QIN

Quantitative Imaging Network

Volume 1, Issue 1 June 18,2010

Special points of interest:

- **The next steering committee call will be on June 21 at 11:00 AM EDT.**

Phone: 1-866-692-4541 Code: 8321122#

- **Upcoming articles:**

QIBA and QIN: Interactions to advance imaging.

Web site

RSNA: What can QIN do?

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Brigham & Women's Hospital to join QIN

Dr. Fiona Fennessy from the Brigham & Women's Hospital is the latest investigator to join the Quantitative Imaging Network. Her application to the program announcement PAR-08-225 was titled "Quantitative Imaging for Evaluation of Response to Cancer Therapies", and presented a program to study prostate cancer using MR techniques. The application is based on the hypothesis that the functional aspect of magnetic resonance imaging can contribute to the accuracy of tumor detection and localization, and can potentially serve as a guide for focal ablative therapy. The goal of the program is to determine if optimized MR analysis tools and algorithms can be used as a biomarker guide for targeted therapy and as a surrogate for disease recurrence in localized prostate cancer. This is the first study of prostate cancer using MR techniques in the Quantitative Imaging Network.

Dr. Nordstrom, program director at NCI for the QIN, has briefed Dr. Fennessy on the structure of the network and the need to begin selecting individuals to serve on the five working groups. She will join the steering committee teleconference call on June 21.

The Brigham & Women's team joins six other teams in the QIN network. These members are highlighted in this issue of the Newsletter. The goal of the QIN is to improve clinical decision making by developing and promoting quantitative imaging methods for the measurement of tumor response to therapies in clinical trials settings. The network environment is ideal for creating consensus among the teams in areas such as data collection, data sharing & archiving, analysis methods, and much more.

Dr. Fennessy's team includes a number of individuals from the Brigham & Women's. Co-investigators are Dr. Robert Cormack, Dr. Robert Mulkern, Dr. Ehud Schmidt and Dr.Mary-Ellen Taplin. Contributing collaborators from the Brigham & Women's are Dr. Clare Tempany and Dr. Michelle Hirsch. Also included in this research team is a group from General Electric headed by Dr. Sandeep Gupta. See page 7 of this newsletter for more details.

The program staff members at NCI involved with the QIN program are looking forward to Dr. Fennessy's participation in the QIN.

QIN Mission Statement in Progress

The QIN mission statement is coming together. Thanks to those who gave suggestions. Here is the current version of the statement. Comments are welcomed.

The mission of the Quantitative Imaging network (QIN) is to improve the role of quantitative imaging for clinical decision making in oncology by the development and validation of data acquisition and analysis methods in carefully designed therapy trials, and to create tools to improve the measurement of response to drug or radiation therapy in order to predict outcome better and thus tailor treatment to individual patients.

The University of Pittsburgh

Dr. James Mountz

In September 2009, the Pittsburgh team was the first to enter the QIN. Dr. James Mountz, principal investigator of the Pittsburgh QIN team believes there is a vital need for quantitative assessment of cancer therapy response. CT and standard MRI cannot provide information on the molecular, biochemical and physiologic properties of cancer tissues. Therefore, novel quantitative imaging techniques and protocols are needed to reveal biomarkers of molecular events induced by cancer therapy. In particular, early imaging of molecularly targeted pathways predicted to be essential for effective cancer therapy is highly likely to play a key role in patient management in the future. Quantitative imaging will be performed in malignant brain tumors with responses to molecularly targeted agents imaged by F-18 ApoSense, F-18 FLT and MRI. Quantitative imaging will also be performed in recurrent or metastatic squamous cell carcinoma of head and neck using novel targeted agents against epidermal growth factor receptor (EGFR) and angiogenesis, including vascular endothelial growth factor (VEGF) and VEGF receptor (VEGFR). Imaging biomarkers of therapy-induced early changes in tumor biology will be serially obtained.

The overarching goal of this project is to standardize PET-CT and MRI protocols, to accurately and reproducibly measure changes in imaging biomarkers during cancer therapy trials, in order to optimize early predictions of subsequent clinical outcomes.

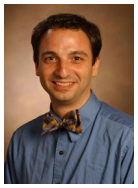
Stanford University

Dr. Daniel Rubin

Stanford University was one of three teams to enter the QIN from the second round of review. Dr. Daniel Rubin stated in his application that quantitative imaging methods promise to improve the ability of cancer researchers to evaluate tumor burden and treatment response, but progress is thwarted by the lack of software infrastructure to record quantitative imaging information efficiently and reproducibly in the routine clinical workflow, and by the inability to store and share image metadata in standard formats. Many different quantitative imaging features that could more completely describe tumor burden are not being captured because collecting this information is laborious without tool support.

In his QIN program that started in May of 2010, Dr. Rubin plans to create tools leveraging caBIG technologies to standardize quantitative imaging assessment of tumor burden. In addition, he will develop methods to analyze quantitative image metadata and to help oncologists evaluate quantitative criteria on images collected as part of clinical trials. Finally, Dr. Rubin will evaluate the utility of the Stanford infrastructure by applying tools in two clinical trials to quantitatively measure tumor burden.

Vanderbilt University



Dr. Thomas Yankeelov

Dr. Vandana Abramson

The second team to enter the QIN from the second round of review was headed by Dr. Thomas Yankeelov and Dr. Vandana Abramson from Vanderbilt University. This team proposed to develop integrated high field (3T) magnetic resonance imaging (MRI) and positron emission tomography (PET) methods for assessing the effects of molecularly targeted anti-angiogenesis and cytoxic treatments in breast cancer clinical trials. Their goal is to provide the breast cancer community with practical data acquisition and analysis protocols to facilitate the translation of advanced imaging technologies into patient management and clinical trials. Dynamic contrast enhanced MRI (DCE-MRI) and diffusion weighted MRI (DW-MRI) can report on vascular status, tissue volume fractions, and cellularity, while fluorodeoxythymidine PET (FLT-PET) can report on cell proliferation. The team proposes to combine these MRI and PET data to provide anatomical, physiological, and molecular assessments of the response of breast tumors to novel anti-angiogenic and cytoxic treatments in clinical trials.

Three specific aims define the program from Vanderbilt. After developing protocols and registration of PET and MR images, they will use Phase II and III studies to validate their algorithms.

H. Lee Moffitt Cancer Center

The third team to enter the QIN from the second round of review is the H. Lee Moffitt team headed by Dr. Robert Gatenby and Dr. Robert Gillies. This group has a strong reputation in non-small cell lung cancer (NSCLC) research.

The major hypothesis of the this effort is that quantitative analysis of clinical images can be prognostic and predictive of response to specific therapies. If true, these results would have medical significance through improved care and outcomes. This would also have socioeconomic significance as it would allow evidence-based medicine to be practiced using standard-of-care images. To test this hypothesis, this project will extract imaging data from two powerful patient databases at the Moffitt Cancer Center in Tampa, FL and the MAASTRO clinic in Maastricht, the Netherlands. These databases contain images, gene expression profiling and outcomes data from hundreds of stage III and IV NSCLC patients. Features extracted retrospectively from the Moffitt dataset will be quantitatively analyzed to generate predictive models for gene expression patterns and progression-free survival. These models will be tested in the MAASTRO data set and re-tested using prospective data from Moffitt acquired under rigorous conditions. An important outcome of this work will define the rigor and resolution needed for images to be useful in predictive models.

Dr. Robert Gatenby

Dr Robert Gillies

The University of Iowa

The University of Iowa team was one of two who came to the QIN from the third round of review. Dr. John Buatti, along with Dr. Milan Sonka, Dr. Michael Graham, and Dr. Thomas Casavant head the research from this team. He has assembled a remarkably strong team of oncologists, clinical imaging specialists, computer scientists, imaging and therapy physicists, bioinformatics specialists, and statisticians, as well as collaboration with NIST and a public/private partnership with Siemens. This group is an ideal team to address the goals of this NCI U01 Program Announcement and contribute robustly to the envisioned Quantitative Imaging Network (QIN).

Studying head & neck cancers, the team will develop novel semi-automated tools for quantitative image-based response assessment. They will design, implement, and validate open source 2D and 3D semi-automated quantitative image analysis tools for tumor definition and quantitative metrics applicable to response assessment. They will also develop and apply advanced decision-support software as well as measurement variability tools so that image analysis tools can be compared and optimally selected for clinical cancer trials.

This team will be working closely with NIST.

Dr. John Buatti

Dr. Milan Sonka

Dr. Michael Graham

Dr. Thomas Casavant

The University of Washington

The second team to enter into the QIN from the third round of review was the University of Washington. Led by Dr. Paul Kinahan, Dr. David Mankoff and Dr. Hanna Linden, this team proposed to improve cancer clinical trials by enhancing the effectiveness of quantitative PET/CT imaging of tumor response. This has three distinct and linked components; (1) measuring and reducing the bias and variance of multi-center quantitative PET/CT imaging measurements, (2) devising optimal PET image analysis methods appropriate for quantitative PET/CT imaging in clinical trials, and (3) developing and testing guidelines for incorporating quantitative PET/CT imaging as a biomarker and measure of response in cancer clinical trial design. Underlying themes include optimizing the clinical and biologic data that can be gleaned from imaging in the setting of cancer therapy clinical trials, matching the design of the imaging components to the phase and complexity of the cancer clinical therapy trial, and matching the imaging approach to the type of tumor and the therapeutic agent. The focus is on early drug trials (Phase I and II studies) and imaging biomarker studies; however, the methods investigated and tools developed will be equally applicable to larger (Phase III) trials and imaging as a surrogate endpoint.

Dr. Paul Kinahan

Dr. David Mankoff

Dr. Hanna Linden

University of Pittsburgh Team

Individual	Organization	QIN Position	Team Responsibility
James Mountz, MD, PhD	University of Pittsburgh	PI	PET & MRI Image acquisition
Charles Laymon, PhD	University of Pittsburgh	Co-Investigator	PET/CT Scanner QC, data analysis
Fernando Boada, PhD	University of Pittsburgh	Co-Investigator	Software MRI data acquisition
Erik Weiner, PhD	University of Pittsburgh	Co-Investigator	QC for DCE MRI
Athanassios Argiris, MD	University of Pittsburgh	Co-Investigator	Clinical trials
Ashok Muthukrishnan, MD	University of Pittsburgh	Co-Investigator	PET Image processing
Frank Lieberman, MD	University of Pittsburgh	Co-Investigator	Clinical trials
Brian Lopresti, BS	University of Pittsburgh	Co-Investigator	Dynamic analysis method
Scott Mason, PhD	University of Pittsburgh	Co-Investigator	FLT PET
Chester Mathis, PhD	University of Pittsburgh	Co-Investigator	Radiochemistry development
Dennis Nelson	M-Vista	Co-Investigator	
Julie Price	University of Pittsburgh	Co-Investigator	
Douglas Potter, PhD	University of Pittsburgh	Co-Investigator	Biostatistics

Vanderbilt University Team

Individual	Organization	QIN Position	Team Responsibility
Thomas Yankeelov	Vanderbilt University	PI	Administration
John Gore	Vanderbilt University	Co-Investigator	Administration
Ingrid Mayer	Vanderbilt University	Co-Investigator	Oncology
Dominique Delbeke	Vanderbilt University	Co-Investigator	
E. Brian Welch	Vanderbilt University	Co-Investigator	Data collection methods
Tamarya Hoyt	Vanderbilt University	Co-Investigator	
Mark Kelly	Vanderbilt University	Co-Investigator	
Tatsuki Koyama	Vanderbilt University	Co-Investigator	
Mia Levy	Vanderbilt University	Co-Investigator	Bioinformatics
Subramani Mani	Vanderbilt University	Co-Investigator	
Vandana Abramson	Vanderbilt University	PI	
Melinda Sanders	Vanderbilt University	Co-Investigator	
Xi Li	Vanderbilt University	Post-doctoral fellow	
Lori Arlinhaus	Vanderbilt University	Post-doctoral fellow	Software tools, image analysis
Carlos Arteaga	Vanderbilt University		Outreach

H. Lee Moffitt Team

Individual	Organization	QIN Position	Team Responsibility
Robert Gatenby, MD	H. Lee Moffitt	MPI	Radiology & Nuclear Medicine
Robert Gillies, PhD	H. Lee Moffitt	MPI	Radiology & Nuclear Medicine
Edward Eikman, MD	H. Lee Moffitt		Radiology & Nuclear Medicine
Claudia Berman, MD	H. Lee Moffitt		Radiology & Nuclear Medicine
Virendra Kumar, PhD	H. Lee Moffitt		Radiology & Nuclear Medicine
Yuhua Gu, PhD	H. Lee Moffitt		Radiology & Nuclear Medicine
Steven Eschrich, PhD	H. Lee Moffitt		Bioinformatics
Jongphil Kim, PhD	H. Lee Moffitt		Biostatistics
Kenneth Forster, PhD	H. Lee Moffitt		Radiation Oncology
Thomas Dilling, MD	H. Lee Moffitt		Radiation Oncology
Eric Haura, PhD	H. Lee Moffitt		Lung Cancer SPORE
Jhanelle Gray, MD	H. Lee Moffitt		Lung Cancer SPORE
Matthew Schabath, PhD	H. Lee Moffitt		Lung Cancer SPORE
Lawrence Hall, PhD	University South Florida		Electrical & Computer Engineering
Dmitry Goldgof, PhD	University South Florida		Electrical & Computer Engineering
Satrajit Basu, BS	University South Florida		Electrical & Computer Engineering
Philippe Lambin, MD, PhD	Maastro	Co-PI	Radiation Oncology
Dirk DeRuysscher, MD, PhD	Maastro		Radiation Oncology
Andre Dekker, MS, PhD	Maastro		Physics
Hugo Aerts, MS, PhD	Maastro		Physics

Stanford University Team

Individual	Organization	QIN Position	Team Responsibility
Daniel Rubin	Stanford University	PI	
Sandy Napel	Stanford University	Co-Investigator	Image Processing; CT/MRI
Ted Graves	Stanford University	Co-Investigator	Image Processing; PET
R. Brooke Jeffrey	Stanford University	Co-Investigator	CT/MRI clinical image analysis
Andrew Quon	Stanford University	Co-Investigator	PET clinical image analysis
George Fisher	Stanford University	Co-Investigator	Clinical trial RECIST study PI
Andrew Evens	Northwestern University	Co-Investigator	Clinical trial IHC study PI
Mia Levy	Vanderbilt University	Co-Investigator	Imaging Informatics for lesion

University of Iowa Team

Individual	Organization	QIN Position	Team Responsibility
John Buatti	University of Iowa	PI	Oncology
Thomas Casavant	University of Iowa	PI	Bioinformatics
Michael Graham	University of Iowa	PI	Radiology
Milan Sonka	University of Iowa	PI	Radiology
John Bayouth	University of Iowa		Electrical & Computer Engineering
Terry Braun	University of Iowa		Radiation Oncology
John Sunderland	University of Iowa		
Bartley Brown	University of Iowa		Electrical & Computer Engineering
Reinhard Beichel	University of Iowa		Electrical & Computer Engineering
Aristides Capizzano	University of Iowa		Radiology
Anjali Gupta	University of Iowa		Radiation Oncology
Vincent Magnotta	University of Iowa		Radiology
Yusuf Menda	University of Iowa		Radiology
Manickam Muruganandham	University of Iowa		Radiation Oncology
Brian Smith	University of Iowa		Biostatics
Wendy Smoker	University of Iowa		Radiology
John Pearson	Siemens Corporate Research		Siemens Corporate Resaearch
Brian Zimmerman	NIST		NIST

University of Washington team

Individual	Organization	QIN Position	Team Responsibility
Paul E. Kinahan	University of Washington	MPI	Imaging Physics
David A. Mankoff	University of Washington	MPI	Nuclear Medicine
Hanna Linden	University of Washington	MPI	Oncology
Evan Yu	University of Washington	PI	Oncology
Jen Specht	University of Washington	PI	Oncology
Robert K. Doot	University of Washington	Fellow	Imaging Physics / Modelling
Brenda F. Kurland	Fred Hutchinson Cancer Center	PI	Biostatistics
Jenine Yager	University of Washington	Staff	Research Coordinator
Erin K. Schubert	University of Washington	Staff	Research Coordinator
Larry Pierce	University of Washington	Staff	Research Coordinator
Mark Muzi	University of Washington	Staff	Modeling

Brigham & Women's Hospital Team

Individual	Organization	QIN Position	Team Responsibility
Fiona Fennessy	Brigham & Women's Hospital	PI	MRI physics
Robert Mulkern	Brigham and Women's Hospital	Co-I	MRI physics
Sandeep Gupta	General Electric	Co-I	Image analysis
Ehud Schmidt	Brigham and Women's Hospital	Co-I	Engineering Physics
Robert Cormack	Brigham and Women's Hospital	Co-I	Radiaton Oncology
Mary-Ellen Taplin	Brigham and Women's Hospital	Co-I	Oncology
Yi Tang	Brigham and Women's Hospital		Radiology

Winter 2009 - 2010 in Washington DC

Snow covered Bob Nordstrom's house for days.

His driveway is somewhere under all that.

Maybe Dakota can dig them out.

NCI Staff participating in the QIN:

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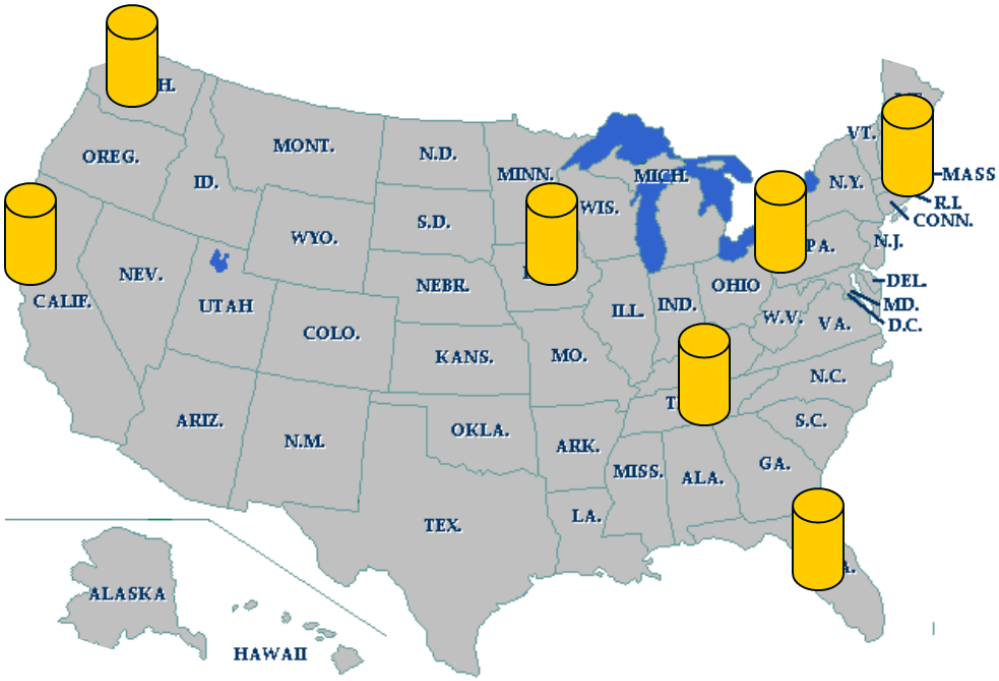
Visit our web site
http://imaging.cancer.gov

QIN

The Cancer Imaging Program: Visualizing the problem and directing the solution.



The present QIN Network.

Potpourri

QIN Web Site:

The NCI program staff is working to set up a web site for the QIN as a part of the Cancer Imaging Program web site. It will have basic information on each of the teams. This will be taken from the abstracts of your applications. If you want to add or change any of the content, please contact Robert Nordstrom with the updates. The web site will link to pages that discuss each of the working groups, and as they create their mission statements, those will be included.

If the teams have constructed web pages discussing the QIN, the CIP site can link to those sites as well. This will be the topic of the upcoming steering committee teleconference.

Working Groups Launched:

In its first face-to-face meeting last March, the QIN steering committee decided to organize five working groups for the network. The purpose of the working groups is to foster cross-team consensus building in specific areas. The five areas are

- Clinical Trial Design & Development
- Data Collection
- Image Analysis & Performance Metrics
- Bioinformatics/IT & Data Sharing
- Outreach: External/ Industrial relations

Each team principal investigator assigned team members to the five working groups. Program staff at NCI then organized separate teleconferences to introduce the working groups to the organization of QIN and to the responsibilities of being a member of a working group. These teleconference meetings were successful and initiated discussions that will lead to the creation of mission statements for each group.

QIN Application Review:

The fifth review of QIN applications tool place on Monday June 14. As always, the review process was professionally handled by Dr. Kenneth Bielat. We must now wait for scores and summary statements before deciding which applications are eligible for acceptance in QIN. This process requires several months.