type of stroke (hemorrhagic or ischemic), and determine whether the patient should be transferred to MGH for treatment. This new tool is now being incorporated into the software that runs on some CT scanners to further test and evaluate its performance. It provides a step along the path toward creating a precise, rapid-response system for managing ischemic stroke.

Another CCDS project developed in collaboration with Brigham Health's Michael Rosenthal, MD, PhD and MGH's Florian Fintelmann, MD focuses on developing an algorithm that can accurately determine body composition from a single CT slice. The current methods for reliably measuring how much fat and muscle a person has are quite labor intensive and largely impractical. While assessments of body composition can help guide lifestyle decisions about diet and exercise, they can also be important clinically. Fat and muscle amount and location, for example, can be predictors of surgical outcomes. In addition, a sudden shift in body composition can sometimes be an early sign of disease, such as pancreatic cancer — a condition that is currently difficult to detect in its initial stages.

The center is also pursuing a range of AI-based projects that extend beyond radiology. CCDS seeks to significantly expand its ranks, hiring an additional 20 or so experts in software engineering, data science, and machine learning by the end of the year. "This is a really unique place where you can make an impact on patients very rapidly," says Michalski. "We're not harnessing data science to build a better customer loyalty program for some company — we want to save lives."

In addition to the work underway at CCDS, researchers across the Partners community are harnessing machine learning and deep learning approaches to improve clinical care. Examples include:

"But already we've been able to create things that are useful and we're now beginning to integrate them into clinical practice."

MGH & BWH CENTER FOR
CLINICAL
DATA
SCIENCE

ischemic stroke

Stroke is a significant health problem worldwide and in developed countries, it is among the top three in cost to society. In the U.S., there are roughly 800,000 stroke cases each year; more than 80 percent are ischemic — that is, due to lack of blood flow.

Several Partners researchers are working to apply machine-learning methods to address the most critical gaps in ischemic stroke care. That includes a team led byMGh's Hakan Ay, MD. He and his colleagues recently published an analysis of an automated, evidence-based tool they developed to help determine the cause of an ischemic stroke. With many possible causes, roughly half of patients with ischemic stroke present with symptoms that complicate early diagnosis and treatment.

Ay's software, called Causative Classification of Stroke (CCS), helps reduce this complexity through an algorithm that mines patients' clinical and imaging data and sorts them into different etiological groups. In a study of more than 1,800 ischemic stroke patients, CCS outperformed a pair of conventional, non-automated stroke classification methods. It was also able to assign etiologies for up to 40 percent of patients for whom other methods failed to identify an underlying cause, and proved better at predicting the likelihood of a recurrence within 90 days.

lung disease

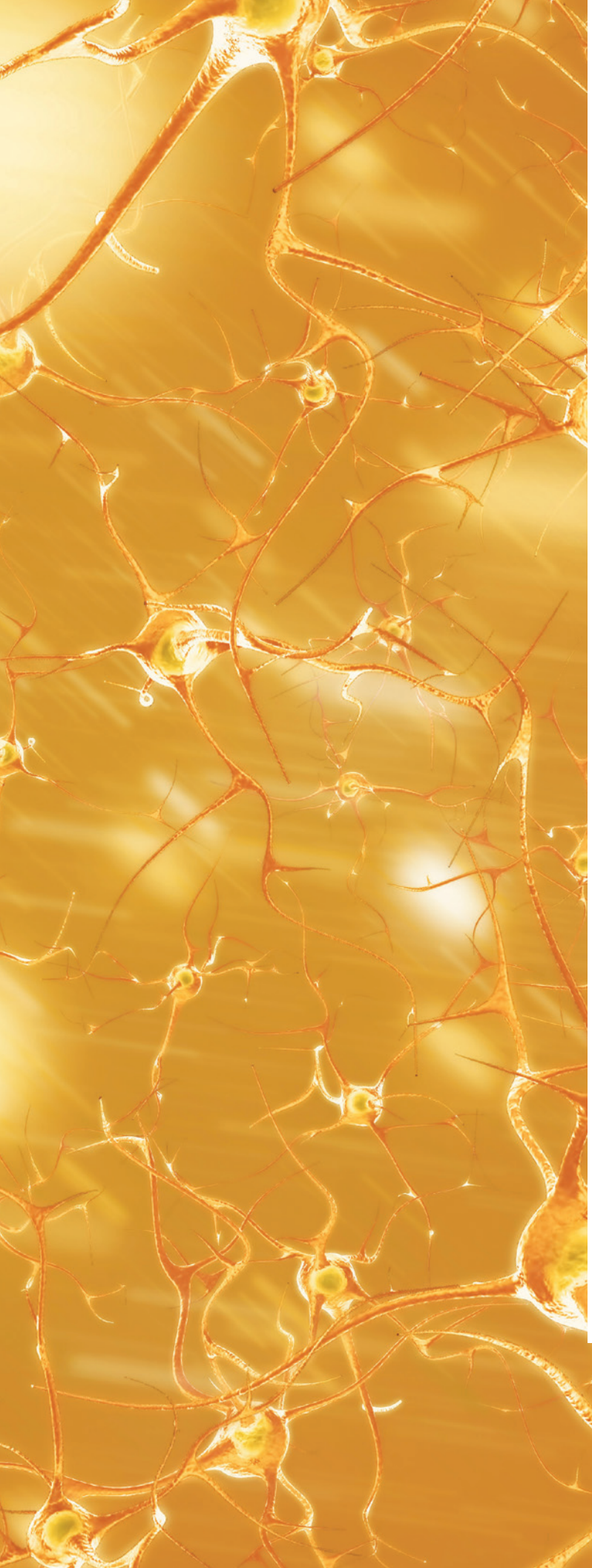
Chronic Obstructive Pulmonary Disorder (COPD) represents a group of progressive lung conditions that result in increasing breathlessness and wheezing over time. More than 30 million people in the U.S. suffer from COPD and it is the nation's third leading cause of death.

Few therapies can effectively control COPD, in part because of the condition's significant heterogeneity, complicating efforts to pinpoint the underlying biological causes and prescribe appropriate therapies. Researchers at BWH are harnessing machine learning techniques to improve the classification and diagnosis of COPD and catalyze a deeper understanding of its root causes. For example, Raúl San José Estépar, PhD and colleagues recently published a study using deep learning methods to analyze CT scans of the chest in smokers with and without COPD. By applying the model to patients in a large database of smokers with and without COPD, patients with COPD were correctly distinguished from those without COPD 85% of the time. This approach also was able to predict outcomes, such as acute respiratory disease events and mortality. Estepar and colleagues are now extending this work to further develop image-based biomarkers that can transform the management of COPD.

neurological and sleep disorders

The ability to evaluate the electrical activity of the brain through an electroencephalogram (EEG) is indispensable for a variety of neurological conditions. Yet reading and interpreting EEGs — comprised of multiple streams of data often collected from as many as 20 or more electrodes — is still a largely manual process. The work, which requires expertly trained neurologists, is tedious and time-consuming. Moreover, expert visual inspection can still miss subtle variations that are beyond the limits of human detection.

Researchers at MGH are leveraging machine learning to develop automated approaches for analyzing EEGs. Brandon Westover, MD, PhD and colleagues recently published an automated method for quantifying EEG reactivity in comatose patients. As current techniques for predicting neurologic outcomes in these patients are largely subjective, this research could help lay the foundation for a more precise, data-driven model to predict patients' likelihood and length of recovery.



The Westover team also published a study describing their work to develop an automated, EEG-based sleep staging system. Currently, sleep staging consists of a complex set of manual data analyses that are required to diagnose sleep disorders. They have taken an early step toward an automated method that could significantly expand the use of sleep analysis in medicine. Similar machine learning approaches to develop an automated method to improve epilepsy diagnosis.

cancer diagnosis and treatment

In breast cancer, the advantages of early detection are clear. Despite the benefits, there are growing concerns about the risks patients face when they receive suspicious mammogram findings but do not actually have breast cancer. High-risk breast lesions (HRLs) are usually benign, but are often surgically excised due to their low but present potential to advance to malignancy. To help predict the chance of a lesion becoming malignant and reduce overtreatment, MGH's Constance Lehman, MD, PhD at MGH and colleagues recently published a machine-learning model that helps distinguish high- and low-risk HRLs diagnosed by image-guided biopsy. Their model incorporates the full spectrum of patient data, including clinical information, mammographic findings, and image-guided needle biopsy and surgical pathology reports.

When applied to a set of 335 HRLs (all of which were identified and then surgically excised), Lehman's algorithm identified 97.4% of the malignancies. If applied prospectively, it would have identified the vast majority of HRLs requiring excision and avoided roughly 30% of the surgeries on benign lesions. Her team's long-term hope is that this kind of tool will help reduce some of the anxiety and worry — along with unnecessary surgeries — that can accompany routine mammography.

Physicians and researchers at Partners HealthCare are blazing new trails across the medical spectrum.

Other Partners researchers are also working to develop AI-based methods that will improve cancer detection and treatment. A major challenge in some types of cancer, such as brain cancer, is gaining access to tissue to inform diagnosis and treatment. To overcome this challenge, Brigham researchers are working to identify visual signals on clinical images, such as MRIs or CT scans, that can help classify brain tumors, predict their molecular makeup, identify which therapies are likely to be effective, and help guide surgery.

Raymond Huang, MD, PhD and colleagues describe the development and early application of a tool to help predict survival in patients with recurrent glioblastoma (GBM) who are treated with bevacizumab (an antibody-based therapy against VEGF). GBM is the most common primary adult brain tumor and carries one of the worst prognoses across all forms of the disease, with a median survival of about 15 months after diagnosis. While bevacizumab can have a marked response on tumor growth in some patients, only a small fraction of patients typically respond. There is a need to discover image-based biomarkers — a kind of "virtual" biopsy — that can help pinpoint patients who are likely to derive the greatest therapeutic benefit.

In a recent study of glioma, another form of cancer of the brain and central nervous system, Huang together with MGH's Jayashree Kalpathy-Cramer, PhD and colleagues applied machine-learning methods to create a model that can help predict mutations in the isocitrate dehydrogenase (IDH) gene family based on clinical variables and image features extracted from conventional MRIs. Gliomas that carry IDH mutations are typically associated with longer overall survival compared to tumors carrying wildtype versions. Therefore, the accurate and noninvasive prediction of IDH genotype prior to surgery may have both diagnostic and prognostic value.

Similar challenges are being pursued in lung cancer. Brigham's Hugo Aerts, PhD and colleagues recently published a pilot study of high-resolution CT images of nearly 50 patients with non-small cell lung cancer, both before and after treatment with the EGFR-inhibitor gefitinib. Their goal was to identify a non-invasive, image-based method that predicts EGFR mutation status and the associated response to gefitinib. The researchers initial work reveals that machine learning techniques applied to pre-treatment images can predict these characteristics, underscoring the potential of the approach.

surgery

Cancer is an extremely heterogeneous disease. Even patients whose tumors carry the same genetic mutations can experience distinct outcomes. Tools capable of characterizing tumors on a molecular level — that could be deployed in the surgical suite when a tumor is being biopsied or removed — could enhance resection, and also predict the course of disease and personalized treatment.

BWH's Nathalie Agar, PhD and colleagues have recently published a proof-of-concept study that helps illustrate the promise of this approach. They use matrix-assisted laser desorption/ionization (MALDI) mass spectrometry imaging (MSI), combined with statistical and machine learning analyses to identify and define pituitary tumors. With this approach, it is possible to map the peptide and protein hormone profiles of tissue removed from pituitary tumors in less than 30 minutes. That means surgeons could have near-real-time access to this information, informing their surgical decision-making. This could potentially be broadened to other tumors of the brain and perhaps to masses elsewhere in the body.

pathology

The ability to digitize pathology slides in a clinical capacity only recently became possible — the first whole-slide imaging system for digital pathology was approved by the FDA in April 2017. With the dawn of digital pathology, a new era is beginning in which pathologists will be able to take advantage of decision support tools that rely on machine learning to improve diagnosis and treatment.

Researchers, including MGH's Quanzheng Li, PhD, are working toward this goal by developing machine learning methods that, like those being applied to radiological images, can help automate the analyses of pathology images and provide pathologists with better tools for patient care. Li and his colleagues recently participated in the CAMELYON16 grand challenge (Cancer Metastases in Lymph Nodes Challenge) organized in collaboration with the Institute of Electrical and Electronics Engineers' International Symposium on Biomedical Imaging. Participants submitted algorithms to enable the automated detection of sentinel lymph node metastases in breast cancer patients from hematoxylin and eosin (H&E) stained whole-slide images of lymph nodes.

Li and his colleagues developed deep learning algorithms that ranked among the top two-performing algorithms out of a total of 32 submissions. The results of the challenge, which were published late last year, underscore deep learning as a promising approach to creating decision support tools in pathology.

These projects and many more in progress across Partners HealthCare are steering AI into an era marked by opportunity, innovation and profound enhancements to patient care. +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Speaker
Registration

Partners HealthCare

INNOVATION

This World Forum is brought to you by Partners HealthCare Innovation, the nearly 120 person business development unit responsible for the worldwide commercial application of the capabilities and discoveries of Partners' 74,000 employees. Innovation supports the research requirements of its 3,600 Harvard Medical School faculty and research hospitals. It has responsibility for industry collaborations, venture investing, international consulting, licensing, innovation management, company creation, technology marketing, open innovation alliances, and workforce development.

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PARTNERS® HEALTHCARE | INNOVATION

agenda

[monday, april 23rd]

All speaker bios are at: **worldmedicalinnovation.org/speakers**

7:00 am | 8:00 am — **Breakfast**
GE foyer

7:00 am | 8:00 am — **Registration**
Nuance foyer

8:00 am | 11:30 am — **First Look: The Next Wave of AI Breakthroughs in Health Care**
Partners HealthCare ballroom

Early career Harvard Medical School investigators kick-off the 2018 World Medical Innovation Forum with rapid fire presentations of their high potential new technologies. Nineteen rising stars from Brigham Health and Massachusetts General Hospital will give ten-minute presentations highlighting their discoveries and insights that will disrupt the field of artificial intelligence. This session is designed for investors, leaders, donors, entrepreneurs and investigators and others who share a passion for identifying emerging high-impact technologies.

Please see pages 12–13 for more details.

Moderators
Trung Do, VP, Business Development, Innovation, PHS
Clare Tempany, MD, Vice-Chair, Radiology Research, BWH; Professor of Radiology, HMS


11:30 am | 11:45 am — **Break and Move to Discovery Café Workshops**

11:45 am | 1:00 pm — **Discovery Café Workshops**
3rd floor and 7th floor

Lunch with Top Leadership from across Partners HealthCare and Industry. Seven intensive workshops addressing cutting-edge artificial intelligence topics.

Please see pages 14–15 for more details.

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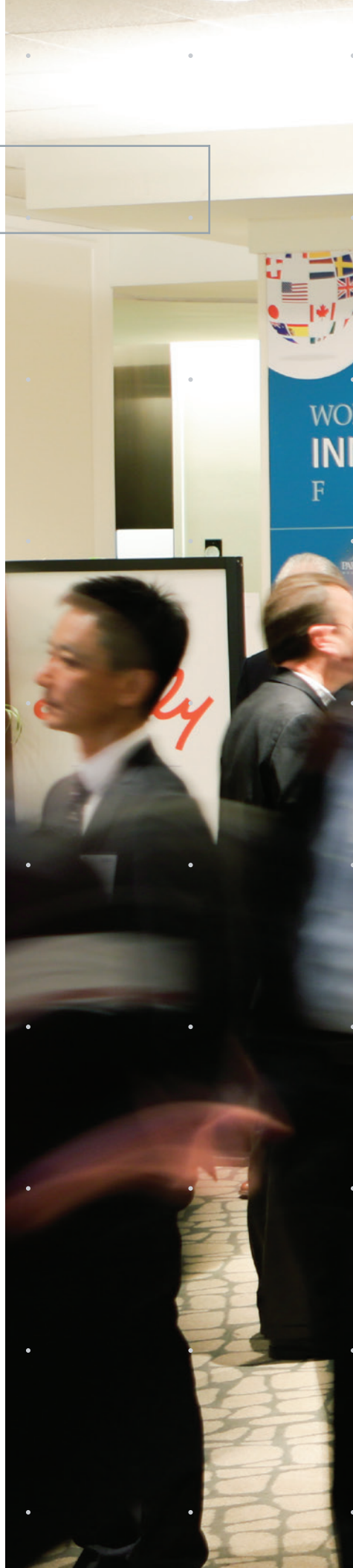


1:00 pm | 1:20 pm **Break**

1:20 pm | 1:45 pm **Opening Remarks**
NVIDIA ballroom

Anne Klibanski, MD, Chief Academic Officer, PHS; Laurie Carrol Guthart Professor of Medicine, Academic Dean for Partners, HMS; 2018 Forum Co-Chair
David Torchiana, MD, CEO, PHS
The Honorable Charlie Baker, Governor of the Commonwealth of Massachusetts



1:45 pm | 2:25 pm **Reflecting on the Impact of AI at the Bed and the Bench: Chairs Roundtable**
NVIDIA ballroom

Senior clinical leaders, current and past Forum Chairs, will share perspectives on the range of impact of AI on clinical practice. Discussion will highlight the rapid evolution of AI as a practical clinical tool and short and mid-term prospects for adoption in cancer, cardiovascular and neurological care.

Moderator
Sue Siegel, CIO and CEO, Business Innovations, GE

Keith Dreyer, DO, PhD, Chief Data Science Officer, PHS; Vice Chairman, Radiology, MGH; Associate Professor, Radiology, HMS
Anne Klibanski, MD, Chief Academic Officer, PHS; Laurie Carrol Guthart Professor of Medicine, Academic Dean for Partners, HMS; 2018 Forum Co-Chair
Calum MacRae, MD, PhD, Vice Chair for Scientific Innovation, Department of Medicine, BWH; Chief Executive, One Brave Idea, BWH; Associate Professor of Medicine, HMS; 2017 Forum Co-Chair
Gregg Meyer, MD, Chief Clinical Officer, PHS; Professor of Medicine, MGH and HMS; 2018 Forum Co-Chair
Anthony Rosenzweig, MD, Chief, Cardiology Division, MGH; Professor of Medicine, HMS; 2017 Forum Co-Chair






2:25 pm | 3:15 pm

Can AI Based Drug Development Feed A Hungry Pipeline?

NVIDIA ballroom

Given the scarcity of late-stage assets, prolonged timelines and enormous costs of bringing drugs to market, AI-based approaches to target discovery, drug design and drug repurposing hold significant promise to positively disrupt the existing R&D paradigm.

Moderator

Anthony Philippakis, MD, PhD, Chief Data Officer, Broad Institute; Cardiologist, BWH; Venture Partner, Google Ventures

Sean Harper, MD, EVP, R&D, Amgen
Andrew Hopkins, CEO, Exscientia
Sekar Kathiresan, MD, Director, Center for Genomic Medicine, MGH; Ofer and Shelly Nemirovsky MGH Research Scholar; Associate Professor of Medicine, HMS
Thomas Lynch, MD, EVP and CSO, R&D, Bristol-Myers Squibb
Niven Narain, CEO, BERG

3:15 pm | 4:05 pm

Smart EHRs: AI for All

NVIDIA ballroom

The first wave of EHR adoption has focused primarily on digitizing the patient record – with a more recent focus on building interactive clinical decision support capabilities. Development and implementation of CDS applications currently requires clinical staff to observe trends in data, develop protocols to act on these trends and work with technical staff to codify the logic into executable form. As NLP and computer vision capabilities become more advanced, algorithms will identify and propose actions reflecting patterns in the data. The panel will discuss existing challenges and whether AI technology will ultimately support an unsupervised learning approach in the EHR to identify trends and possible responses at both the patient and population level?

Moderator

O'Neil Britton, MD, SVP and CMO, MGH

Dan Burton, CEO, Health Catalyst
Seth Hain, Director, Analytics & Machine Learning, Epic
Sudhir Kulkarni, President, Digital, Persistent Systems
Noga Leviner, CEO, Picnic Health
Diana Nole, CEO, Wolters Kluwer Health

4:05 pm | 4:55 pm

AI and the Cost of Trials: The Impact of Real World and Real Time Evidence

NVIDIA ballroom

AI based approaches to conduct faster and more efficient clinical trials are beginning to emerge. Current approaches include applying predictive tools to perform more targeted patient recruitment and more accurate eligibility assessment. Panelists will discuss timelines for AI technology to have a measurable effect on trial cost and time to conduct the trial. Bottlenecks to applying the technology at scale and whether there will be a measurable effect on the cost of bringing drugs to market over the next decade will also be examined.

Moderator

Krishna Yeshwant, MD, Partner, Google Ventures; Instructor in Medicine, BWH

Amy Abernethy, MD, PhD, CMO, CSO & SVP Oncology, Flatiron Health
Ramesh Durvasula, PhD, VP, Research IT, Eli Lilly and Company
Colin Hill, CEO, GNS Healthcare
Jackie Hunter, PhD, CEO, BenevolentAI
Joseph Scheeren, PharmD, Senior Advisor, R&D, Bayer
Stephen Wiviott, MD, Executive Director, Clinical Trials Office, PHS; Cardiologist, BWH; Associate Professor of Medicine, HMS

5:00 pm | 6:00 pm

Opening Reception

Nuance foyer

[tuesday, april 24th]

All speaker bios are at: worldmedicalinnovation.org/speakers

7:15 am | 7:50 am

Continental Breakfast

Nuance foyer

7:50 am | 8:00 am

Opening Remarks

NVIDIA ballroom

Chris Coburn, Chief Innovation Officer, Partners HealthCare; President, Partners HealthCare International

8:00 am | 8:50 am

Will AI Bend the Cost and Access Curve

NVIDIA ballroom

Historical barriers have driven increased medical costs and decreasing access since the 1960s. The "Iron Triangle of Healthcare" continues to represent a tenuous balance of quality, cost and accessibility – economists have lamented attempts to optimize one characteristic at the expense of the others. The accumulation of innovations in care delivery (e.g. shift to lower cost providers and settings), population management, value based reimbursement and hospital administration are having a measurable effect. Can AI based technologies accelerate the pace of innovation and finally bend the cost and access curves in the US?

Moderator

Timothy Ferris, MD, CEO, MGPO

Roy Beveridge, MD, SVP and CMO, Humana
Leonard D'Avolio, PhD, CEO, Cyft, Inc.
Peter Orszag, PhD, Vice Chairman, Investment Banking and Managing Director, Lazard Freres




8:50 am | 9:40 am

Drug Therapy Redefined Through Machine Learning

NVIDIA ballroom

The drug development process is highly complex and has many drivers. The panel will discuss the strategic impact of AI on the entire process and the implications for health care overall. How will the combination of factors – research strategy, drug development, regulatory approvals, reimbursement and clinical effectiveness – be influenced by the implementation of AI. Panelists will discuss short and mid-term prospects and whether AI will ultimately lead to a restructuring of the pharma model to develop new therapies.

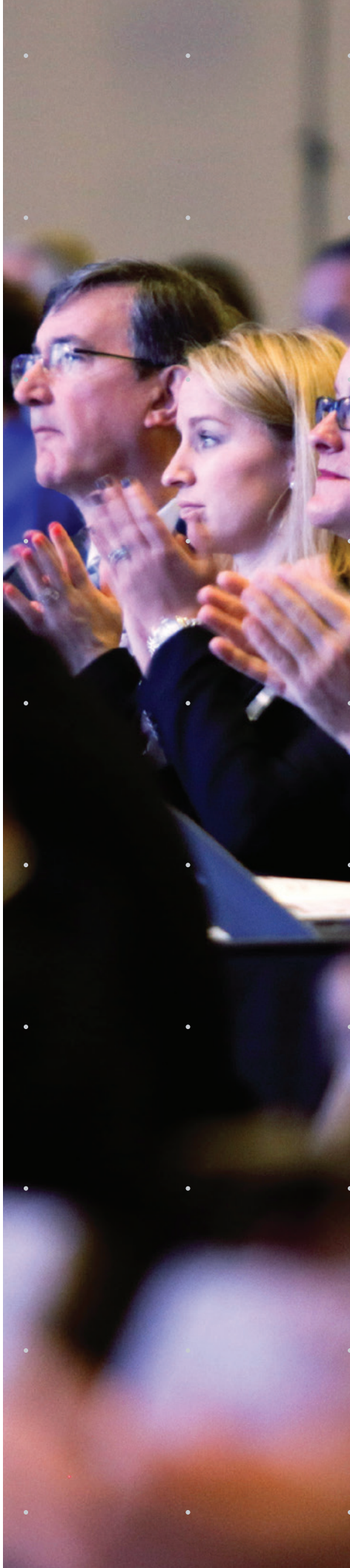
Moderator

Jean-François Formela, MD, Partner, Atlas Venture

Jay Bradner, MD, President, Novartis Institutes for Biomedical Research
Mark Murcko, PhD, CSO, Relay Therapeutics
Georgia Papathomas, PhD, Global Head of Data Sciences, Johnson & Johnson
Eric Perakslis, PhD, CSO, Datavant
Gregg Talbert, PhD, Global Head of Digital and Personalized Health Care Partnering, Roche





9:40 am | 10:10 am

1:1 Fireside Chat: Atul Gawande, MD

NVIDIA ballroom

Introduction

John Fish, CEO, Suffolk; Chairman of Board Trustees, Brigham Health

Moderator

Elizabeth Nabel, MD, President, Brigham Health; Professor of Medicine, HMS

Atul Gawande, MD, Executive Director, Ariadne Labs; Samuel O. Thier Professor of Surgery, HMS; Surgeon, BWH



10:10 am | 10:25 am

Morning Break

Nuance foyer

10:25 am | 11:15 am

Data Engineering in Health Care: Liberating Value

NVIDIA ballroom

The promise of machine learning and big data in health care seems boundless – but health care data is massive and complex, and organizing and managing this data is the first step to an AI-empowered health care system. Technology giants are investing in solutions to overcome these data engineering challenges, but with many visions of the future of health care data jockeying for dominance, what will the future of health care data really look like? Can we finally liberate the value of data for patient care? And how will it happen?

Moderator

Mark Michalski, MD, Executive Director, MGH & BWH CCDS

Iain Buchan, MD, Director of Healthcare Research, Microsoft Research
Patricia Florissi, VP and Global CTO, Sales, Dell EMC
James Mault, MD, SVP and CMO, Qualcomm Life
Greg Moore, MD, PhD, VP, Healthcare, Google Cloud
Shawn Murphy, MD, PhD, Chief Research Information Officer, PHS; Professor of Neurology, HMS
Timothy Tuttle, PhD, CTO, Cognitive Collaboration Group, Cisco







11:15 am | 11:45 am

1:1 Fireside Chat: Jensen Huang, CEO, NVIDIA

NVIDIA Ballroom

Introduction

Scott Sperling, Co-President, Thomas H Lee Partners; Chairman of the Board of Directors, PHS

Moderator

Keith Dreyer, DO, PhD, Chief Data Science Officer, PHS; Vice Chairman, Radiology, MGH; Associate Professor, Radiology, HMS

Jensen Huang, CEO, NVIDIA



12:00 pm | 1:00 pm

Lunch

GE Ballroom

2017 WORLD MEDICAL INNOVATION FORUM

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12:30 pm | 1:00 pm

1:1 Fireside Chat: Paul Ricci, CEO, Nuance

GE ballroom

Introduction

Cathy Minehan, Managing Director, Arlington Advisory Partners; Chairman, Board of Trustees, MGH

Moderator

James Brink, MD, Chief, Department of Radiology, MGH; Juan M. Taveras Professor of Radiology, HMS

Paul Ricci, CEO, Nuance



1:00 pm | 1:10 pm

Transition to plenary sessions

1:10 pm | 2:00 pm

AI and Gene Sequencing

NVIDIA ballroom

Gene sequencing technology has evolved considerably over the last 10 years, dramatically decreasing the cost to sequence a human genome. As the costs associated with the technical assay continue to decrease, data interpretation and reporting has become the new bottleneck. Can AI and ML based approaches be applied to better understand how genetic mutations play a role in diseases like cancer – where the high rate of mutation makes treatment challenging? And will continued democratization of genetic information help to accelerate the pace of innovation in the field?

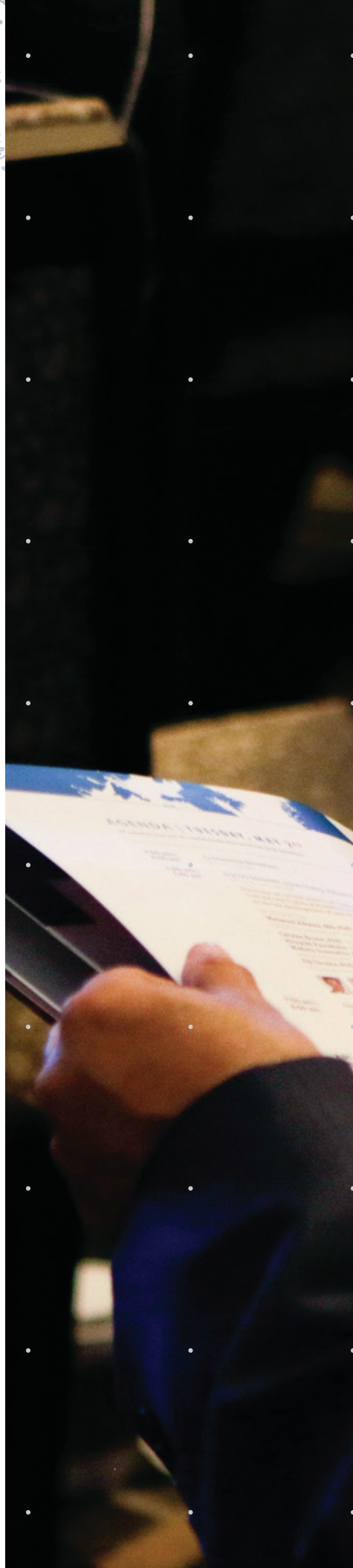
Moderator

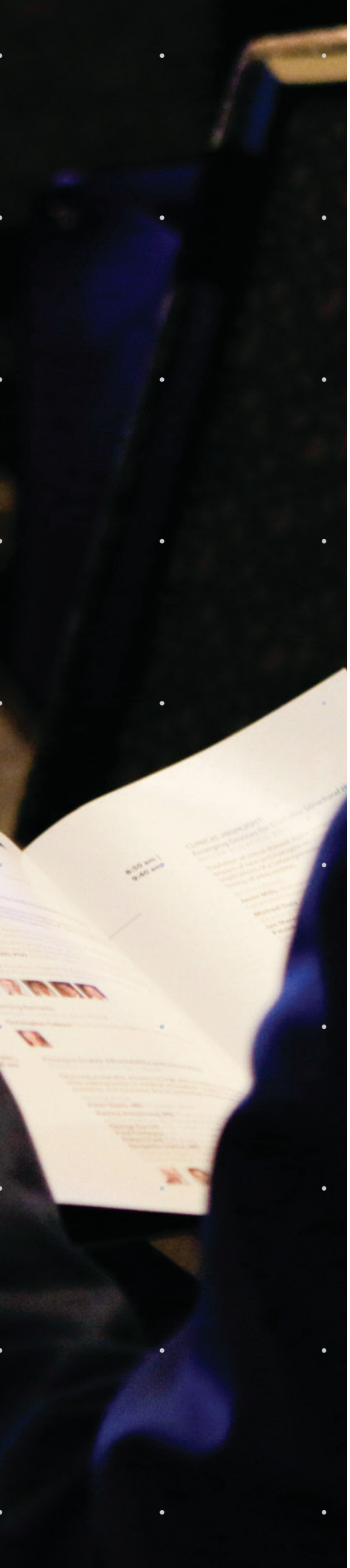
Heidi Rehm, PhD, Chief Laboratory Director, Laboratory for Molecular Medicine, PHS Personalized Medicine; Associate Professor of Pathology, BWH and HMS

Gad Getz, PhD, Director, Bioinformatics Program, Cancer Center and Department of Pathology, MGH; Director, Institute Member, Broad Institute; Associate Professor of Pathology, HMS
Long Le, MD, PhD, Director, Computational Pathology and Director, Technology Development, Center for Integrated Diagnostics, MGH; Assistant Professor, Pathology, HMS
Gabriel Otte, CEO, Freenome
Morten Sogaard, PhD, VP & Global Head, WRD Genome Sciences & Technologies, Pfizer, Inc.
Susan Tousi, SVP, Product Development, Illumina, Inc.







2:00 pm | 2:50 pm

Tangible Returns on the AI Value Proposition

NVIDIA ballroom

Fueled by billions in venture investments, thousands of new companies have emerged worldwide to develop and apply AI in health care. Beyond the US, China's high AI priority has resulted in a vast array of technology driven start-ups. Global investors will discuss which area of machine learning will have the earliest meaningful impact? How do investors critically assess differentiation in such a crowded field? How are investment priorities set among the many divergent categories where AI will take hold?

Moderator
Meg Tirrell, Reporter, CNBC

Joe Cunningham, MD, Managing Director, Santé Ventures
Roger Kitterman, VP, Venture, Innovation, PHS
Amir Nashat, PhD, Partner, Polaris Partners
Vijay Pande, PhD, Partner, Andreessen Horowitz
Lei Yang, PhD, Managing Director, Northern Light Venture Capital






2:50 pm | 3:40 pm

CEO Roundtable: The AI Opportunity as Foundational Change

NVIDIA ballroom

Chief executives share perspectives on the impact of AI on their respective companies and industry segments. How prominently does AI figure into current investment strategies? And how are they measuring return on existing investments in AI? Panelists will be asked to take a position on whether AI is a truly transformational technology.

Moderator
Peter Slavin, MD, President, MGH

Frans van Houten, CEO, Philips
Jeffrey Leiden, MD, PhD, CEO, Vertex
Bernd Montag, PhD, CEO, Siemens Healthineers
Kieran Murphy, CEO, GE Healthcare





3:40 pm | 3:50 pm

Announcement of IDG Awardees

NVIDIA ballroom

Giles Boland, MD, Chair, Department of Radiology, BWH; Philip H. Cook Professor of Radiology, HMS
James Brink, MD, Chief, Department of Radiology, MGH; Juan M. Taveras Professor of Radiology, HMS


3:50 pm | 4:40 pm

Regulating AI in Health Care, Requirements and Challenges

NVIDIA ballroom

The increasing application of AI in health products puts pressure on the historical model of regulation – among them the agile development cycles and continuous learning environment that support AI / machine learning based algorithms. Panelists will discuss the regulatory approaches including the FDA's recently announced Software Precertification pilot program.

Moderator
Michael Jaff, DO, President, NWH, PHS, Professor of Medicine, HMS

Fabien Beckers, PhD, CEO, Arterys
Hilary Malone, PhD, Chief Regulatory Officer, Sanofi
Todd McNitt, VP and GM, Healthcare Digital Solutions, GE Healthcare
Bakul Patel, Associate Director for Digital Health, FDA

4:40 pm | 5:30 pm

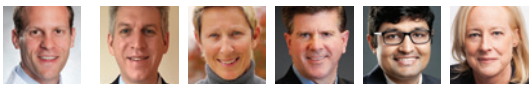
AI in Hospital Environments: The Learning Provider

NVIDIA ballroom

Health systems are actively evaluating strategies to drive efficiency throughout hospital operations. The deployment of AI based technologies to automate organizational tasks (e.g. medical coding / billing, prior authorizations) and optimize resource utilization (e.g. smart scheduling, no-show prediction) promises to help hospital systems adapt to changing macro-economic factors. This panel will discuss the role of AI in hospital operations and assess various approaches to reduce health care administration costs and increase efficiency.

Moderator
Adam Landman, MD, VP and CIO, Brigham Health

Samuel Aronson, Executive Director, IT, Personalized Medicine, PHS
A.G. Breitenstein, Partner, Optum Ventures
Neil de Crescenzo, CEO, Change Healthcare
Mudit Garg, MD, CEO, Qventus
Lisa Maki, Co-Founder, Director, PokitDok



5:30 pm | 6:30 pm

Attendee Networking Reception

GE foyer

[wednesday, april 25th]

All speaker bios are at: **worldmedicalinnovation.org/speakers**

7:00 am | 7:30 am

Continental Breakfast

Nuance foyer

7:30 am | 8:20 am

Reconceiving Medical Devices in an AI Dominated Environment

NVIDIA ballroom

Medical device companies are focused on developing smaller, faster and smarter devices. New technologies will enhance the function of medical devices throughout patient care. Leveraging AI technology to more effectively interact with patients and inform / facilitate outcomes enables smart devices that can learn and improve performance over time. The nature of AI based devices, the challenges inherent in developing them and how such devices can evolve over the next 5 years and beyond will be examined.

Moderator

Pat Fortune, PhD, VP, Market Sectors, Innovation, PHS

Charles Cadieu, PhD, CEO, Bay Labs
Richard Kuntz, MD, SVP, Chief Medical and Scientific Officer, Medtronic
Jonathan Rothberg, PhD, Founder and CEO, Butterfly Network
Jagmeet Singh, MD, PhD, Associate Chief, Cardiology Division, MGH; Professor of Medicine, HMS





8:20 am | 8:50 am

1:1 Fireside Chat: Seema Verma, Administrator, Centers for Medicare and Medicaid Services

NVIDIA ballroom

Moderator

Gregg Meyer, MD, Chief Clinical Officer, PHS; Professor of Medicine, MGH and HMS; '18 Forum Co-Chair

Seema Verma, Administrator, Centers for Medicare and Medicaid Services


8:50 am | 9:20 am

Fireside Chat: Paying for AI: Thinking Strategically About Reimbursement and Acceptance

NVIDIA ballroom

Understanding how AI will be absorbed into a highly defined payment system is crucial to determining the rate and breadth that the technology will play in health care in the next decade. Two senior leaders will share their perspectives on how the technology will be paid for and what mechanisms will be used to arbitrate the scope and timing of those payments.

Moderator

Peter Markell, EVP Administration and Finance, CFO and Treasurer, PHS

Patrick Conway, MD, CEO, BCBS of North Carolina
Eric Murphy, CEO, OptumInsight & Enterprise Growth Officer, Optum



9:20 am | 9:50 am

1:1 Fireside Chat: Vasant Narasimhan, MD, CEO, Novartis

NVIDIA ballroom

Moderator

Gregg Meyer, MD, Chief Clinical Officer, PHS; Professor of Medicine, MGH and HMS

Vasant Narasimhan, MD, CEO, Novartis


9:50 am | 10:40 am

Machine Learning in Image Analysis: A Diagnostician's Best Friend…or Replacement?

NVIDIA ballroom

Diagnostic imaging is among the clinical fields receiving the greatest attention in the early stages of AI in health care. Even in this initial phase it appears that the technology may have profound effects on one of the most resource intensive fields in medicine. Panelists will consider the broad implications as well as topics such as how will role of radiologists evolve? Will AI tools ever become advanced enough to make decisions autonomously within the clinical workflow?

Moderator

Giles Boland, MD, Chair, Department of Radiology, BWH; Philip H. Cook Professor of Radiology, HMS

Andrew Beck, MD, PhD, CEO, PathAI
Eyal Gura, Co-Founder and Chairman, Zebra Medical Vision
Dorin Comaniciu, PhD, VP, Medical Imaging Technology, Siemens Healthineers
Karim Karti, CEO, GE Healthcare Imaging
Constance Lehman, MD, PhD, Chief, Breast Imaging Division, MGH; Professor of Radiology, HMS






10:40 am | 10:50 am

Morning Break

Nuance foyer

10:50 am | 11:20 am

1:1 Fireside Chat: John Kelly, PhD, SVP, Cognitive Solutions and Research, IBM

NVIDIA ballroom

Moderator

James Noga, VP and CIO, PHS

John Kelly, PhD, SVP, Cognitive Solutions and Research, IBM


11:20 am | 12:10 pm

Illuminating the Path to Clinician Empowerment

NVIDIA ballroom

The sacred exchange between patient and clinician at the heart of medicine is increasingly under duress. Increasing clinician burnout is recognized as among the many negative consequences of this trend. Panelists will discuss how AI may improve the quality of the patient encounter, clinician workflow and ultimately clinician quality of life. Panelists will discuss how the new technology can meet these objectives when earlier information based technologies may have exacerbated the challenge.

Moderator

Sree Chaguturu, MD, VP, Population Health Management, PHS

Peter Durlach, SVP, New Business Development, Healthcare Division, Nuance
Dennis Schmuland, MD, Chief Health Strategy Officer, US Health & Life Sciences, Microsoft
Punit Soni, CEO, Robin AI
David Ting, MD, Chief Medical Information Officer, MGPO

12:10 pm | 1:10 pm

Disruptive Dozen: 12 AI Technologies That Will Reinvent Care

NVIDIA ballroom

The culture of innovation throughout Partners HealthCare naturally fosters robust discussions about new "disruptive" technologies and which ones will have the biggest impact on health care. The Disruptive Dozen was created to identify and rank the technologies that Partners faculty feel will break through over the next decade to significantly improve health care. This year, the Disruptive Dozen focuses on relevant advances and opportunities in artificial intelligence (AI).

Moderators

Katherine Andriole, PhD, Director of Research Strategy and Operations, MGH & BWH CCDS; Associate Professor, Radiology, HMS
Keith Dreyer, DO, PhD, Chief Data Science Officer, PHS; Vice Chairman, Radiology, MGH; Associate Professor, Radiology, HMS

1:10 pm | 1:15 pm

Last Look

NVIDIA ballroom

Keith Dreyer, DO, PhD, Chief Data Science Officer, PHS; Vice Chairman, Radiology, MGH; Associate Professor, Radiology, HMS
Anne Klibanski, MD, Chief Academic Officer, PHS; Laurie Carrol Guthart Professor of Medicine, Academic Dean for Partners, HMS
Gregg Meyer, MD, Chief Clinical Officer, PHS; Professor of Medicine, MGH and HMS

Note: Times, speakers, and content are subject to change.

PARTNERS HEALTHCARE INNOVATION

innovation advisory board

The Innovation Advisory Board provides Partners HealthCare with independent guidance on commercial strategy, market potential and collaborative opportunities

Earl (Duke) Collier
President, The Braxton Company
and Innovation Advisory Board Chairman

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Managing Director, Santé Venture

Neil Exter
Partner, Third Rock Ventures

Jean-François Formela, MD
Partner, Atlas Venture

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General Partner, Flare Capital Partners

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Steve Gullans, PhD
Managing Director, Excel Venture Management

Andy Hurd
CEO, MedeAnalytics

Ed Kania
Managing Partner and Chairman,
Flagship Ventures

Keith Kerman, MD
Operating Partner and Senior Advisor,
The Riverside Company

Paul LaViolette
Managing Partner & COO, SV Health Investors and
Innovation Advisory Board Vice-Chairman

Adam Koppel, MD, PhD
Managing Director, Bain Capital Life Sciences Fund

John Lepore, MD
SVP, R&D Pipeline GlaxoSmithKline

Barbara Lubash
Co-Founder and Managing Director,
Versant Ventures Funds

Amir Nashat, PhD
Managing Partner, Polaris

Ben Pless
CEO, Pivotal Design Labs

Russ Richmond, MD

Sue Siegel
Chief Innovation Officer, GE

Steve Weinstein

Innovation Fellows Program

The Innovation Fellows Program enables personnel exchanges between Partners hospitals and participating industry. Biopharmaceutical, device, venture capital, digital health, payors, and consulting firms engage with early career Harvard faculty and trainees appointed at Brigham and Women's Hospital, Massachusetts General Hospital and McLean Hospital. Fellows gain the competencies they need to become future leaders in health care through experiential opportunities. The Innovation Fellows Program matches the interests and qualifications of candidates with objectives of the host organizations.

"Boston Pharmaceuticals is excited to participate as a host for this unique collaboration opportunity between the talented individuals across industry and Partners HealthCare. The Fellows Program uniquely fosters the culture of open innovation that is so important for the future of health care."

Constantine Chinoporos, Chief Business Officer, Boston Pharmaceuticals, Inc

We welcome interested Fellow candidates and potential host organizations to learn more at:
innovation.partners.org/about/special-programs/innovation-fellows-program

PARTNERS HEALTHCARE | INNOVATION

PARTNERS HEALTHCARE INNOVATION

commercialization council

The Commercialization Council represents Partners research community—its innovators, translational investigators and leadership

Paul Anderson, MD, PhD
Chief Academic Officer and SVP of Research, BWH; K. Frank Austen Professor of Medicine, HMS

Jay Austen, MD
Chief, Division of Plastic and Reconstructive Surgery, MGH and HMS

Sree Chaguturu, MD
Vice President, Population Health Management, Partners HealthCare

Maurizio Fava, MD
Director, Division of Clinical Research, MGH Research Institute; Executive Vice Chair, Department of Psychiatry and Executive Director, Clinical Trials Network and Institute, MGH; Slater Family Professor of Psychiatry, HMS

Mason Freeman, MD
Chief, Lipid Metabolism Unit, MGH; Director, Translational Medicine Group, MGH Center for Computational and Integrative Biology and MGH Clinical Research Program; Professor of Medicine, HMS

Ole Isacson, MD
Principal Investigator Harvard Stem Cell Institute, McLean Hospital; Professor of Neurology and Neuroscience, HMS

Christiana Iyasere, MD
Associate Director, Innovation Support Center and Inpatient Clinician Educator Service, MGH

Jeff Karp, PhD
Associate Professor, BWH and HMS; Principal Faculty, Harvard Stem Cell Institute; Affiliate Faculty, Broad Institute and Harvard-MIT Division of Health Sciences and Technology

Adam Landman, MD
Emergency Physician and Chief Medical Information Officer, Health Information Innovation and Integration, BWH

Calum MacRae, MD, PhD
Vice Chair for Scientific Innovation, Department of Medicine, BWH; Chief Executive, One Brave Idea, BWH; Associate Professor of Medicine, HMS

2016 WORLD MEDICAL INNOVATION FORUM

Fireside Chat: Giovanni Caforio, MD, CEO, Bristol-Myers Squibb

Moderator | **Meg Tirrell**
Biotech and Pharma Reporter, CNBC

Giovanni Caforio, MD
CEO, Bristol-Myers Squibb

Orhun Muratoglu, PhD
Alan Gerry Scholar, MGH; Co-Director, Harris Orthopaedics Lab, MGH; Associate Professor, HMS

Harry Orf, PhD
SVP, Research, MassGeneral Research Institute, MGH; Principal Associate, HMS

Dennis Orgill, MD, PhD
Vice Chair, Quality Improvement, Surgery, BWH; Director, BWH Wound Care Center; Professor of Surgery, HMS

Mark Poznansky, MD, PhD
Attending Physician, Infectious Diseases Medicine, MGH; Director, Vaccine and Immunotherapy Center, MGH; Associate Professor of Medicine, HMS

Brian Seed, PhD
Founding Director, Center for Computational and Integrative Biology, MGH; Professor of Genetics, HMS

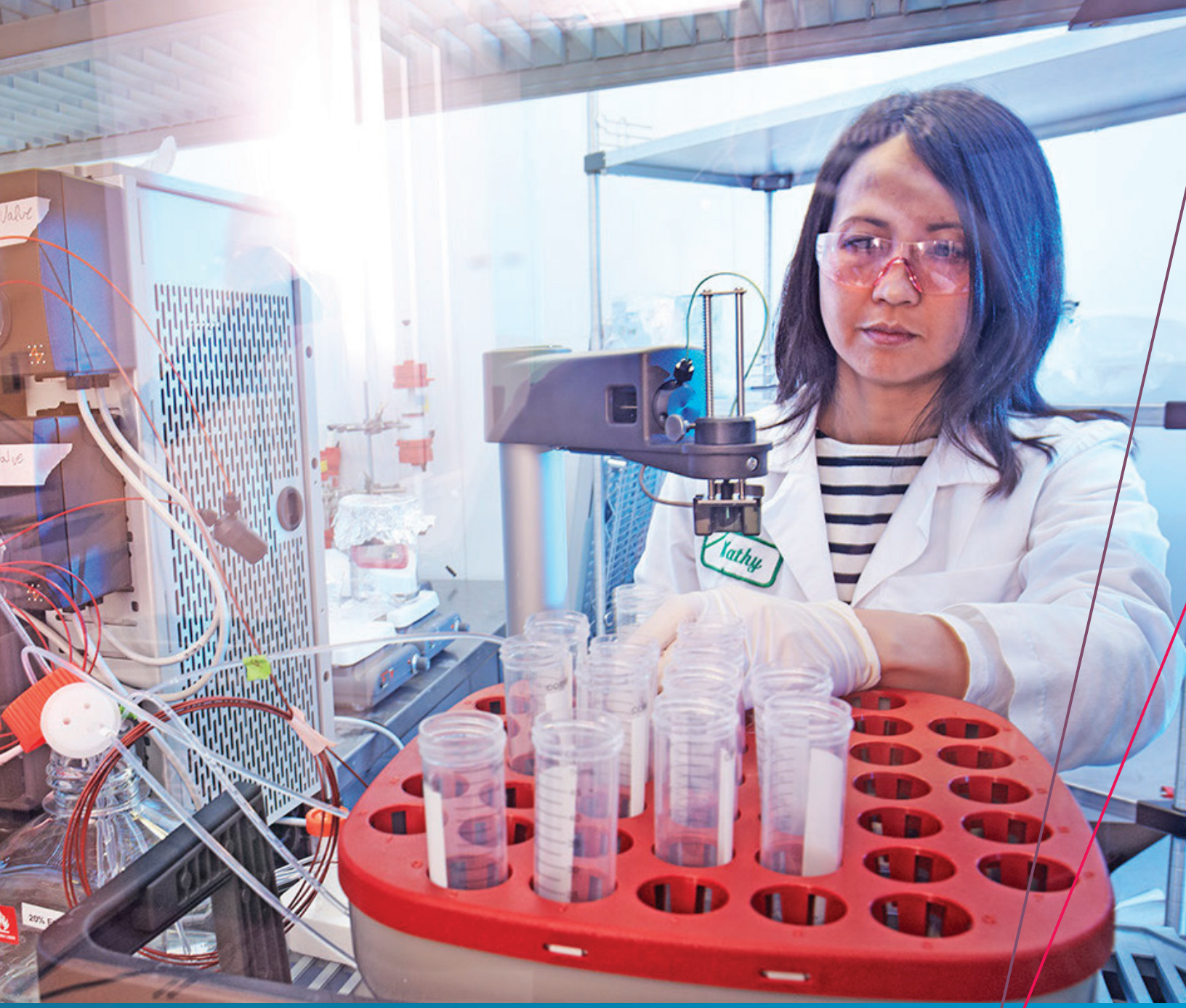
Christine Seidman, MD
Director, Cardiovascular Genetics Center, BWH; Professor of Medicine, HMS

Susan Slaugenhaupt, PhD
Scientific Director, MGH Research Institute; Professor, Neurology, MGH and HMS

Rudolph Tanzi, PhD
Vice-Chair, Neurology, Director, Genetics and Aging Research Unit, MGH; Joseph P. and Rose F. Kennedy Professor of Neurology, HMS

Guillermo Tearney MD, PhD
Mike and Sue Hazard Family Research Scholar, MGH; Professor, Pathology, HMS

Mehmet Toner, PhD
Associate Director, Center for Engineering in Medicine, MGH; Professor of Surgery, HMS; Professor, Biomedical Engineering, Harvard-MIT Division of Health Sciences and Technology



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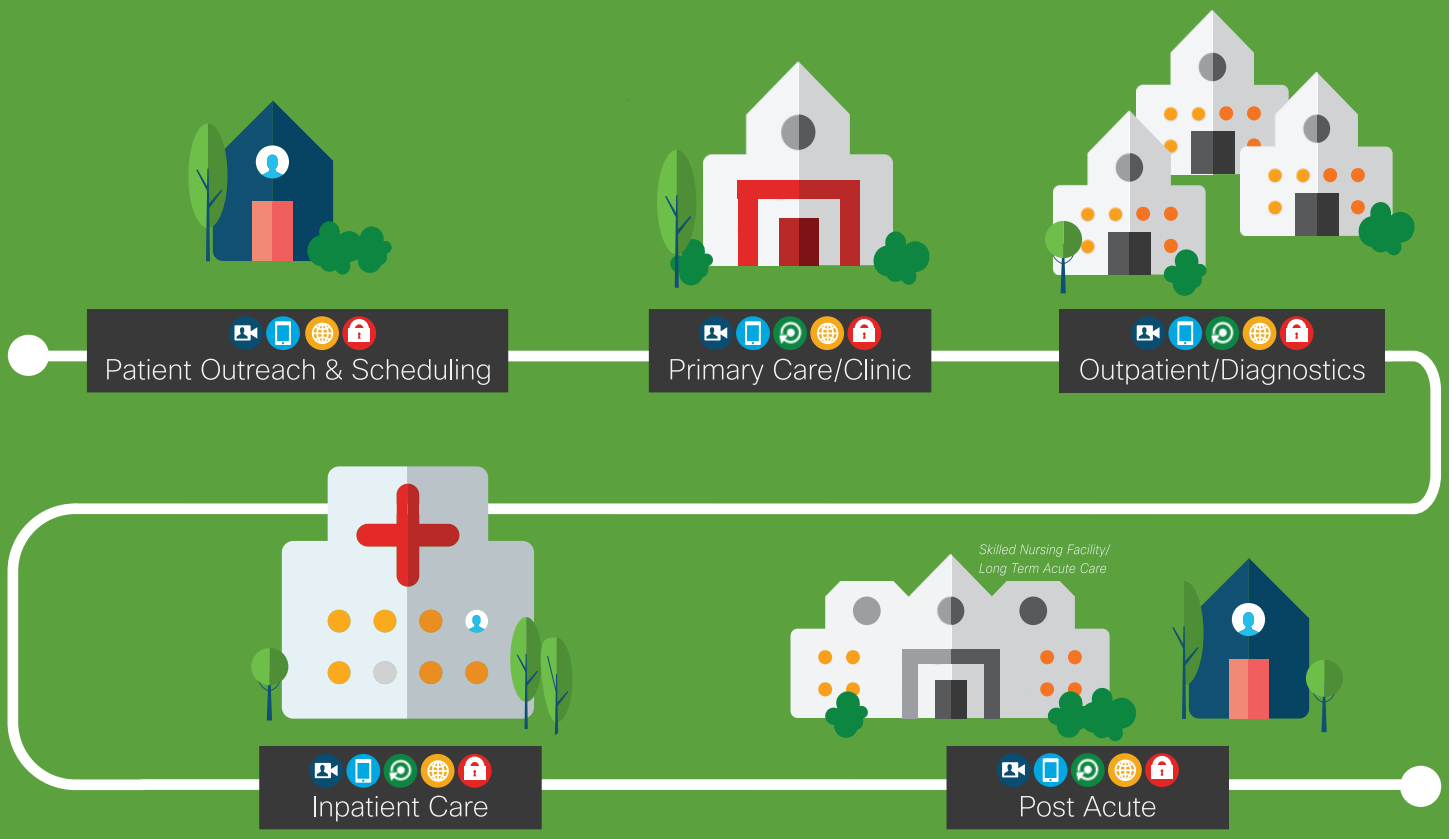

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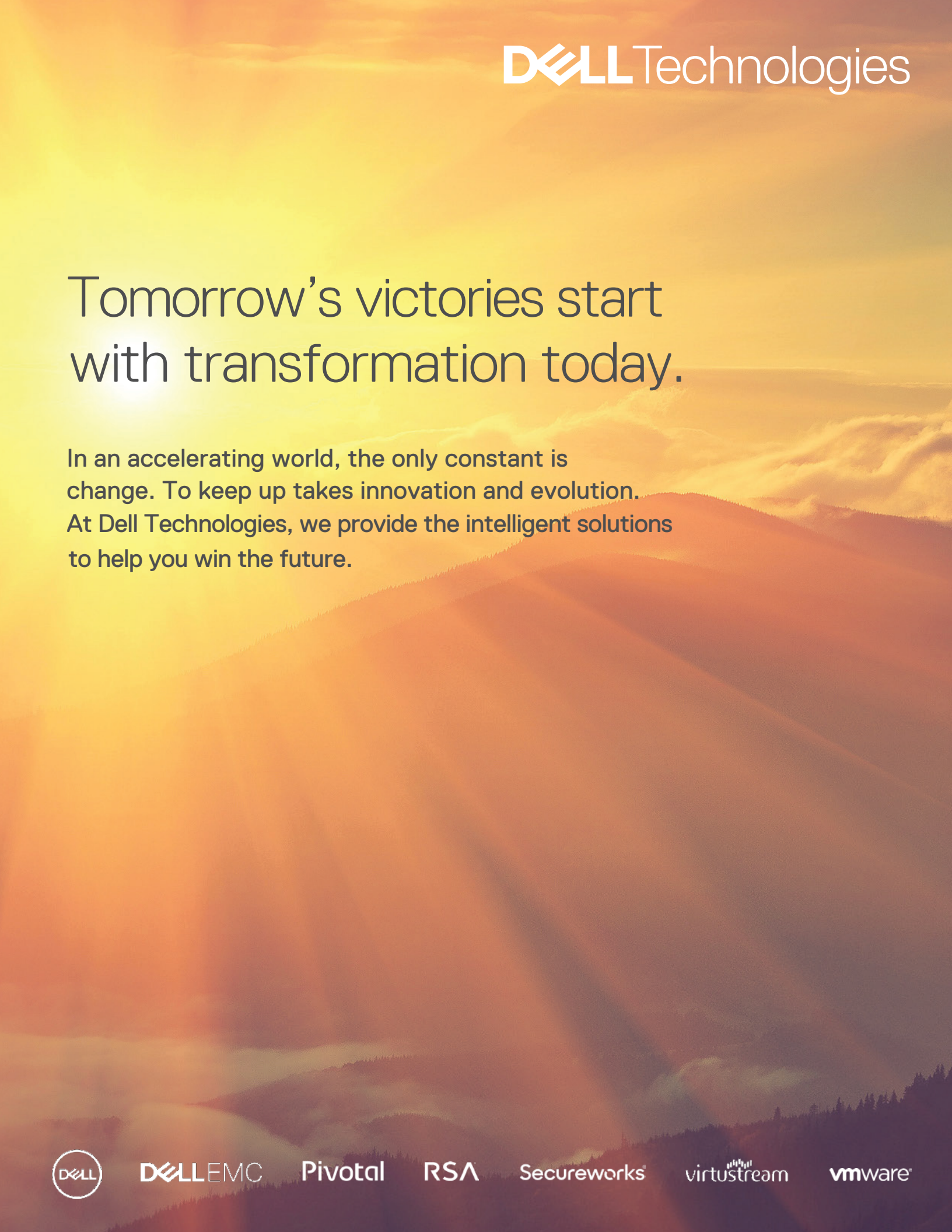
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*JAMIA, Volume 24, Issue 1, 1 January 2017

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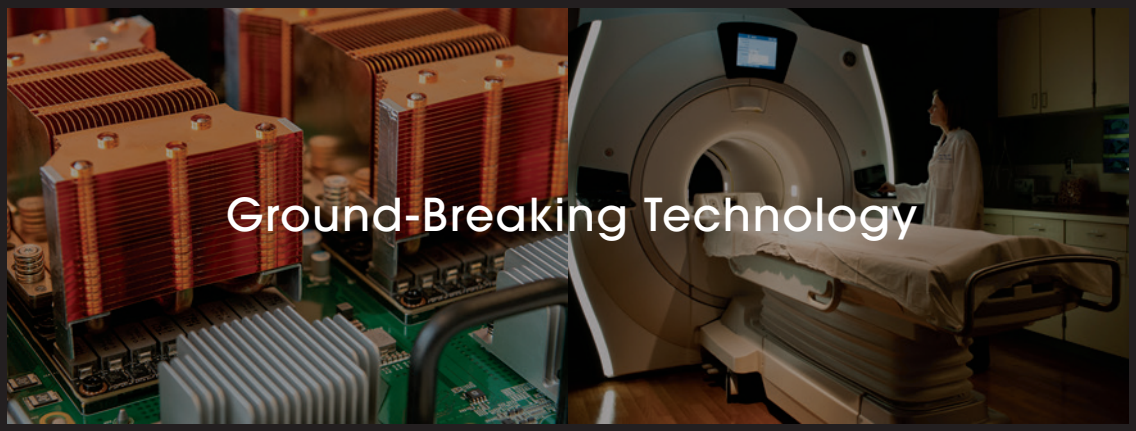

The Center for Clinical Data Science is partnered with GE, NVIDIA, and Nuance to reshape healthcare.

Machine learning is on the verge of transforming healthcare, and the Center for Clinical Data Science is at the forefront of this revolution.

CCDS, GE, NVIDIA, and NUANCE are working together to create the future of healthcare.

Visit us at our demo booth on the 3rd floor of the World Medical Innovation Forum.

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We are inspired by our client Partners HealthCare and the **World Medical Innovation Forum**.

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April 23 - June 29
Online Registration

July 2 - August 19
Practice on Platform

September 12 - October 10
Competition

Prize Awards

First - $15,000

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About Our Challenge

Partners HealthCare is hosting a “Biobank Disease Challenge,” an artificial intelligence and machine learning data analytics competition and it is open to researchers across the United States. The goal of this competition is to enable major translational data science players to leverage the Partners HealthCare Biobank in order to develop better phenotypic algorithms for clinical and basic research.

Registration will be open on April 23 and close on June 29, 2018 to 50 teams. Prize money will be awarded to the top 3 teams.

To learn more and get up to date information,
visit us at http://www.partners.org/biobankchallenge

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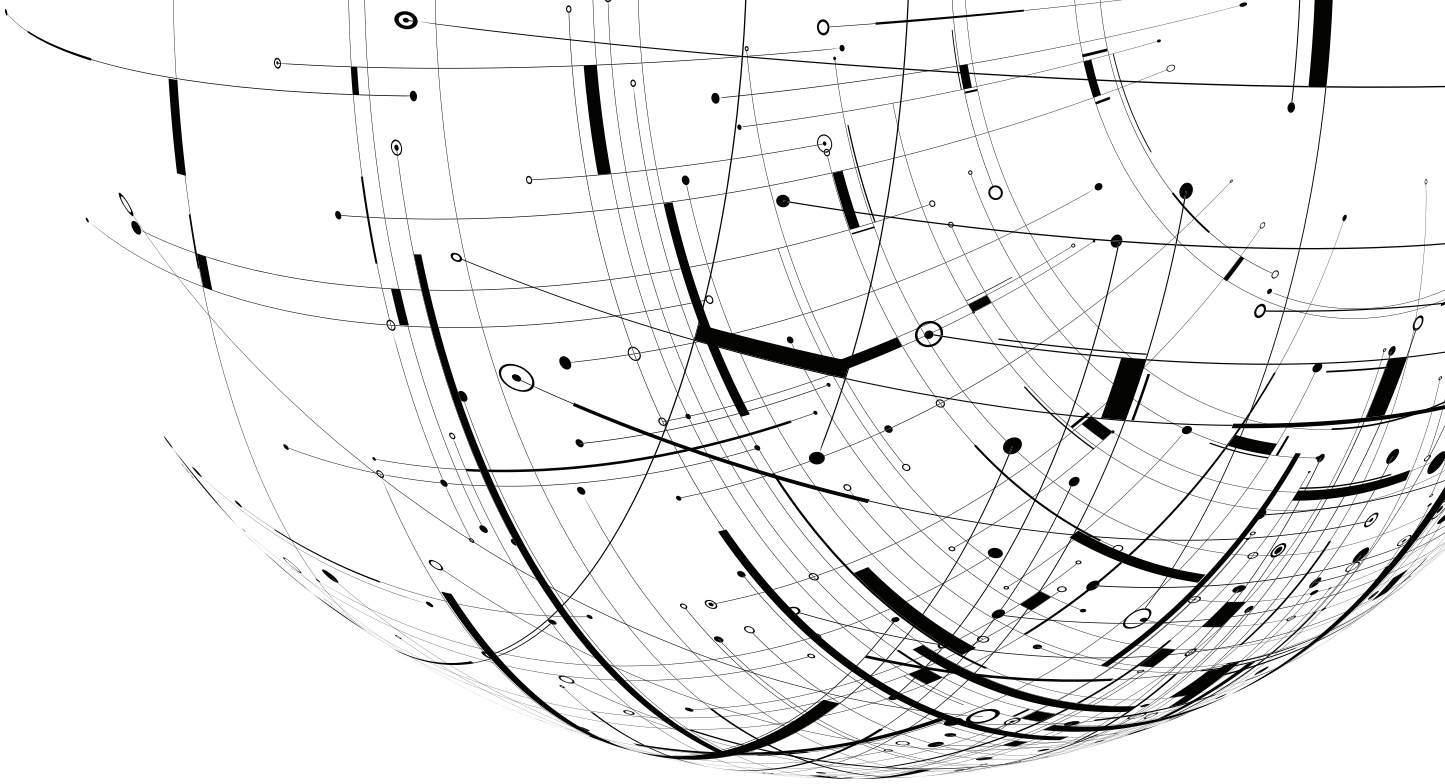

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Partners HealthCare International® (PHI) is the global advisory services arm of Partners HealthCare and a unit of Partners Innovation. Over the past two decades, PHI has partnered with institutions and health care systems in more than 40 countries to drive transformative health care delivery systems.

To learn more, visit: **international.partners.org**

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M-Z

2018 WORLD MEDICAL INNOVATION FORUM

planning committee

A special thanks to Innovation's Planning Committee and Event Team for their unstinting commitment over the last 18 months to create the 2018 World Medical Innovation Forum.

planning committee

Christopher Coburn
Chief Innovation Officer, Partners HealthCare
President, Partners HealthCare International

Katherine Andriole, PhD
Director of Research Strategy and Operations, MGH & BWH CCDS; Associate Professor, Radiology, HMS

Mike Band
Associate Director, Business Development, Innovation, PHS

Trung Do
Vice President, Business Development, Innovation, PHS

Richard Fountain
Director, Strategic Marketing, Innovation, PHS

Michelle Grdina
Program Manager, World Medical Innovation Forum, Innovation, PHS

Madeleine Halle
Marketing and Events Coordinator, Innovation, PHS

Beth Mollineaux
General Manager, Strategic Marketing and Communications, Innovation, PHS

event team

Biomedical Communications
Nicole Davis, PhD

Healthcare Leadership Council
Michael Freeman

Jamie Belkin Events
Jamie Belkin
Anne Kallevig
Jerry Mizer
Amy Pappas
Lisa Savin

Mueller Design
Eric Castle
Greg Mueller

Gerald Secor Couzens
1949-2017

Last May, just three weeks after the conclusion of our 2017 Cardiovascular World Forum, Gerald Secor Couzens, a founding member of the Forum planning team, died suddenly at his home in Woodstock, New York from cardiovascular disease. Gerald was beloved for his breadth of knowledge, creativity, and the unmatched enthusiasm he brought to every meeting, call or conversation – no matter the time of day or topic. He was passionately anticipating this AI Forum and played a key role in its selection.

In the year since Gerald's passing, we reflect on the poignancy of hosting a global conference in 2017 on breakthroughs in treating cardiovascular disease and to lose a cherished colleague to it within the month. His tragic death reminds and motivates each of us as to why we are so strongly committed to innovation. It is a shared appreciation of the relentless march of disease and the prospect to collectively slow and ultimately prevent its consequences that drives all of us — clinician, investor, entrepreneur, scientist and executive — to a common goal.

Join Us in 2019.

The 2019 World Medical Innovation Forum will focus on the advancements and opportunities in neuroscience and related information technology. The 2019 event will bring together industry-leading CEOs, our Harvard faculty, investors, and deal-makers to share perspectives on how the clinical, diagnostic, and physiological aspects of neurology are transforming patient care. International leaders will be joined by over 1,300 registrants from the senior ranks of the biotechnology, IT, pharmaceutical, government, and health care investment communities.

Registration is now open.

Special discounted pricing is available until May 31st.

Visit the registration section of the website or our Forum registration desk to take advantage of this special discount.

www.worldmedicalinnovation.org

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2ND ANNUAL

Innovator's Recognition Dinner

Keynote Speaker: Sue Siegel, Chief Innovation Officer, GE

Excellence in Innovation

Celebrating the accomplishments of the 650 Partners-wide investigators and their discoveries in 2017.

The 2nd Annual Innovator's Dinner is an invitation-only event on Wednesday, April 25th honoring investigators from the Partners HealthCare community who submitted inventions in calendar year 2017. We commend these inventors for committing to their unique inspirations to better patient care.

The dinner will feature a special ceremony for the Peter K. Ranney Innovation Award honoring a single BWH and single MGH First Look presenter who embodies the innovative, entrepreneurial and visionary spirit that the World Medical Innovation Forum.

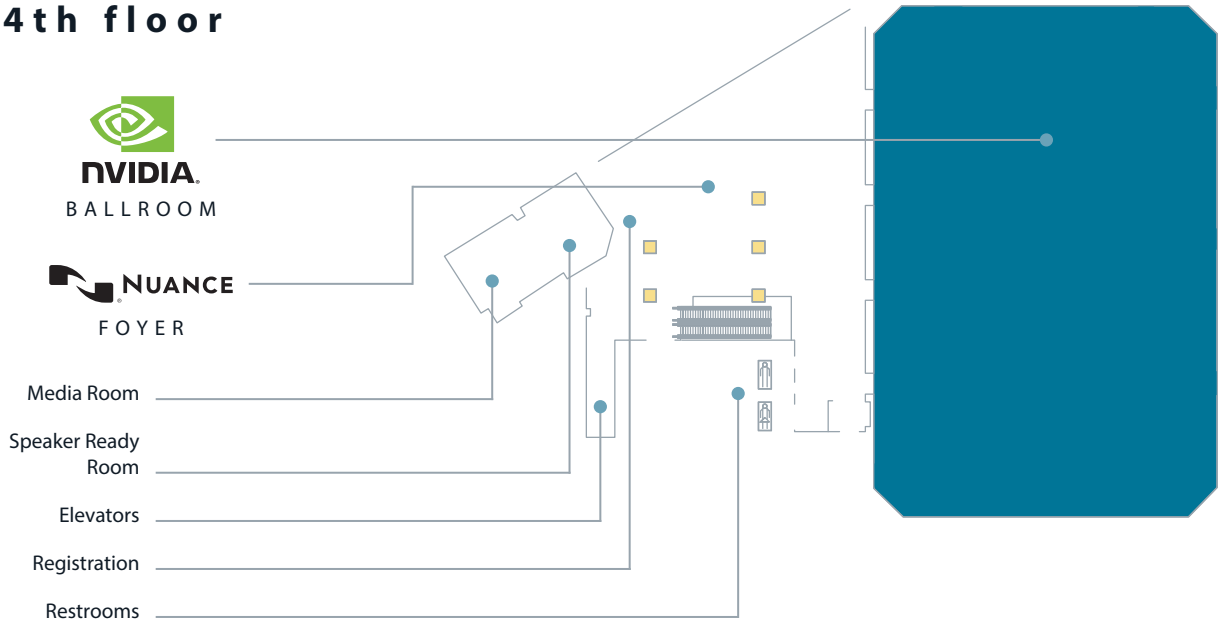
PARTNERS HEALTHCARE | INNOVATION

maps

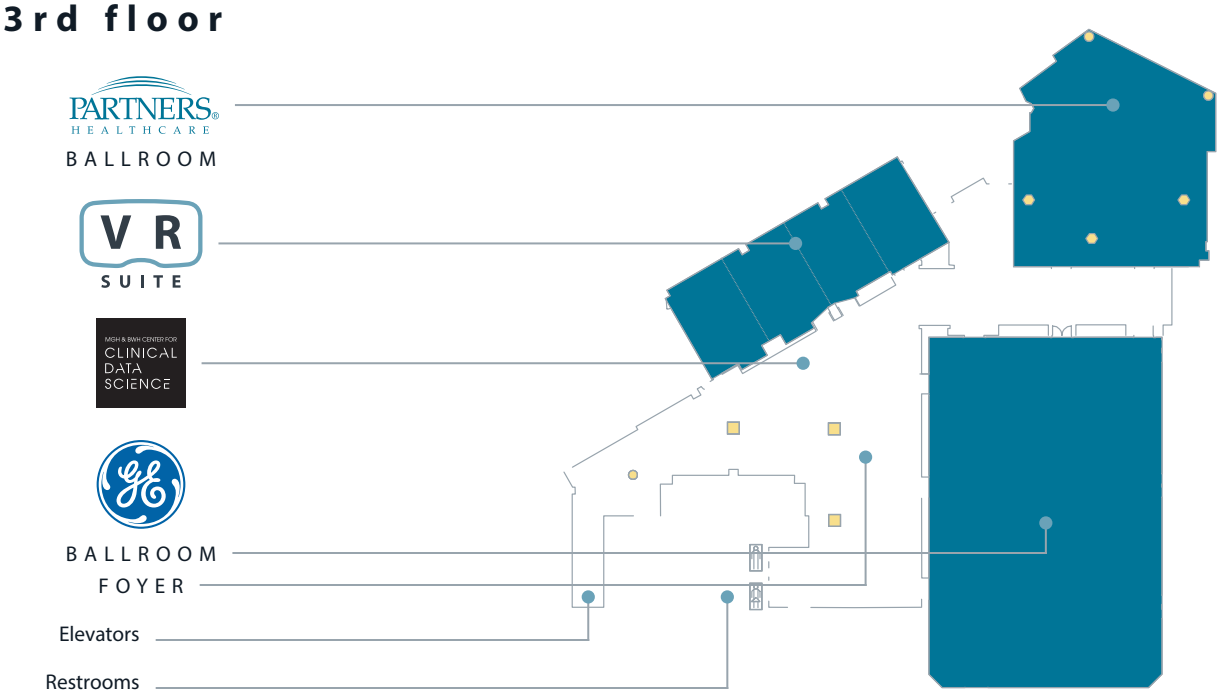
Registration and information is located in the Nuance Foyer

The Westin Copley Place, Boston
10 Huntington Avenue, Boston, MA, 02116

4th floor



3rd floor



Note: Locations of exhibits are subject to change.

PARTNERS HEALTHCARE | INNOVATION

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