63rd Meeting of the National Cancer Institute (NCI) Director's Consumer Liaison Group (DCLG)

Hyatt Regency Bethesda
One Bethesda Metro Center
Bethesda, Maryland
December 2, 2013

Members Present

Mr. Max Wallace, *Chair*
Dr. Jeff Allen
Mr. David Arons
Dr. Adam Clark
Ms. Andrea Ferris
Ms. Joya Delgado Harris
Mr. Jeff Kaufman
Dr. Michelle McMurry-Heath
Mr. Jon Retzlaff
Mr. Josh Sommer

Speakers

Amy Bulman	Acting Director, Office of Advocacy Relations (OAR), NCI
Max Wallace	Chair, Director's Consumer Liaison Group
Paulette Gray, Ph.D.	Director, Division of Extramural Activities (DEA), NCI
George Komatsoulis, Ph.D.	Deputy Director, Center for Biomedical Informatics and Information Technology, NCI
Mark Guyer, Ph.D.	Deputy Director, National Human Genome Research Institute (NHGRI), National Institutes of Health (NIH)
Brad Margus	Chief Executive Officer, Genome Bridge
Fadesola Adetosoye	Public Affairs Manager, Office of the National Coordinator for Health Information Technology, Department of Health and Human Services
Peter Embi, M.D.	Associate Professor of Biomedical Informatics and Internal Medicine (Rheumatology), Vice-Chair, Department of Biomedical Informatics, The Ohio State University

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Opening Remarks
Ms. Amy Bulman and Mr. Max Wallace

- Ms. Bulman and Mr. Wallace thanked participants for their flexibility in attending this meeting, which was rescheduled after the government shutdown.

- The focus of this meeting is Big Data and optimizing technological advances to improve research and clinical care.

- The DCLG hopes to bring on board three new members: Martha Gaines, J.D., LLM, from the University of Wisconsin Law School; Mila McCurrach of the Lustgarten Foundation; and Regina Vidaver, Ph.D., of the National Lung Cancer Partnership. They are not present at this meeting. Some slots on the DCLG remain open.

Division of Extramural Activities (DEA) Reorganization Update
Dr. Paulette Gray

- The DEA will abolish its Special Review and Logistics Branch and replace it with two new branches, one for technology and the other for special review. The reorganization is expected to streamline operations and will not involve additional personnel or expenses.

The Future of Big Data: Initiatives of the NIH and the NCI

NCI's Cancer Genomics Cloud Pilots: Computational Technology to Support Precision Medicine
Dr. George Komatsoulis

- Typically, it is not a single change that makes a cell cancerous, but multiple changes of high complexity. A series of genetic changes are required to induce the phenotypic changes that appear in cancer. This enormous complexity has substantial implications for treatment.

- NCI has recognized that a new paradigm is needed for continued advances in treating cancer. There will be no single cure for cancer. Rather, there is a need to find a set of molecular changes that will enable researchers to find cures for hundreds and thousands of cancers.

- It is imperative to bring precision medicine to cancer, to take large numbers of patients and large numbers of samples to figure out molecular changes, determine how they respond to treatment, and ultimately discover how to design the best treatments.

- This type of precision medicine necessitates support of the collection, storage, and analysis of a wide range of data types at a substantially larger scale than has been done in the past, as well as the development of a new generation computational infrastructure.

- The current model of computational analysis has limitations for large datasets and is under a great deal of stress. The size of the Cancer Genomics Hub (CGHub) has grown exponentially, with increasingly steep growth predicted for the next year. Data also are becoming multidimensional with data types that include not just DNA sequencing, but also epigenetics, laboratory data, imaging data, and more.

- NCI grantees have indicated that a new information technology (IT) infrastructure should focus on data access, computing capacity, data interoperability, training, usability, and governance.

- NCI will issue a broad agency announcement (BAA) for investigators to develop pilot biomedical clouds, which will consist of co-located storage preloaded with NCI data and feature secure computational and analytic capacity. The goal of the BAA is to attract interest from both industry and academia.

- Three pilot designs will be selected. The pilot clouds must be extensible and interoperable as well as scalable and sustainable. Clouds must be designed to support up to 100-fold expansion in data size and usage. Community-based testing will determine which systems community members prefer using.

- Dr. Komatsoulis estimated that NCI will need a 10–50 petabyte (PB) cloud of preloaded data over upcoming years, but for now it will support 3 pilot scale clouds of 2.5 PB each.

- Potential problems arise in interpreting and aggregating data, which can be difficult or impossible with many potential variants.

- Dr. Komatsoulis concluded that NCI wants input from the DCLG and all involved with the Institute about what the priorities for the cloud pilots should be. The comment period will close around December 10, 2013, and the BAA will be released at that point.

Discussion Highlights

- The end goal of the cloud pilots is to maximize value of NCI data by making it available to people in the cancer research community, and to democratize the data (i.e., make it available and affordable to all).

- The complexities of disease, particularly cancer, are greater than the complexity of IT.

- The National Cancer Informatics Program (NCIP) is working on how data will get to the cloud.

NIH's Big Data to Knowledge (BD2K) Program
Dr. Mark Guyer

- The current bottleneck in turning Big Data to knowledge is figuring out how to use the data.

- The cost of DNA sequencing has decreased by a million-fold in the past 20 years. This presents both enormous opportunities and challenges. A major challenge is the many different types of data that are used including genomics, other "omics," imaging, phenotypic, exposure, and clinical data.

- Big Data exceeds the capacity of unaided human cognition for its comprehension, and it strains current technology capacity. Sources of Big Data include a small number of groups that produce very large amounts of data, individual investigators (or clinical sources) who produce large datasets that could also be broadly useful by the research community at large, and sources that produce small datasets whose value can be amplified by aggregating or integrating them with other data.

- The goal of the Big Data to Knowledge (BD2K) Initiative is to enable answering biological questions with data available in public resources.

- About 2 years ago, Dr. Francis Collins, NIH director, organized the NIH Data and Informatics Working Group (DIWG). DIWG identified four overarching themes:
    - Importance of capitalizing on technology advances now
    - Need for cultural change to emphasize data sharing among institutes and centers (ICs)
    - Need to develop new opportunities for data sharing, analysis, and integration
    - Long-term NIH commitment with sustainable funding

- Specific problems to be solved:
    - Locating and accessing data
    - Extending policies for data sharing
    - Organizing, managing, and processing biomedical Big Data
    - Developing new analysis methods
    - Training researchers to use biomedical Big Data

- To address the challenges of Big Data, NIH has created the new position of associate director for data science, an internal Scientific Data Council, and BD2K. The BD2K Initiative is a new program that aims to be catalytic and synergistic with the overarching goal to enable a quantum leap in the ability of the biomedical research enterprise to maximize the value of the growing volume and complexity of biomedical data by the end of this decade.

- BD2K will promote data sharing and ensure that data are available to researchers, work to promote new technology for Big Data, train Big Data informaticians, and establish large Centers of Excellence for biomedical Big Data.

- BD2K funding begins this year, FY2014. The sequester significantly affected the budget and the current projections are $27 million for FY2014 (revised from $64 million), $80 million for FY2015 (revised from $96 million), and $99 million for FY2016 (revised from $109 million). The program uses a novel funding model with early front-loading contributions by the NIH Common Fund and increasing IC contributions each year.

- BD2K's first Funding Opportunity Announcement (FOA) is to support six Centers for Excellence for Big Data computing in the biomedical sciences. Applications were received by November 20, 2013 and awards will be made in summer 2014.

- Biomedical research is undergoing a major change because of Big Data. This is a trans-NIH problem needing trans-NIH solutions, and the solutions include multifaceted cultural changes.

Making Sure the World Can Share its Genomic Data

Mr. Brad Margus

- Mr. Margus was motivated to leave a successful career as a businessman and become involved with genomics because of the diagnosis of two of his three sons with ataxia-telangiectasia (A-T), a rare, obscure, orphan disease caused by a mutation of the ataxia telangiectasia mutated (ATM) gene, a single base deletion in exon 33, which leads to cerebellar atrophy.

- Children with A-T are normal until 2 years of age but then become "wobbly" and are usually in a wheelchair by age 10. They lose control of their eyes and fine motor control. They have trouble with speech and swallowing, and develop tremors. They develop neurodegeneration, immune defects, cancers, sterility, and radiosensitivity and are susceptible to sinusitis, bronchitis, and pneumonia. Lung problems are the most common cause of death. Most die by their 20s. Only about 400 children in the U.S. have this disease.

- Mr. Margus began the A-T Children's Project, a foundation to improve the lives of children with A-T. It is difficult to raise funds for such a rare disease, but a number of grassroots fundraising events have been successful. The project raised about $2 million per year and supports research grants, conferences, family support, tissue banks, animal resources, databases, a clinical center, and social media outlets. The efforts have raised the median age of death from 16 to 23 years of age.

- A-T researchers have applied multiple techniques and tools to study the condition. Critical questions are why children with A-T lose brain cells, how it can be stopped, and whether it can be repaired. Many hypotheses and potential treatments are being explored. Since an early paper in 1995, the scientific understandings have become increasingly complex.

- Mr. Margus said his dream is that every scientist in every field will think about whether his or her approach is applicable to A-T.

- In 2000, Mr. Margus started Perlegen Sciences, which uses DNA probes to identify single-nucleotide polymorphism (SNPs). A primary goal is to develop drugs for genetic targets.

- In 2009, Mr. Margus left Perlegen and started another company, Envoy Therapeutics, which focuses on the need for cheaper sequencing, more samples, and larger effect sizes. Envoy is advancing its proprietary bacTRAP technology for labeling and extracting protein-making components of certain cells, particularly in the brain. In 2012, Takeda Pharmaceutical Company, Ltd., a Japanese company and one of the original investors in Envoy, purchased Envoy.

- In the 13 years since Mr. Margus entered the biotech business, the cost of sequencing a person's complete genome has fallen nearly a million-fold, setting the stage for a revolution in biology and medicine. Reading the entire sequence of our genomes has become practical, and this presents an opportunity to learn more about targeted cancer therapies and study rare, inherited diseases.

- An individual's genetic information becomes clinically meaningful only when interpreted in the context of large collections of genetic data from other people. But data storage, analysis, interpretation, and sharing lag behind the ability to collect genomic information.

- Mr. Margus proposed two possible future paths. One, like the Internet, would create a consortium like the World Wide Web that would enable exchange of information while protecting privacy. This approach would propel an explosion of innovation, accelerate medical progress, and create new businesses and new industries. A contrasting path would be analogous to electronic medical records, with data forever locked into incompatible systems and silos and no ability to share and compare information.

- Quick action is required to determine which path to take, or the opportunity will be missed.

- Mr. Margus and his associates have created a two part solution: 1) a global alliance of stakeholders to establish technology, security, and privacy standards and maintain the interoperability of technology platform standards for managing and sharing genomic data in clinical samples and 2) a collection of new or existing organizations that will build secure, cloud-based open technology platforms for data processing and sharing.

- To date, 112 health care, research, and disease advocacy organizations in 17 countries have agreed to participate in the global alliance, which is still seeking a name.

- In spring 2013, Mr. Margus began Genome Bridge, a new, entrepreneurial, nonprofit organization that will enable researchers and clinicians worldwide to apply specialized tools to aggregated genomic data to dramatically improve health care. Genome Bridge is

building a cloud-based platform to store, process, analyze, and interpret genomic data. Genome Bridge will offer an environment for sharing data between communities of researchers, clinicians, patients, and biopharmaceutical companies. Genome Bridge will not develop tools itself but will develop an infrastructure to use tools.

- The Genome Bridge project dashboard will provide a summary of project quality control, with randomized internal sample identification, quality control status, processing progress, germline or cancer, and sharing settings. Users who upload sequences will be able to compare the quality of their sequencing to the work of others. Potential users include clinicians, researchers, patient groups, and consumer genetics companies.

- Currently, Genome Bridge is being incubated within the Broad Institute of Harvard and M.I.T. as a nonprofit spinoff. Genome Bridge is now analyzing all cancer datasets in the world in one month—approximately 18,000 exomes, 3 PB of data, and 3.5 million compute hours.

- Genome Bridge's biggest challenge has been funding. It has been difficult to identify NIH funding mechanisms that fit the Genome Bridge plan.

Discussion Highlights

- The concept behind the clouds is to provide biologists access to computational systems biology work in order to obtain scientific insights into a large, complex system. Clouds have the potential to support systems biology, which is a sort of infrastructure itself.

- Cancer was the first condition to come up against the practical problems of handling huge amounts of newly generated data.

- DCLG's message to Congress could address data standards and standards related to patient privacy. A broader issue to be addressed is the potential value of associating patient care data with scientific research.

- Funding is finite. Some non-government groups might want to align with NIH. How can disease groups integrate their mission and possibly transition from data to knowledge not in 7 years, but in 2, 3, or 5 years?

- Over the long term, NCI is unlikely to be able to provide computing resources for the entire cancer research community. The goal is to initiate activities and get them underway. NCI would like cloud projects to be developed as noncompetitive technology and for businesses to be able to access and analyze the data. Disease organizations will have multiple important roles with aggregated data. Then an industry will arise that can provide these types of services with other organizations and consortia.

- The need for culture change at NIH is an important part of Big Data activities. Also important is the need to create an environment in which people want to participate in

research. People need to feel comfortable about the role of research and how they can contribute.

Optimizing Data to Improve Research

Electronic Health Records: How the Nation Transitioned to Health IT
Ms. Fadesola Adetosoye

- Health IT is about helping patients use their information to improve their health care.
- The Health Information Technology for Economic and Clinical Health (HITECH) Act, passed in 2009, sought to stimulate unprecedented investment in health IT and adoption of electronic health records (EHRs) in order to improve American health care delivery and patient care. Since the passage of the HITECH Act, great progress has been made in the nation's transition to health IT.
- Physicians and hospitals across the country are accelerating their adoption of EHR technology. The adoption of any EHR system by office-based physicians increased from 42 percent in 2008 to 72 percent in 2012. The number of non-federal acute care hospitals that adopted "basic" EHR increased from 12 percent in 2009 to 44 percent in 2012.
- It is important to also think about what health IT means for patients and for research.
- Meaningful Use, the ONC certification program for providers and hospitals, defines a process to ensure that EHR technologies meet standards and certification that have been established by the Centers for Medicare and Medicaid Services (CMS).
- The use of electronic prescribing is widespread across the country and increasing rapidly.
- In public health, health IT is increasing the capacity of state and local health jurisdictions to accept electronic transactions.
- Consumers have identified a number of valued health IT functions including sending and refilling prescriptions electronically; receiving electronic reminders for appointments, preventive screenings, and tests; having access to health information during an emergency; receiving summaries of visits with health care providers; and sharing health information with other providers.
- About 60 percent of cancer patients surveyed indicated they were interested in becoming more engaged with their care through health IT.
- ONC's communications campaign raises awareness, encourages EHR adoption, and encourages primary care providers to adopt EHRs and register and qualify for federal EHR incentive payments. Four consumer public service announcements will be released in 2014.

- ONC also is promoting use of the Blue Button program, which allows an increasing number of consumers to access all of their medical records electronically through the Blue Button portal.

- For the future of health IT, a focus is on interoperability and creating standards to ensure operations of EHR. Smart phones and mobile apps will play an increasing role.

- EHR and Big Data analytics are the wave of the future. The next step is targeted treatment and prevention opportunities based on medical histories.

Discussion Highlights

- ONC will work with NIH to answer questions about how research and EHR expansion can overcome the barriers of the Health Insurance Portability and Accountability Act (HIPAA). HHS also offers several challenge grants that integrate evidence-based medicine.

- In the cancer community, the problem is not that patients don't want their data; it's that they can't get it.

- There is some fear in the provider community about patients obtaining their data on their own, but providers are likely to become more receptive as the concepts evolve.

Advances from the Cloud to the Clinic: Enabling Evidence-Generating Medicine to Accelerate Research and Improve Care
Dr. Peter Embi

- Engagement at the point of care is becoming more and more important to research. EHRs present great opportunities to both improve human health and engage in research at the point of care. Multiple national initiatives expect evidence to be generated at the point of care.

- Generating evidence via practice presents socio-organizational and cultural challenges. Our society has not quite decided how it feels about research at the point of care.

- Traditionally, a uni-directional process of care and research underlies much of the implementation of health care. The persistence of this paradigm impedes progress. It is clear that information from practice would enhance research, but efforts to achieve this have not made much progress.

- However, the notion that simply digitizing more information will advance research is a fallacy. This must be approached in a thoughtful way, selecting information that reflects truth and is complete.

- A major problem now is that research is often an afterthought. The regulatory environment also is confusing.

- A solution to these problems is evidence-generating medicine, the systematic incorporation of research and quality improvement considerations into the organization and practice of health care to advance biomedical science and thereby improve the health of individuals and populations.

- Advancing evidence-generating medicine is critical to completing the evidence-based medicine lifecycle, and multiple enabling factors and stakeholders are key to making this reality. A bi-directional flow is needed between research and practice.

- The movement toward evidence-generating medicine is working against tremendous headwinds.

- Informatics, fiscal, socio-organizational, and cultural elements are key to advancing an evidence-generating medicine paradigm. Health IT must be leveraged. Much of the work must be carried out locally, such as connecting health care systems and addressing IT and informatics, culture, and individual roles of participants including patients and the health care team.

- The eMERGE (electronic MEdical Records and GEnomics) Network, supported by NHGRI, demonstrates the value of clinically collected electronic data. The American College of Rheumatology's Rheumatology Informatics System for Effectiveness (RISE) project is another example. But there are still challenges. For quality results, quality data are needed from the start. How to improve use of data and still take excellent care of patients needs more thought. The challenges go far beyond technical concerns.

- Data collection must be an expectation among the health care team members, with regulatory and cultural issues addressed.

- Beyond primary data collection, evidence-generating medicine must identify patients for research studies. A clinical trial alert (CTA) decision support tool could leverage features of the EHR and enhance trial enrollment.

- Evidence-generating medicine must be considered at several levels: policy, systems, and individual.

- The evidence-generating medicine paradigm makes clear the need to reconcile and resolve research and privacy and sometimes conflicting regulations and policies. Currently, incentives and health care operations are not aligned well for evidence-generating medicine. In a new model that Dr. Embi proposed, the relative research unit, research activities in academic or community settings are compensated.

Discussion Highlights

- Government can enable evidence-generating medicine with incentives. Government also has a role in providing more guidance about regulatory issues, which often complicate the concept and reality of evidence-generating medicine.

- Cancer patients often are not well informed about trials, and several noted that clinicaltrials.gov is not very useful. A tool such as Blue Button could be used as a portal to import data and link to clinical trials. It is difficult to leverage clinicaltrials.gov computationally. A recruiting tool must consider enabling entry at the front end. Vendor compliance could be helpful. ONC is working on this.

- If data could be helpful for patient care, the information should be available at clinical sites. Also, recruitment should provide feedback to the referring party.

- Providers feel burdened and face many changes in their practices. Incentives (financial as well as information sharing) could be very helpful to get providers on board.

- A recurring theme at this meeting has been that clinicians don't have time to be volunteers on research studies. It might be useful to ask NCI to revisit that model. Perhaps small grants could be awarded for clinicians to become involved in research. Maybe DCLG could do something to develop a cancer-related portal to clinicaltrials.gov.

- Underserved populations often are not well represented in trials simply because they are not asked to participate. A tool like a clinical trial letter can address problems associated with recruitment of underserved populations.

DCLG New Business
Mr. Max Wallace

Working Groups

- The DCLG voted to adopt three working groups: Informed Consent in Genomics Research Working Group, Advocate Engagement Working Group, and an Organizational Engagement Working Group. These working groups can bring non-DCLG member advocates into the group's activities and broaden the reach of the DCLG.

New Name for Director's Consumer Liaison Group

- The DCLG discussed changing the name of the Board name to reflect its role as advocates for cancer research. Mr. Wallace proposed a new name: The NCI Council of Research Advocates. The function of the group will not change. Group members voted in favor of the proposed name change.

Certification

I hereby certify that the foregoing minutes are accurate and complete.