Informatics White Paper

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History

- Annual Meeting of the Quantitative Imaging Network
  - April timeframe
  - Includes a joint session with CBIIT for past 4 years
- The meeting of April 2015
  - Focused on funding opportunities in imaging and informatics
  - Quantitative imaging standards
  - Open science approaches
  - Informatics infrastructure for imaging support

Three More Workshops on the Topic Followed

- Recommendations directed to NCI
  - Continue with grants programs such as QIN, ITCR and SBIR programs
  - Encourage data sharing and analysis (tool) sharing
  - Continue to hold workshops on the subject of informatics and imaging
- Completion of the white paper was suspended to include the results from these workshops
- The resulting white paper (finished in late 2016) includes results of these inputs
  - Additional inputs from several reviewers

Topics Covered

- Open standards and open source architecture
- Archives of well-curated datasets
- Annotation, markup, and quantitative imaging features
- Data exploration, integration and retrieval
- Algorithm development and validation and use in challenges to encourage reproducibility
- Container technologies and cloud deployment

Bringing Quantitative Imaging into Clinical Workflow

- Case Study: Open Health Imaging Foundation
  - Dana Farber/Harvard Cancer Center

Future Initiatives

- Developing a Cancer Imaging Commons
- Virtual Tissue Repository
- MeDICI Challenge Management System
- Prototype data harmonization and integration project
- Imaging and cloud computation
- ITCR projects

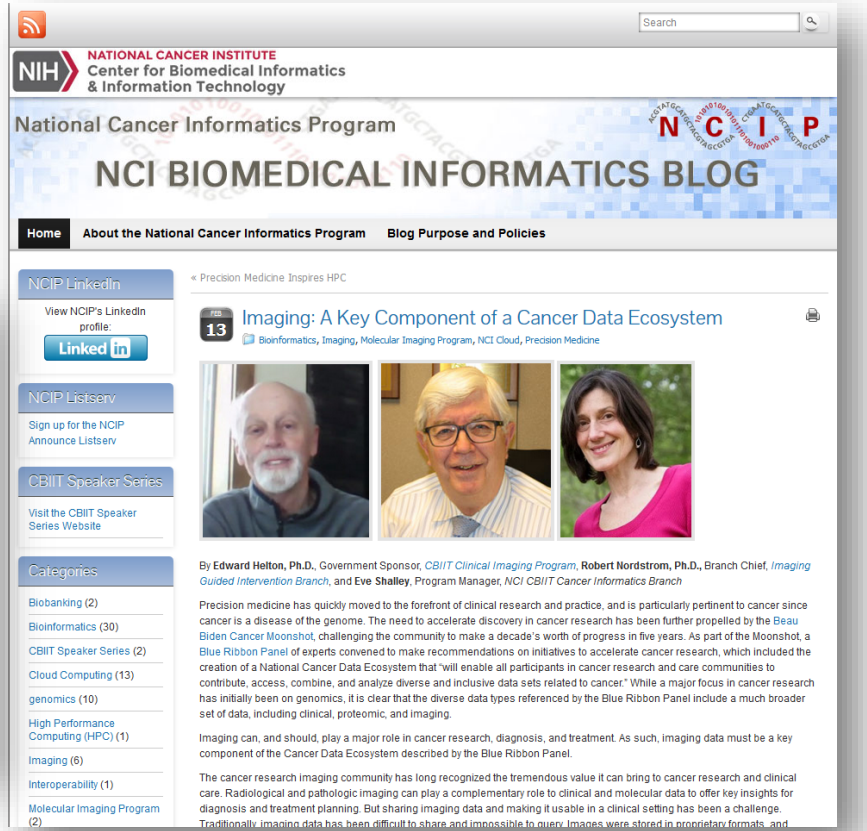
Vision

- Encourage innovation
- Adoption of imaging standards
- Incentivize and reward sharing
- Educate clinicians and ensure buy-in from them
- Educate technology transfer and legal departments
- Work towards flexible, extensible and integrated solutions
- Ensure data quality and veracity
- Use well-defined challenges

Blog & White Paper

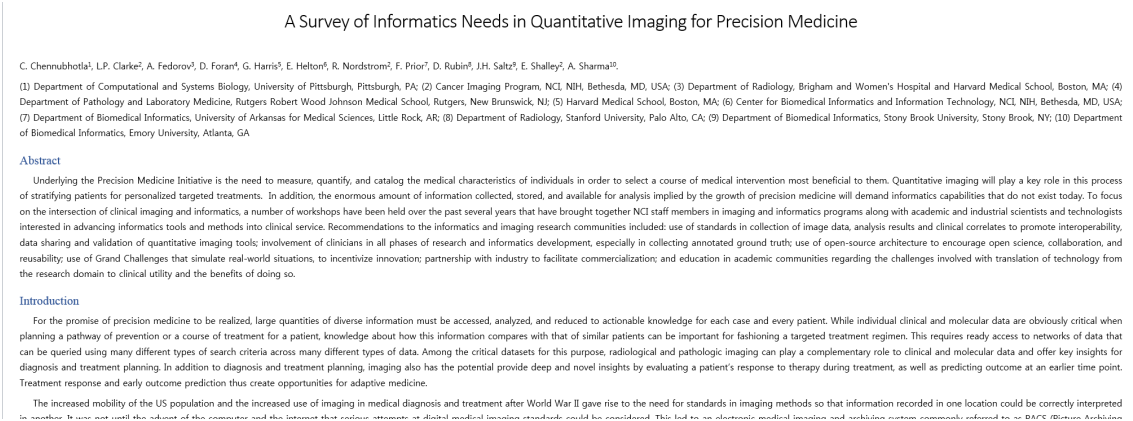
https://cbiit.nci.nih.gov/

Workshop Discussion:
Informatics Needs in Medical Imaging



Paper submitted

- Ashish Sharma, Emory University
- IMIA: International Medical Informatics Association
- Survey article. Part of an imaging section in their annual issue
  - By: Chuck Penn, William Hsu, and Soojin Park



A Survey of Informatics Needs in Quantitative Imaging for Precision Medicine

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Abstract

Underlying the Precision Medicine Initiative is the need to measure, quantify, and catalog the medical characteristics of individuals in order to select a course of medical intervention most beneficial to them. Quantitative imaging will play a key role in this process of stratifying patients for personalized targeted treatments. In addition, the enormous amount of information collected, stored, and available for analysis implied by the growth of precision medicine will demand informatics capabilities that do not exist today. To focus on the intersection of clinical imaging and informatics, a number of workshops have been held over the past several years that have brought together NCI staff members in imaging and informatics programs along with academic and industrial scientists and technologists interested in advancing informatics tools and methods into clinical service. Recommendations to the informatics and imaging research communities included: use of standards in collection of image data, analysis results and clinical correlates to promote interoperability, data sharing and validation of quantitative imaging tools; involvement of clinicians in all phases of research and informatics development, especially in collecting annotated ground truth; use of open-source architecture to encourage open science, collaboration, and reusability; use of Grand Challenges that simulate real-world situations, to incentivize innovation; partnership with industry to facilitate commercialization; and education in academic communities regarding the challenges involved with translation of technology from the research domain to clinical utility and the benefits of doing so.

Introduction

For the promise of precision medicine to be realized, large quantities of diverse information must be accessed, analyzed, and reduced to actionable knowledge for each case and every patient. While individual clinical and molecular data are obviously critical when planning a pathway of prevention or a course of treatment for a patient, knowledge about how this information compares with that of similar patients can be important for fashioning a targeted treatment regimen. This requires ready access to networks of data that can be queried using many different types of search criteria across many different types of data. Among the critical datasets for this purpose, radiological and pathologic imaging can play a complementary role to clinical and molecular data and offer key insights for diagnosis and treatment planning. In addition to diagnosis and treatment planning, imaging also has the potential provide deep and novel insights by evaluating a patient's response to therapy during treatment, as well as predicting outcome at an earlier time point. Treatment response and early outcome prediction thus create opportunities for adaptive medicine.

The increased mobility of the US population and the increased use of imaging in medical diagnosis and treatment after World War II gave rise to the need for standards in imaging methods so that information recorded in one location could be correctly interpreted

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