DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
NATIONAL INSTITUTES OF HEALTH

NATIONAL ADVISORY COUNCIL FOR BIOMEDICAL IMAGING AND BIOENGINEERING

Summary of Meeting[1]

May 15, 2009

The National Advisory Council for Biomedical Imaging and Bioengineering (NACBIB) was convened for its 20th meeting on May 15, 2009, at the Bethesda Marriott Suites in Bethesda, Maryland. Dr. Roderic I. Pettigrew, Director of the National Institute of Biomedical Imaging and Bioengineering (NIBIB), presided as Council chairperson.

In accordance with Public Law 92–463, the meeting was open to the public from 9:00 a.m. to 12:20 p.m. for review and discussion of program development, needs, and policy. The meeting was closed to the public from 1:20 to 3:00 p.m. for discussion and consideration of individual grant applications.

Council members present:
Dr. Philip Alderson, Saint Louis University, St. Louis, MO
Dr. Ronald L. Arenson, University of California, San Francisco, San Francisco, CA
Ms. Rebecca M. Bergman, Medtronic, Inc., Minneapolis, MN
Dr. Richard L. Ehman, Mayo Clinic, Rochester, MN
Dr. Katherine W. Ferrara, University of California, Davis, Davis, CA
Dr. Gary H. Glover, Stanford University, Stanford, CA
Dr. Augustus O. Grant, Duke University Medical Center, Durham, NC
Dr. Mae C. Jemison, Biosentient Corporation, Houston, TX
Dr. Percival McCormack, University of Illinois at Chicago, Chicago, IL
Dr. Cherri Pancake, Oregon State University, Corvallis, OR

Ex officio members present:
Dr. Anne Plant, National Institute of Standards and Technology
Dr. John McGrath, National Science Foundation
Dr. James G. Smirniotopoulos, Uniformed Services University of the Health Sciences
Dr. Andrew Watkins, Centers for Disease Control and Prevention

Council member absent:
Dr. David Satcher, Morehouse School of Medicine, Atlanta, GA

Ex officio members absent:
Dr. Raynard Kington, National Institutes of Health
Dr. P. Hunter Peckham, Veterans Administration
Ms. Kathleen Sebelius, U.S. Department of Health and Human Services

[1] For the record, it is noted that members absent themselves from the meeting when the Council is discussing applications (a) from their respective institutions or (b) in which a conflict of interest may have occurred. This procedure only applies to applications that are discussed individually, not to "en bloc" actions.

Ad Hoc member present:
Dr. Don Giddens, Georgia Institute of Technology, Atlanta, GA

Executive Secretary:
Dr. Anthony Demsey

Also present:
NIBIB staff present for portions of the meeting:
Mr. Angelos Bacas
Dr. Richard A. Baird
Ms. Sheila Barrett
Ms. Barbara Cantilena
Dr. Larry Clarke
Dr. Zohara Cohen
Ms. Shirley Coney-Johnson
Ms. Chris Ann Davis
Mr. Jeff Domanski
Ms. Kathryn Ellis
Dr. Zeynep Erim
Ms. Carol Fitzpatrick
Ms. Pamela Galpin
Dr. David George
Ms. Marie Gill
Ms. Pam Glikman
Dr. Valery Gordon
Ms. Terry Green
Dr. Ruth Grossman
Ms. Jude Gustafson
Dr. John Haller
Dr. John Hayes
Ms. Eunica Haynes
Dr. William Heetderks
Dr. Lori Henderson
Dr. Rosemarie Hunziker
Dr. Chris Kelley
Dr. Peter Kirchner
Dr. Brenda Korte
Dr. Lixin Lang
Dr. Albert Lee
Dr. Guoying Liu
Dr. Hector Lopez
Dr. James Luo
Dr. Alan McLaughlin
Mr. Todd Merchak
Mr. Larry Morton
Dr. Peter Moy
Ms. Donna Pearman
Dr. Grace Peng
Dr. Karen Peterson
Dr. Roderic I. Pettigrew
Ms. Sonal Sampat
Dr. Belinda P. Seto
Mr. Shaun Sims
Ms. Thomasine Stovall
Ms. Kawanna Taylor
Ms. Stacy Wallick
Ms. Li-Yin Xi
Dr. Yantian Zhang
Dr. Ruixia Zhou

Members of the public present for portions of the meeting:
Mr. Benjamin Corb, American Institute for Medical and Biological Engineering
Dr. Sanjiv Sam Gambhir, Stanford University School of Medicine
Dr. Ramin Khorasani, Brigham and Women's Hospital
Mr. Ronald Mata, Event Technology Solutions
Mr. Vhic Mata, Event Technology Solutions
Mr. Jason Michelitch, National Capital Captioning
Ms. Heather Rawls, NOVA Research Company

I. Call to Order: Dr. Anthony Demsey

Dr. Demsey called to order the 20th meeting of the National Advisory Council for Biomedical Imaging and Bioengineering (NACBIB). He reminded attendees that the morning session of the meeting is open to the public, welcomed attendees, and introduced Dr. Pettigrew, who formally welcomed all participants.

II. Director's Remarks: Dr. Roderic Pettigrew

A. Departing Members

Dr. Pettigrew thanked Council members Augustus Grant, Ronald Arenson, and Don Giddens for their contributions during their terms of appointment on Council. These members were recognized at a Council dinner the previous night and received a plaque from the National Institute of Biomedical Imaging and Bioengineering (NIBIB) in recognition of their dedication and service.

Augustus Grant, cardiologist and academic physician at Duke University, joined the Advisory Council in September 2005 and provided a unique clinical perspective during his term.

Ronald Arenson, former President of the Academy of Radiology Research, joined the Advisory Council in September 2005. He served on numerous committees during his term, most prominently, the NIH Council of Councils.

Don Giddens, former President of the American Institute of Medical and Biological Engineering, was recognized for his support of the Institute prior to becoming a Council member.

B. American Recovery and Reinvestment Act Update

Dr. Pettigrew reported on the 2009 budget for the National Institutes of Health (NIH) and NIBIB. He explained that budget appropriations are separate from the American Recovery and Reinvestment Act (ARRA) contributions to research funding and current appropriations. As of January, NIH was operating under a continuing resolution, but Congress later passed a budget that reflected a 1.4 percent increase in funding for NIH. The distribution of funds is comparable to previous years, with 71 percent supporting research project grants (RPG). ARRA is designed to stimulate the U.S. economy through the support of scientific research and provide investments to increase economic efficiency through technological advancements in science and health. ARRA is providing an additional $10 billion in funding to NIH. Approximately $8.2 billion will be used to support scientific research including $7.4 billion to Institutes and Centers and $800 million to the Office of the Director. The remaining $1.8 billion will serve other needs at NIH such as facility repairs and maintenance. The NIBIB has been allocated approximately $78 million of the $7.4 billion allocated to the Institutes and Centers.

Dr. Pettigrew summarized how NIBIB plans to allocate NIH ARRA funds. The NIBIB will use part of the funds to increase the previously established payline from the 19th percentile to the 25th percentile. ARRA initiatives with which the NIBIB is involved include the Challenge Grant and the Grand Opportunity Grant FOAs. Another ARRA initiative provides support for summer training opportunities for high school and undergraduate students as well as teachers. This summer training program is funded through supplements to existing grantees to hire these individuals to work in their laboratories. Another initiative supports recruitment of new faculty to institutions where faculty recruitments had been delayed due to lack of funding. The NIBIB is also providing significant support for special initiatives such as the Academic Research Enhancement Awards (AREA), which support institutions that have not been major recipients of NIH funding, and awards to small businesses.

C. Recurring Themes Under the New Administration

Comparative effectiveness research is an area of significant importance to the current administration, resulting in an additional $400 million that will be allocated for this endeavor. This

money will be transferred to NIH via the Agency for Healthcare Research and Quality (AHRQ) and will focus on treatment, diagnostics, preventive research, and Health IT (HIT). NIBIB has called for GO applications in comparative effectiveness research with the goal of evaluating minimally invasive therapeutic interventions.

Among other areas important to the new administration are HIT, cost-effectiveness, access to care, and overall wellness. These areas of emphasis are all relevant to point-of-care systems, one of NIBIB's key areas of programmatic focus. NIBIB has increased staff in the area of HIT in its efforts to develop infrastructure that will lead to a patient-centered, web-based system for accessing medical data, including medical images. Creating a system that is interoperable across hospital and vendor computer systems is the biggest challenge. Dr. Pettigrew briefly described several devices that are being developed to take patient measurements as indices of their level of health and wellness. One such example is a digital glucose device that uses Bluetooth® technology to transmit patient information to a physician via a receiving station.

The NIBIB is also collaborating with the American Board of Radiology Foundation to hold a summit, Addressing Overutilization of Medical Imaging, on August 6 and 7 in Bethesda, Maryland. The summit will address the issue of overuse of high cost, high technology procedures and how overuse can be reduced and eliminated.

D. Point-of-Care Network

Dr. Pettigrew discussed the Point-of-Care Network that was established several years ago and the recent grantee meeting held in Seattle, Washington, in April 2009. The network comprises four centers, with each focused on specific point-of-care areas. The centers collaborate with one another in the development of appropriate point-of-care diagnostic technologies that simultaneously merge scientific and technological capabilities with clinical need. The Program for Appropriate Technology in Health (PATH) in Seattle is focused on global health, specifically developing technologies for use in low-resource settings. Johns Hopkins University is leading the way in developing technology for detection of sexually transmitted diseases. The University of California, Davis, is developing technologies to assess diseases in the field of natural disasters and communicable diseases. The University of Cincinnati is focused on emerging neural technologies, specifically developing technologies that make the differential diagnosis between an ischemic and hemorrhagic stroke in order to provide the appropriate treatment.

E. Translational Programs

Dr. Pettigrew provided an update on two NIBIB translational programs: tissue engineering and regenerative medicine under the Armed Forces Institute of Regenerative Medicine (AFIRM) and Advanced Cardiovascular Imaging in support of the Jackson Heart Study. The AFIRM program was officially announced April 17, 2008, by the Department of Defense and is led by the Army, the Navy, and several NIH Institutes. NIBIB is the lead NIH Institute participating in AFIRM. Congress has increased funding for the program from $10 million per year to a total of $165 million for the next five years, with the goal of using regenerative technologies to address battlefield-acquired injuries. Leaders from the sponsoring agencies meet regularly to discuss progress and develop plans for these activities. The most recent meeting focused on applying regenerative medicine technologies to types of transplants that have not been attempted in the past, such as face and hand transplants.

The Jackson Heart Study is similar to the well-known Framingham Heart Study, but specifically focuses on minority populations in Jackson, Mississippi. Dr. Herman Taylor at the University of Alabama leads this study, which recruited its first patient 10 years ago. Researchers will follow longitudinally about 5,000 minority patients over a long period of time. The original study did not include a concerted imaging effort until Dr. Taylor approached NIBIB to support what is now called the Advanced Cardiovascular Imaging program. In January 2008, Wake Forest University proceeded with this effort to perform cardiovascular MRI exams to study ventricular function and the development of heart disease. There is great potential to gain a wealth of knowledge in this patient population over the course of the study. The study could serve to reduce the inequities and disparities in health care in this segment of the broader society.

III. Imaging Gene Expression in Cell Biology and Molecular Therapeutics: Dr. Sanjiv Sam Gambhir

Dr. Gambhir, Professor of Radiology and Bioengineering at Stanford University, gave a presentation on next-generation molecular diagnostic strategies. He pointed to the nation's disproportionate investment in late-stage disease, such as drugs and radiological imaging strategies, rather than in early detection. Creating a framework and building next-generation tools to detect cancer earlier would lead to increased cancer treatment efficacy.

Dr. Gambhir explained the importance of employing the principle of the three I's: **I**dentifying the disease through low-cost tests, **I**solating the disease through molecular and anatomical imaging, and **I**ntervening through minimally invasive interventions. To follow this vision, it is necessary to establish collaboration between the fields of *in vivo* diagnostics and *in vitro* diagnostics. For example, it would be useful to work in parallel on discovering tumor biomarkers in bodily fluids and sister biomarkers on the surface of tumor cells.

Dr. Gambhir and his colleagues are systematically developing a mathematical framework for correlating biomarker levels in the blood to the tumor burden in order to determine minimal tumor size that might be detectable in the future. The mathematical model, which is based on pharmacokinetics, takes into consideration several variables: the sensitivity of the blood test for biomarkers, the rate at which cancer cells and normal cells produce a particular biomarker, the mean blood level of the biomarker in healthy individuals, the half-life of the biomarker, and expected tumor cell densities in tumor tissue. The second and third generation models have helped determine what properties of blood biomarkers are needed, how sensitive and accurate the blood proteomics tests must be, and how to improve the design of the next generation of blood testing. This modeling also allows a better understanding of the cutoff for healthy levels of the blood biomarkers versus the disease and other biochemical parameters.

Dr. Gambhir and his colleagues recently reported on the development of a model that examines minimal detectable tumor size. This model provides guidance in determining what kinds of tests and biomarkers are needed to scale down the detection limit. Through the use of animal models with cancer stem cells, the research team has been able to image the formation of a tumor at a very small focus site, and measure biomarkers that the tumor secretes into the bloodstream. This study will give insight into identifying the next steps for human trials. Work that is currently under review has shown that it is possible to accelerate detection of early-stage tumors by making them secrete biomarkers in response to ultrasound energy. For example, after taking a blood sample from an individual, energy is applied over a suspected cancer site. A follow-up blood sample will then show a transient increase in the level of the biomarker compared to the pre-test level, affirming that a

tumor is hidden in the region where energy was applied. This technique is still in its early efforts; however, human trials will soon be underway.

Dr. Gambhir described a novel handheld, battery-operated device, termed the Magnetic Array (MagArray) Sensor, which is being developed in collaboration with Dr. Shan Wang at Stanford. The technology will allow accurate detection of very low levels of proteins in the blood that may be indicative of disease. The MagArray requires no technicians to operate and costs about $50. It can be used as a point-of-care device in the field or in a laboratory setting. The principle of the MagArray is similar to that of Enzyme-Linked Immunosorbent Assay (ELISA), where the target protein is sandwiched between antibodies; however, the MagArray detection methodology is magnetic rather than optical. The sensor converts small changes in the magnetic field into current. Magnetic signaling is significantly more sensitive than optical techniques. The sensor is coated with a layer of antibodies specific for a blood biomarker. A drop of blood is delivered to the sensor through microfluidics, followed by secondary antibodies labeled with a small magneto-nanoparticle. Binding of the magneto-nanoparticles triggers changes in the magnetic field that can be detected by the sensor. Using standard chip-bonding techniques, Dr. Gambhir's team was able to automatically place many different antibodies onto the chip, allowing simultaneous detection of hundreds of biomarkers in a blood sample. The device has a very large dynamic range, allowing simultaneous detection of low- and high-abundance proteins with exquisite reproducibility.

Although these technologies have been shown to be useful and blood biomarkers have great potential, they are still not accurate enough and may not help localize the disease, which highlights the importance of merging them with *in vivo* imaging. Dr. Gambhir discussed development of imaging agents capable of targeting tumors that consist of just a few thousand cells as opposed to millions of cells. In order to accomplish this, researchers must find ways to increase the signal coming from molecular imaging agents. This has proven difficult because, once injected, the pharmacokinetics of the imaging agents limits the number of agents that can be delivered to the target site: an imaging agent could be heavily protein-bound and not leave the blood, not make it to the tumor, be metabolized heavily by the liver, or be excreted too quickly by the kidneys. Signaling systems that utilize larger molecules produce a lot of signal at the tumor site, which can be detected outside the body. PET and SPECT technologies have great clinical capacity but poor spatial and temporal resolution.

Dr. Gambhir has been exploring development of imaging agents for photoacoustics, which is based on the principle of conversion of light energy into sound. Recently, photoacoustics has been utilized to image molecules targeting tumors. When pulsed lasers illuminate a subject, the imaging agents at the tumor site absorb the light energy, which leads to heating and thermal expansion. The thermal expansion leads to pressure waves and sound. This technology has better penetration than optical techniques and high spatial resolution. The specificity of photoacoustics has been demonstrated in animal models where images are taken pre- and post-injection of an imaging agent. After subtracting the pre-injection images from the post-injection images, the resulting photoacoustic signal directly reflects the number of imaging agents, which is directly related to the number of molecular targets. Through these models, Dr. Gambhir and his colleagues have been able to detect tumors smaller than a cubic millimeter in size. Using dyes, this procedure has been proven to allow for stronger absorption of light, ultimately producing more sound.

Another technology that is amenable to detection of small tumors is based on the Raman Effect – inelastic scattering of light by molecules. Most of the light absorbed by a molecule is scattered elastically, but about 1 in 10 million photons is scattered inelastically. When one shines light on a

living subject, the Raman Effect is very weak, producing a low background signal. Dr. Gambhir has been developing gold nanoparticles coated with small molecules that enhance the Raman Effect by increasing inelastic scattering of light. The nanoparticles can be functionalized with molecules that allow them to home in on the tumor. Small animal imaging instruments have been developed to detect these nanoparticles. The sensitivity of the technique is a hundred-fold higher than fluorescence using quantum dots. Depending on the unique molecule on the surface of a gold nanoparticle, each nanoparticle produces a unique Raman signal, allowing for simultaneous detection of 10–40 different signals from a living subject. The first human application involves placing nanoparticles into the bowel to detect early colorectal cancer. For this purpose, the team developed a Raman endoscope that delivers light to the particles via optical fibers. The scattered light is detected by a collection bundle of fibers. This technique allows detection of flat lesions and very small tumors that otherwise would be missed.

While all of these technologies are still in their infancy, Dr. Gambhir noted that the next generation of instruments – for example, those that would replace mammograms – would be seen more and more. In addition to enhancing early diagnostics, the merger between *in vitro* and *in vivo* technologies is expected to improve treatment monitoring.

Discussion

A Council member asked whether the technologies Dr. Gambhir described have any inherent health concerns or risks. Dr. Gambhir responded by pointing to a study published in *Nature* that reported no toxicity had been observed in small animal models from the use of single-wall nanotubes over a period of one year. A huge effort is underway to characterize the toxicity in larger imaging agents, which Dr. Gambhir believes will show toxicity at certain levels to be similar. The burden of proof will continue to rest on the nano-imaging and nano-therapeutics communities. Researchers are learning to recognize which materials to avoid and which tend to do better in living subjects. Findings have shown that gold-based particles used in the treatment of rheumatoid arthritis are handled relatively well by the body. Carbon nanotubes on the other hand, have caused concern because they are taken up by the reticuloendothelial system and can exist there for many years. Further study is needed to determine the risks involved in the use of these technologies.

Another Council member asked whether targeting tumors with nanoparticles would replace current procedures used to detect prostate cancer. Dr. Gambhir explained that the hope is that the combination of blood biomarkers will indicate the presence of early-stage disease. Researchers at Stanford University and Fred Hutchinson have worked together for five years to examine panels of biomarkers that are relevant and predictive of disease in ovarian, prostate, lung, and pancreatic cancer. After identifying these panels of biomarkers, an imaging study will follow in the hope that it will lead to detection of relevant disease. Dr. Gambhir was asked whether there was a biomarker for pancreatic cancer. He responded that identification of biomarkers for pancreatic cancer has suffered from a lack of investment, and although there are five good leads in this area of research, it is unlikely all five will prove to be useful.

A Council member observed that, although using this technology to identify biomarkers has enormous potential, the lessons learned are more likely to be about the biology of cancer rather than discovering tests for a specific cancer. He believes that specificity and the biology of cancer need further research before successful tests can be developed. Dr. Gambhir agreed that these tests are still in their infancy. In the future, these tools will allow researchers to discover pieces of the

biology of the disease, but those pieces will have to be knitted together to create the natural history model of progression.

A member asked about using RGD, a ubiquitous peptide sequence, to specifically target integrins on the surface of tumor cells. Dr. Gambhir clarified that all new blood vessels in tumors and in normal tissue have high levels of (v)beta(3)-integrins, which bind the RGD peptide. Dr. Gambhir chose RGD for proof of principle because it was available. To increase specificity of the nanotubes for tumor cells, the same particles are labeled with chemical groups that target other biomarkers, such as the epidermal growth factor receptors. To achieve even greater specificity for tumor cells, it is necessary to target multiple biomarkers at the same time. Multiplexing is already being used for *in vitro* diagnostics, and similar approaches are being developed for *in vivo* imaging.

Dr. Pettigrew asked Dr. Gambhir for his perspective on the big question in cancer: what initial event leads to the progression of the disease? Dr. Gambhir responded that his program has teamed with Drs. Irv Weissman and Michael Clarke at Stanford to research the initial events in tumor formation by inserting cancer stem cells into a living animal. They are developing tools that allow the progression of these events to be imaged, which could lead to the answer to this important question.

IV. Using IT to Enable the Practice of Evidence-Based Medicine — Radiology as a Case Example: Dr. Ramin Khorasani

Dr. Ramin Khorasani, Vice Chair of the Department of Radiology and Director for the Center of Evidence-Based Imaging at Brigham and Women's Hospital, reported on using health care IT (HIT) tools for evidence-based imaging to reduce costs.

A 2001 Institute of Medicine report indicated that system changes that enable and promote the practice of evidence-based medicine are needed. HIT that utilizes evidence-based medicine has been shown to improve quality and safety as well as to reduce waste, making it imperative that these tools be integrated into the current health care system. However, the adoption of HIT tools over the past few years has been very poor across the country due to the many barriers faced when implementing such systems. Pre-authorization programs are an example of efforts to eliminate overuse of imaging procedures. However, this approach does not address the problem from the perspective of what procedures are appropriate for the patient; rather, they are strictly a barrier to care. The Centers for Medicare and Medicaid (CMS) is currently looking at alternatives to address this issue.

The use of HIT is a large part of the new administration's health initiatives, and radiology is positioned to take the lead in HIT research and implementation. Radiology has become the area of focus for managing costs due to escalating imaging use and the costs associated with these procedures. Dr. Khorasani used Brigham and Women's experience as an example of how HIT and evidence-based imaging could reduce expenses. Between 2005 and 2008, imaging costs were reduced by 15 percent; this reduction is attributed to the HIT system put in place within the Brigham and Women's Hospital system.

Prior to the implementation of the HIT system, Brigham established its own multi-disciplinary expert panels to investigate which imaging procedures were appropriate. The panels reported that 5 to 20 percent of the imaging being investigated was inappropriate, unnecessary, or redundant. Due to this high percentage of unnecessary imaging procedures, Brigham designed an HIT approach using components of physician ordering and decision support to reduce waste and improve quality. In 2005, high-cost imaging was growing at a rate of about 12 to 18 percent per year nationally, and

payers set up a pre-authorization program for imaging procedures. Brigham negotiated exemption from their big-three payers' pre-authorization programs by guaranteeing they would use their in-house radiology medical management program to authorize imaging procedures. This radiology management program uses evidence-based medicine to determine the right treatment path for each patient.

The HIT system at Brigham has allowed the implementation of evidence-based medicine within eight weeks, in contrast to the 5- to 14-year timeframe implementation usually takes. Dr. Khorasani explained that this IT program costs the hospital about $200 million annually, including staff, operational and equipment costs, and system expenses such as maintenance.

Each component of the HIT system at Brigham was developed in house, and they remain one of the only organizations to have done this to date. The key was maintaining functionality between Brigham's electronic medical records and the traditional radiology IT systems without replacing components from the existing environment. The payers' database is also integrated into the hospital's system so that it takes only 60 seconds to determine whether the payer will cover the service. To order imaging procedures, physicians log onto the web and access the patient's file. Once the hospital system approves the exam order, the physician can schedule the exam online. Physicians can access the reports and the images ten minutes following the procedure.

Brigham's system has not only cut back on the number of unnecessary imaging procedures, but it also allows for analysis of individual physician behavior. When physicians submit imaging orders, the system captures every click they make, which then allows the hospital to benchmark them against their colleagues. The system can then produce a report for each physician to review.

It is important to note that this system is not intended to prevent physicians from ordering specific tests nor hinder them from providing appropriate care. Rather, it is designed to provide decision support and educational material based on evidence-based medicine. Awareness of information has proven to be critical in improving physicians' decision making. Current analysis of the data from the use of this HIT system at Brigham has shown that the reduction of imaging procedures through utilizing a system focused on appropriateness of treatment does not have to be a barrier to care.

Discussion

Dr. Khorasani was asked whether merging HIPAA compliance with in-house systems had been an issue. Dr. Khorasani responded that the hospital systems at Brigham have a very strict IRB process whereby data are de-identified, so that studies that lead to discovery of evidence-based medicine do not compromise patient privacy. This does not underscore the importance and challenge of sanitizing data to ensure that the discovery is valid, tested, peer reviewed, and applicable, which is why expert panels within the hospital review the evidence.

In response to another question, Dr. Khorasani reported that the expert panels originally met every four to six weeks; however, panel meetings are now ad hoc and not in person. Rather, a knowledge management infrastructure is in place where panel members vote on the significance of the evidence. He also noted that if something was evident enough to publish in the *New England Journal of Medicine*, it does not go before the panel but is immediately integrated into the system.

Another Council member asked how often physicians ignore the peer-to-peer review flag within the system. Dr. Khorasani explained that this question is hard to answer and reiterated that the peer-to-peer review program was not designed to deny services, rather to be educational to the physician ordering the services.

V. Review of Council Procedures and Regulations: Dr. Anthony Demsey

Dr. Demsey noted for the record that a quorum was present for this Council meeting, and that Council member Dr. David Satcher and Ex Officio member Dr. P. Hunter Peckham were unable to attend today's meeting.

A. Council Regulations, Policies, and Procedures

Dr. Demsey summarized elements of the Government in the Sunshine Act and the Federal Advisory Committee Act that govern all Advisory Council meetings. These Acts require the U.S. Department of Health and Human Services to open Advisory Council meetings to the public except when proprietary or personal information is discussed. To comply with these regulations, the NACBIB meeting is open to the public for all but the review of individual grant applications. Dr. Demsey reviewed the guidelines with Council regarding conflict of interest, confidentiality, and lobbying.

B. Future NACBIB Meeting Dates

The next NACBIB meeting is scheduled for September 11, 2009, with the site to be determined. Dr. Demsey asked Council members to inform him of major conflicts with upcoming meeting dates. He also reminded members that for the September Council, the *expedited early en bloc Council concurrence* process is used. Three members will be asked by Dr. Pettigrew several weeks prior to September's meeting to review a subset of applications that are going to September Council. All Council members will have access to these applications. Dr. Demsey also received Council's concurrence to include, as necessary, ARRA applications resulting from RFAs in this process.

C. Approval of the January 23, 2009, NACBIB Meeting Minutes

A motion was forwarded and seconded to approve the minutes of the January 23, 2009, NACBIB meeting without modification. The minutes were approved unanimously.

VI. Report of the Strategic Planning Workgroup: Dr. Richard Ehman

Dr. Ehman reported that the Strategic Planning Workgroup had focused on identifying long-term consequences of ARRA funding. Some workgroup members expressed concern for the potential lack of quality among the applications.

The workgroup considered whether the ARRA funding might create major new challenges for existing investigators and programs. The workgroup discussed whether NIBIB might have to dip into existing programmatic funds to provide additional support to extend the two-year ARRA funding. Due to the influx of applications and the number of successfully funded grants, these grants will need to be renewed in two years and will have to compete with a new pool of applicants at that point. This influx could lead to a crisis in two years, which makes it important for NIBIB to keep the payline consistent, providing a "soft landing" for these potential issues in two years.

One Council member expressed gratification that NIBIB is putting about 50% of the funding into the backlog of meritorious grants.

Dr. Pettigrew thanked the workgroup for their deliberations and stated that NIH leadership had anticipated their concerns, some of which may occur sooner than the two-year benchmark. He said the need to fund existing investigators beyond the two years allocated to each of them had been raised at the recent NIH budget retreat and that several models were discussed for dealing with the potential impact on paylines.

VII. Report of the Training Workgroup: Dr. Augustus Grant

Dr. Grant briefly reported that the Training Workgroup spent their session reviewing currently available training programs. The NIBIB Howard Hughes Interface program provided initial resources for developing new programs that were multidisciplinary, with components coming from different fields. This program is currently in phase two, in which NIBIB has taken over support from Howard Hughes. The multidisciplinary nature of these programs will continue to be emphasized, and programs will continue to involve such features as the development of training courses and teaching material.

The graduate training initiatives and changes within the program were discussed. The usual summer programs supported by NIBIB will now be open-ended to include projects that extend into the academic year. The workgroup members agreed that there should be significant interaction between industry and the undergraduate training programs, which would ultimately enrich the programs.

Additionally, the workgroup discussed using ARRA funds to supplement summer programs and provide administrative supplements. ARRA funds would provide key support for new hires and be used to create recruitment packages. The workgroup expressed concern about financially sustaining these new hires, with the consensus that there should be a commitment by institutions to support faculty members for two years beyond the two–year grant period. The workgroup was pleased to see that ARRA funding includes a specific initiative for AREA institutions – those that don't generally grant advanced degrees – as many of these institutions engage educators from the high school level as part of the normal course of interactions in the community.

The workgroup also discussed the challenges associated with sustaining institutional training grants over time.

VIII. Adjournment

The open session of the NACBIB meeting was adjourned at 12:20 p.m.

IX. Closed Session

The specific grant application review portion of the meeting was closed to the public in accordance with provisions set forth in Section 552b(c)(4) and 552b(c)(6) Title 5, U.S. Code and 10(d) of the Federal Advisory Committee Act, as amended (5 U.S.C. appendix 2). The closed session was adjourned at 3:00 p.m.

Certification

We certify that, to the best of our knowledge, the foregoing minutes and attachments are accurate and complete.[2]

_____ Anthony Demsey, Ph.D.

Executive Secretary,
National Advisory Council for Biomedical Imaging and Bioengineering
Director,
Office of Research Administration
National Institute of Biomedical Imaging and Bioengineering

_____ Roderic I. Pettigrew, Ph.D., M.D.

Chairperson,
National Advisory Council for Biomedical Imaging and Bioengineering
Director,
National Institute of Biomedical Imaging and Bioengineering

[2] These minutes were approved formally by the Council at the meeting on September 11, 2009, and corrections or notations have been made.