AbstractID: 14527 Title: Informatics Infrastructure for Quantitative Assessment of Cancer Treatment Response

There have been substantial advances in creating novel imaging platforms and quantitative imaging methods to provide accurate information about the status of patients with cancer. Quantitative imaging biomarkers promise improved sensitivity in assessing cancer treatment response and in identifying new therapeutics. These methods have tremendous potential to improve the accuracy and efficiency of cancer research; however, the lack of software infrastructure to enable validating and adopting these methods in cancer clinical trials hampers progress. Validating and using new quantitative imaging techniques is hindered by several challenges: (1) lack of tools to record quantitative imaging information about tumor burden reproducibly and efficiently in the clinical workflow; (2) lack of coordination and effective communication between oncologists and radiologists in making quantitative imaging assessments; (3) lack of integration of multiple different quantitative measures of tumor burden that, when taken together, would be more informative than individual indicators, and (4) lack of infrastructure to enable sharing of data derived from quantitative imaging methods among centers and data mining.

We are tackling these challenges with the goal of enabling cancer researchers to reproducibly measure tumor burden, to better assess the effectiveness of therapies in patient cohorts, potentially leading to shorter clinical trials, and to make the best treatment choices for individual cancer patients. Our work, being conducted as one of the research centers in NCI's new Quantitative Imaging Network (QIN), has four objectives: (1) to develop software infrastructure to harmonize data collection and analysis across different image viewing platforms, (2) to create tools leveraging caBIG technologies that permit comprehensive and reproducible assessment of the quantitative imaging features of tumor burden, and that will improve the coordination of radiologists and oncologists in collecting quantitative image data, (3) to develop methods to analyze quantitative image data to provide decision support, helping oncologists to evaluate and recognize whether a treatment is effective, and (4) to evaluate the utility of this infrastructure in prospective clinical trials, thereby demonstrating improvement in researchers' ability to assess response to treatment in patient cohorts and in individual patients.

As a result of this work, the oncology community will be able to share approaches to validating and standardizing imaging biomarkers and quantitative imaging measurements of tumor responses to cancer therapies, which in turn will lead to robust comparison of quantitative methods and to the identification of more accurate approaches for assessing tumor response. Ultimately, this work will enable translational research, accelerating incorporation of quantitative imaging methods into cancer research and improving patient care.

Learning Objectives:
1. Understand the opportunity and current limitations of quantitative imaging in cancer research.
2. Learn about new developments in imaging informatics to improve quantitative image-based assessment of cancer treatment response.
3. Recognize future opportunities of imaging informatics to use quantitative imaging for assessing new cancer therapies, optimizing treatment decisions, and personalizing patient care.