PARTNERS HEALTHCARE | FOUNDED BY BRIGHAM AND WOMEN'S HOSPITAL AND MASSACHUSETTS GENERAL HOSPITAL

WORLD MEDICAL INNOVATION FORUM

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PARTNERS HEALTHCARE ANNOUNCES "DISRUPTIVE DOZEN" TECHNOLOGIES FOR 2015 AT THE WORLD MEDICAL INNOVATION FORUM

Inaugural List Features 12 Innovative Fields with the Potential to Revolutionize Neurocare Over the Next Decade

BOSTON — April 29, 2015 — Partners HealthCare today announced its selections for the first annual "Disruptive Dozen," the 12 emerging technologies with the potential to revolutionize neurological and psychiatric care over the next decade. The "Disruptive Dozen" was developed as a way to highlight the innovations with the greatest potential to impact care in a specific area of medicine. The technologies were featured as part of the World Medical Innovation Forum™, an annual collaborative innovation event held in Boston to examine the state of health care and innovation in a chosen medical discipline. The inaugural Forum, which took place April 27-29, 2015, was focused on neuroscience.

"The idea for the 'Disruptive Dozen' grew out of Partners HealthCare's commitment to innovation and state-of-the-art medical technologies as a way of ensuring the best medical care for its patients," said David Silbersweig, M.D., Chairman, Psychiatry, Brigham and Women's Hospital, Stanley Cobb Professor of Psychiatry, Harvard Medical School, and Co-chair of the "Disruptive Dozen" selection committee. "We hope that the selected technologies will provide physicians and patients with a renewed sense of optimism about the future diagnosis and treatment of neurological and psychiatric diseases, as well as encourage future medical innovation."

The "Disruptive Dozen" were chosen via a rigorous nomination and selection process during which more than 50 Partners HealthCare neuroscience experts were interviewed to elicit nearly 100 nominations. A select panel of faculty then ranked the finalists through a defined group process. The selected technologies are as follows:

1. **EARLY DIAGNOSIS AND TREATMENT OF ALZHEIMER'S DISEASE**
   A variety of therapies for the early diagnosis and treatment of Alzheimer's disease are being developed that have the potential to detect and treat Alzheimer's long before symptoms manifest, including "Alzheimer's-in-a-Dish," experimental drugs to reduce amyloid in the brain, and blood tests to detect biomarkers. Given the expected rise in Alzheimer's cases in the years ahead, early intervention will provide the greatest chance of halting or reversing disease progression.

2. **STEM CELL THERAPY TO REPAIR AND REPLENISH THE BRAIN**
   The use of stem cells as a form of replacement or protective therapy for neurodegenerative diseases represents a promising treatment opportunity for Parkinson's disease, multiple sclerosis, amyotrophic lateral sclerosis (ALS) and Alzheimer's disease, all of which currently lack effective therapies.

3. **SMART BRAIN PROSTHETICS**
   Implantable wireless brain devices are being tested as a means of relieving depression, post-traumatic stress disorder, bipolar disorder and traumatic brain injury, as well as restoring movement in those with severe physical limitations. These devices represent a trend towards neural engineering, which seeks to manipulate brain signals in order to treat neurological diseases and impairments.

4. **RAPID INTERVENTION FOR PSYCHIATRIC DISORDERS**
   A variety of new therapies demonstrate promise for the treatment of severe resistant depression, including ketamine, medical gases and low-field magnetic stimulation therapy. These therapies present an opportunity for rapid stabilization and treatment for some of the most common and serious psychiatric disorders.

5. **THE PROMISE OF FOCUSED ULTRASOUND**
   Transcranial MRI-guided focused ultrasound and focused ultrasound in conjunction with microbubbles allow physicians to target tissues deep within the body through the use of sound waves, as opposed to incisions and radiation. Focused ultrasound has the ability to revolutionize the treatment of conditions such as brain cancer and Alzheimer's through its potential for greater precision and quicker patient recovery.

6. **THE PROMISE OF BRAIN BIOMARKERS**
   Advanced diagnostic equipment is allowing researchers to identify biomarkers for various neurodegenerative and psychiatric disorders in blood, spinal fluid and brain-imaging patterns. The identification of biomarkers for these diseases will ensure the development of more effective diagnostic and treatment approaches in the future.

7. **NEW ASPECTS OF GENE THERAPY**
   Several clinical trials have demonstrated promising results with regard to the efficacy of gene therapy for neurological conditions, raising the likelihood of its adoption in the clinic. Gene therapy applications could be used to replace or "turn off" disease-causing genes for a wide range of central nervous system (CNS) diseases, including Parkinson's disease, ALS and epilepsy.

8. **MOLECULAR INTERVENTION USING MINIMALLY INVASIVE TECHNOLOGY**
   Sophisticated imaging systems such as PET, CT and MRI scans, ultrasound, and fluoroscopy will one day allow neurosurgeons to noninvasively locate surgical targets and distinguish between malignant and benign tissue, which will allow for minimally invasive, image-guided neurosurgery on the brain. Traditional brain surgery techniques

will be replaced by molecular interventions ranging from alterations in brain circuitry to DNA modifications and the introduction of modified viruses.

9. **HEALING THE BRAIN WITH NEUROMODULATION**
   Non-pharmaceutical, minimally invasive treatments ranging from pulses of electricity to light are being developed for the treatment of a wide range of neurological and psychiatric diseases. Electroceuticals—low-powered electrical devices placed on the skin or implanted—could be used to treat diseases ranging from depression and mood disorders to Parkinson's disease, while low-current transcranial (through the skull) direct-current stimulation (tDCS) could be used to address chronic pain, depression and schizophrenia.

10. **IMMUNE CHECKPOINT INHIBITORS FOR BRAIN CANCER**
    Intravenous immunomodulators, or checkpoint inhibitors, block the action of PD-I and other proteins that brain cancer cells use to escape recognition by the immune system, facilitating the body's immune response against the cancer cells. Given the poor prognosis for patients with glioblastoma and other forms of brain cancer, these immunotherapies could translate into life-saving treatments in the near future.

11. **NEUROIMAGING FOR NEURODEGENERATIVE AND PSYCHIATRIC DISORDERS**
    Advanced neuroimaging techniques continue to build upon existing knowledge about brain functioning and neurological and psychiatric disorders. Research initiatives such as the Human Brain Project and Brain Initiative promise to yield valuable insights into the cause and progression of these diseases, as well as new opportunities for treatment.

12. **DIAGNOSING AND TREATING NEURODEGENERATIVE DISEASES THROUGH THE MICROBIOME**
    Researchers are studying the 3.3 million genes of the microbiome to identify links between gut microflora and psychiatric and neurological diseases like multiple sclerosis and Parkinson's disease.

Visit the World Medical Innovation Forum website, here, to learn more about this year's "Disruptive Dozen" selections.

About the World Medical Innovation Forum

The World Medical Innovation Forum is a global gathering of more than 1,000 senior health care leaders hosted by Partners HealthCare in the heart of Boston. It was established to respond to the intensifying transformation of health care and its impact on innovation. The Forum is rooted in the belief that no matter the magnitude of that change, the center of health care needs to be a shared, fundamental commitment to collaborative innovation and its ability to improve patient lives.

Each year, experts from throughout health care will assess the most compelling advances in technology, care, research and unmet needs in a key area of care – the first year's focus is on the neurosciences (2015), year two is cancer (2016) and year three is cardiovascular (2017). Leading

sponsors in 2015 include Biogen, Novartis, Amgen, Boston Scientific, General Electric and MacDougall Biomedical Communications. AstraZeneca, Genzyme, HealthXL, the Massachusetts Life Sciences Center, Polaris Partners, Vertex and Yorn are also sponsors.

For more information please go to www.worldmedicalinnovation.org.

About Partners HealthCare
Partners HealthCare is an integrated health system founded by Brigham and Women's Hospital and Massachusetts General Hospital. In addition to its two academic medical centers, the Partners system includes community and specialty hospitals, a managed care organization, community health centers, a physician network, home health and long-term care services, and other health-related entities. Partners HealthCare is one of the nation's leading biomedical research organizations and a principal teaching affiliate of Harvard Medical School. Partners HealthCare is a non-profit organization.

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