

NCI Programs in Image-Guided Cancer Interventions

Keyvan Farahani, PhD
Image-Guided Interventions Branch
Cancer Imaging Program

National Cancer Institute
Bethesda, MD

NCIGT 2011



Outline

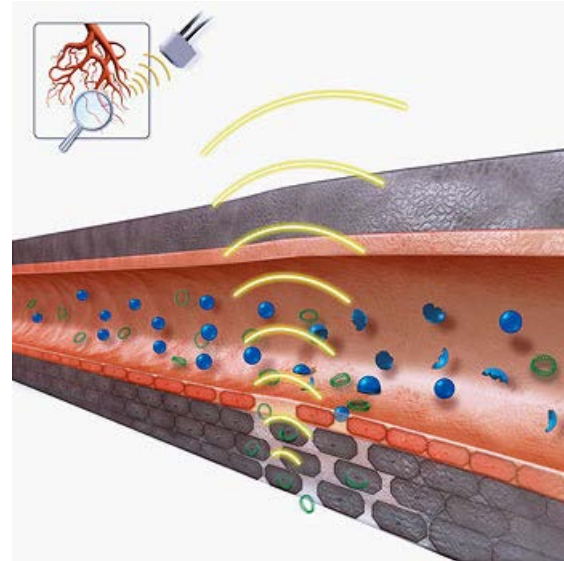
- 1. Image-Guided Drug Delivery (R01)**
- 2. Academic Industry Partnerships (R01)**
- 3. Early Phase Clinical Trials in Imaging and IGI (R21)**
- 4. Quantitative Imaging for Evaluation of Response to Cancer Therapies (U01)**
- 5. Small Business Grants (R43/R44; R41/R42)**

Image-Guided Interventions (IGI) Branch

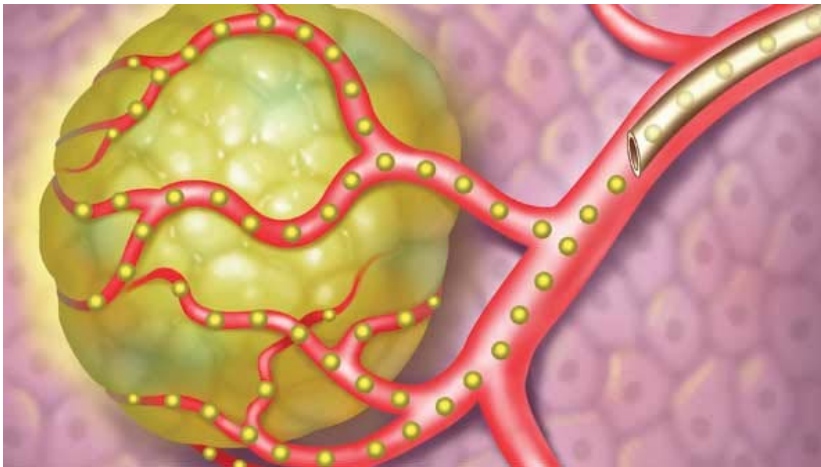
- **Mission: to promote and support the integration and validation of imaging and interventional oncologic treatments and their applications toward improved clinical management of cancer.**

Drug Delivery Systems

- **Focused Ultrasound**



- **Chemoembolization**



IG- Local Triggering of Drug Release

- **Temperature sensitive nanocarriers (*phase III & pre-*)**
- **Pressure sensitive microbubbles (*preclinical*)**
- **Ultrasound-induced tissue permeability (*preclinical*)**
- **FUS-induced ablation + microbubble cavitation (*preclinical*)**

Drug Delivery Systems

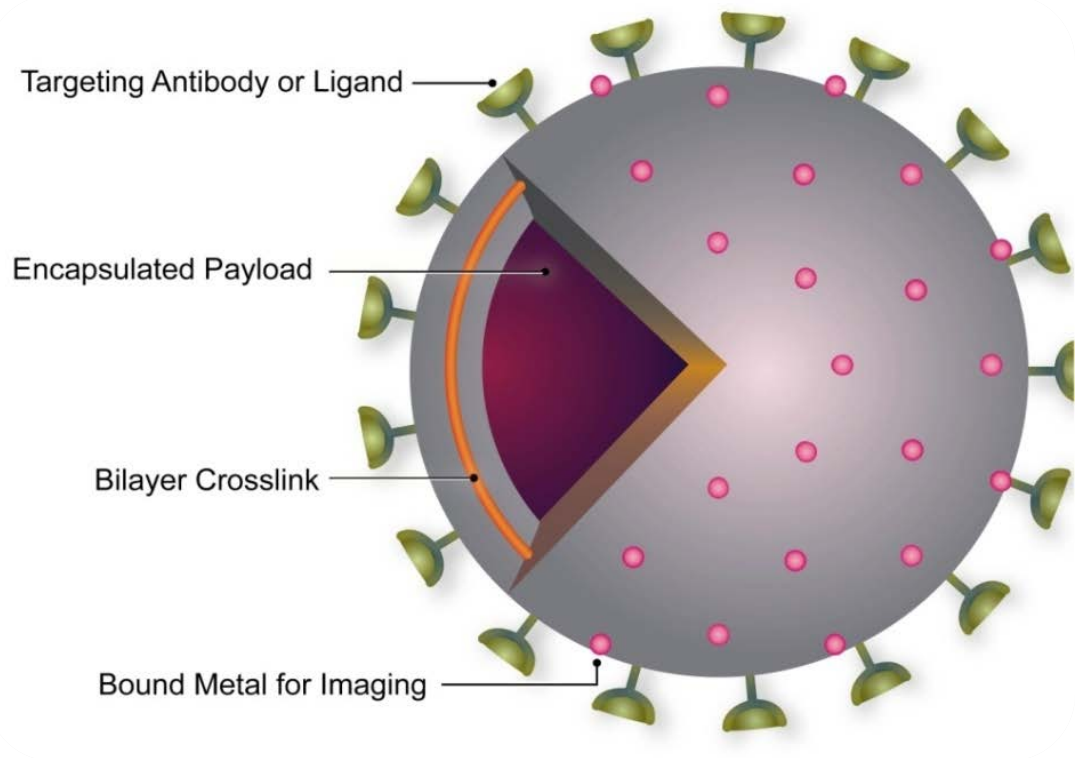
- **Nanocarrier platforms enable drug delivery**

- **Multifunctional**

- Contrast
- Drugs
- Targeting
- Activation

- **Multiplexed**

- Molecular signals
- Targeting
- Monitoring



Bound Metal for Imaging

IGDD Shifting Paradigms

- **Imaging as an enabling tool:**
 - **Biodistribution**
 - **Pharmacokinetics (PK)**
 - **Pharmacodynamics (PD)**
 - **Evaluation of response to therapy**

Image-Guided Drug Delivery (IGDD)

- A form of personalized therapy where imaging guides the target localization, controlled release, and monitoring of drug delivery.
- Goal: to optimize the therapeutic ratio.
- Requirements:
 - Drugs that can be imaged and possibly targeted
 - Mechanisms for controlled release and activation
 - Imaging: Anatomic / Physiologic / Molecular / Quantitative

Image-Guided Drug Delivery in Cancer (R01) – [PA-09-253]

- **First Receipt Date: Feb 5, 2010**
- **Expiration: May 8, 2013**
- **Single or Multiple PIs**
- **Reviews assigned to various Study Sections (CSR): MEDI, CMIP, GDD, RTB, NANO, etc.**

Goals of IGDD PA

- **Development of integrated platforms for multifunctional and multiplexed oncologic IGDD systems**
- **Development of quantitative in-vivo imaging methods in IGDD in cancer**
 - **interrogate tumor/drug interaction**
 - **imaging studies of biodistribution, PK/PD, Tx response**
 - **perform imaging studies in non-human primates or large animal models for toxicity screening**

Academic-Industrial Partnerships (R01) – [PAR-10-169]

- **Purpose: Development and Validation of Imaging Systems and Methods**
- **Requires Partnership between academic and industrial Co-Pis**
- **Includes investigations of IGI-systems**
- **Standard R01 Application Receipt Dates**
- **SEP Review (CSR)**

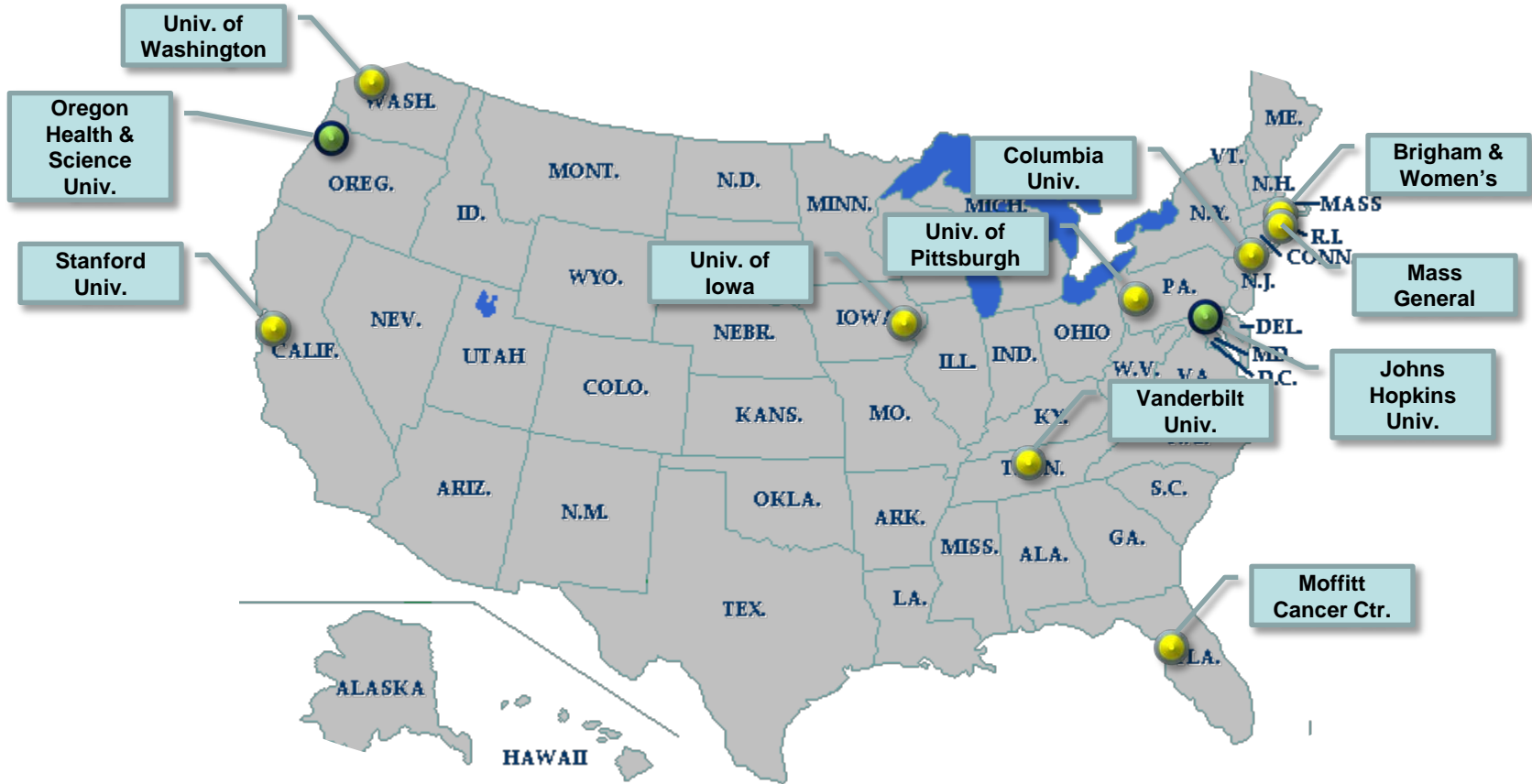
Early Phase Clinical Trials in Imaging & IGI (R21) - [PAR-11-216]

- **Quick (2 yr) clinical trials of novel imaging and IGI**
- **Intended to accelerate the development of imaging and IGI modalities, methodologies, and agents through the early stages of clinical development - such as trials evaluating safety and preliminary efficacy**
- **Phase I & II studies to establish treatment parameters and early therapeutic efficacy**
- **SEP Review (CSR)**

Quantitative Imaging for Evaluation of Response to Cancer Therapies (U01) – [PAR-11-150]

- **Quantitative imaging of response to therapies, including IGI, to facilitate clinical decision making**
- **Development and implementation of QI methods and tools and their applications to current or pending Phase I/II clinical trials**
- **Funded teams join the Quantitative Imaging Network (QIN)**

The QIN Map (Q2-2011)



QIN Working Groups

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

Image-Guided Cancer Interventions

PA-10-079 (SBIR); PA-10-080 (STTR)

- **Development and optimization of integrated cancer imaging and therapy systems**
- **Validation of integrated IGI systems through clinical evaluations**
 - Phase I: up to 2 years**
Total costs: \$150,000 per year
 - Phase II: up to 3 years**
**Total Costs: \$1,000,000 (clinical studies),
\$750,000 (otherwise)**

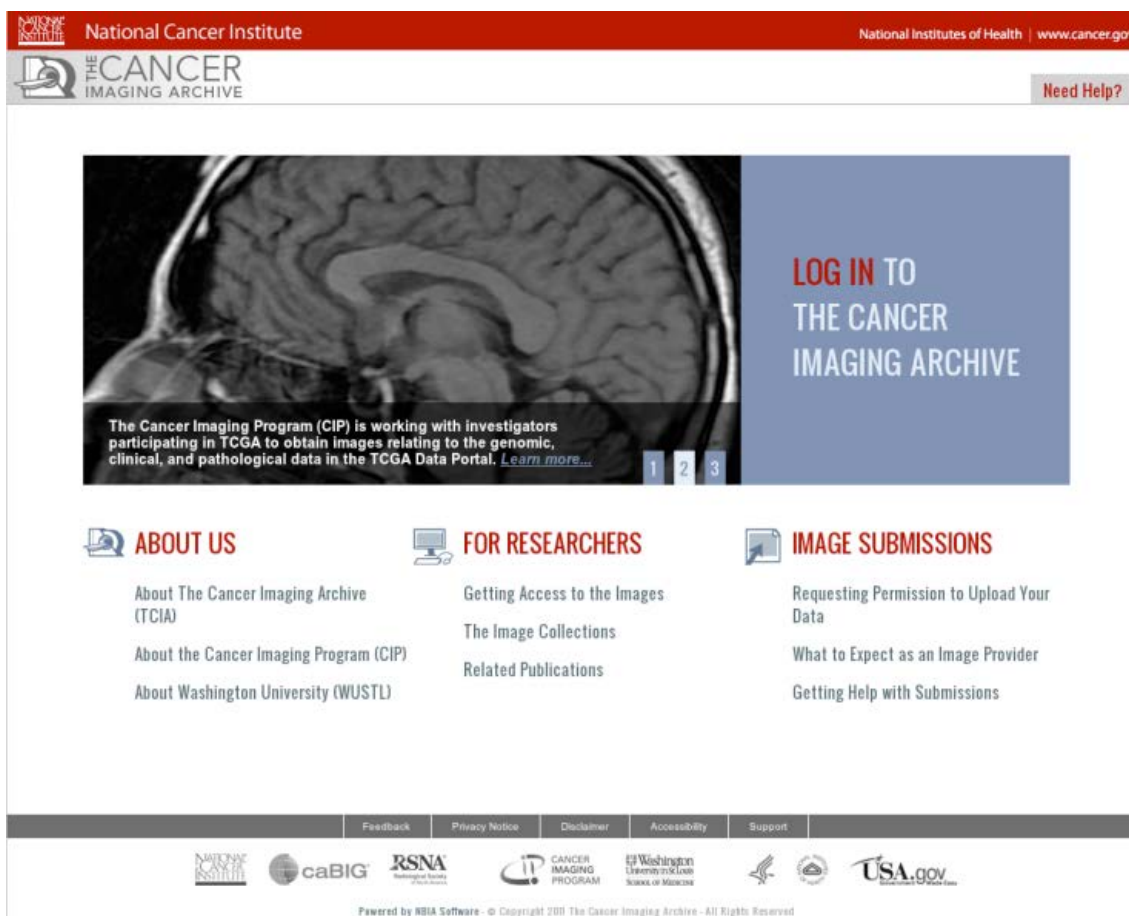
Other Initiatives

- **Bioengineering Research Funding Opportunities**
 - Exploratory Bioengineering Research Grants (EBRG) – PA-10-010
 - Bioengineering Research Grants (BRG) – PA-10-009
 - Bioengineering Research Partnerships (BRP) – PAR-10-234

- **Innovations in Biomedical Computational Science & Technology**
 - R21: PAR-09-219
 - R01: PAR-09-218
 - SBIR: PAR-09-220
 - STTR: PAR-09-221

TCIA: The Cancer Imaging Archive

<http://cancerimagingarchive.net>



The screenshot shows the homepage of the Cancer Imaging Archive (TCIA). At the top, there is a red navigation bar with the National Cancer Institute logo and the text "National Cancer Institute" on the left, and "National Institutes of Health | www.cancer.gov" on the right. Below this is a grey header with the TCIA logo and a "Need Help?" button. The main content area features a large image of a brain MRI scan on the left and a blue box on the right with the text "LOG IN TO THE CANCER IMAGING ARCHIVE". Below the MRI image is a text box stating: "The Cancer Imaging Program (CIP) is working with investigators participating in TCGA to obtain images relating to the genomic, clinical, and pathological data in the TCGA Data Portal. [Learn more...](#)". Below this are three numbered tabs (1, 2, 3). The main navigation area is divided into three columns: "ABOUT US" (with a magnifying glass icon), "FOR RESEARCHERS" (with a computer icon), and "IMAGE SUBMISSIONS" (with a document icon). Each column lists several links. At the bottom, there is a dark grey footer with links for "Feedback", "Privacy Notice", "Disclaimer", "Accessibility", and "Support". Below the footer are logos for the National Cancer Institute, caBIG, RSNA, Cancer Imaging Program, University of Washington School of Medicine, and USA.GOV. At the very bottom, a small line of text reads: "Powered by NBIA Software - © Copyright 2011 The Cancer Imaging Archive - All Rights Reserved".

National Cancer Institute National Institutes of Health | www.cancer.gov

THE CANCER IMAGING ARCHIVE Need Help?

LOG IN TO THE CANCER IMAGING ARCHIVE

The Cancer Imaging Program (CIP) is working with investigators participating in TCGA to obtain images relating to the genomic, clinical, and pathological data in the TCGA Data Portal. [Learn more...](#)

1 2 3

ABOUT US

- About The Cancer Imaging Archive (TCIA)
- About the Cancer Imaging Program (CIP)
- About Washington University (WUSTL)

FOR RESEARCHERS

- Getting Access to the Images
- The Image Collections
- Related Publications

IMAGE SUBMISSIONS

- Requesting Permission to Upload Your Data
- What to Expect as an Image Provider
- Getting Help with Submissions

Feedback Privacy Notice Disclaimer Accessibility Support

NATIONAL CANCER INSTITUTE caBIG RSNA CANCER IMAGING PROGRAM UNIVERSITY OF WASHINGTON SCHOOL OF MEDICINE USA.GOV

Powered by NBIA Software - © Copyright 2011 The Cancer Imaging Archive - All Rights Reserved

TCIA: The Cancer Imaging Archive

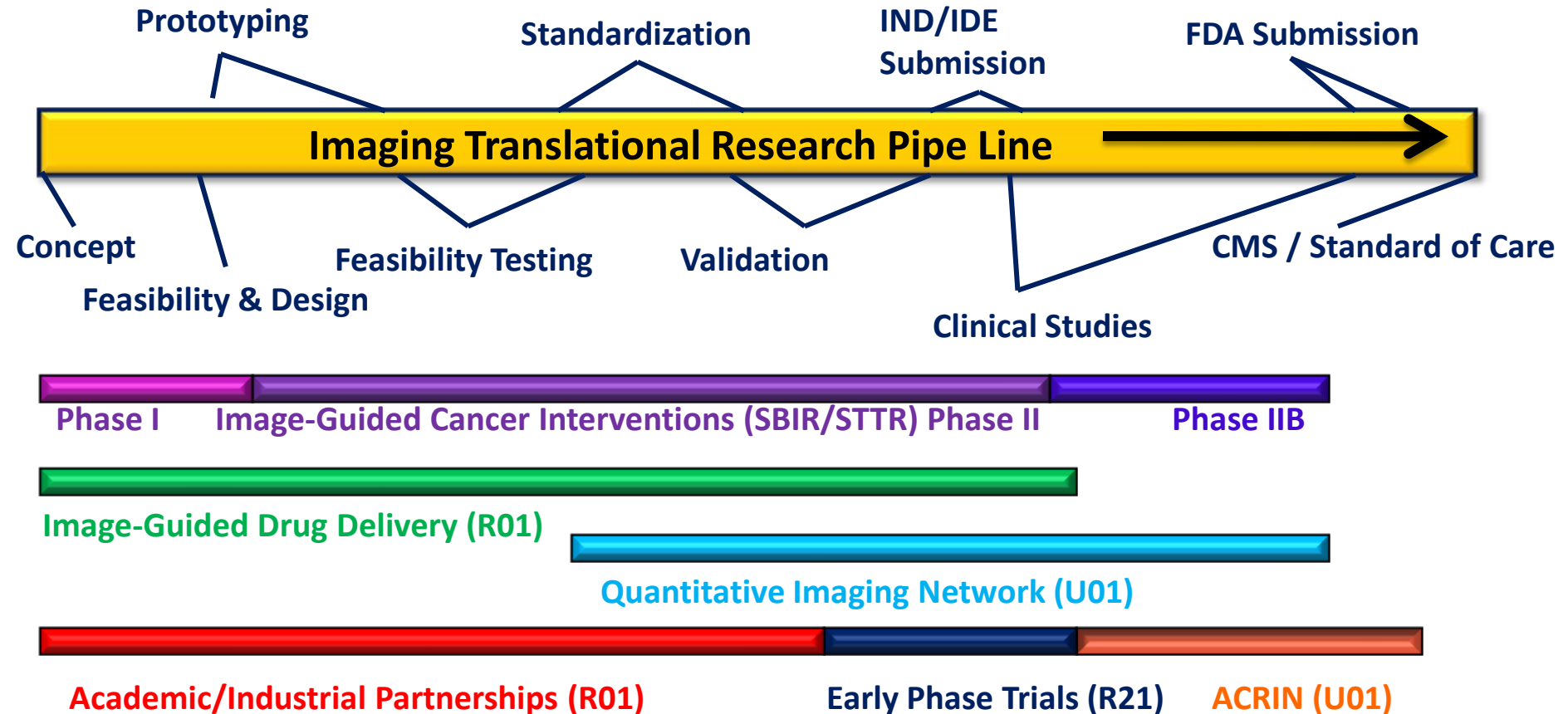
Funded by CIP/NCI, is a large archive of clinical images of cancer accessible for download.

TCIA de-identifies, organizes, and catalogs the images for use by the research community.

The archive is already home to high value data sets including a growing collection of cases that have been characterized in the Cancer Genome Atlas (TCGA)

<http://cancerimagingarchive.net>

Translational Research Support



Shifting Paradigms

Imaging

- Early detection
- Characterization
- Treatment
- Follow-up

Lower and focused
energy or drug dosing for
improved
safety & efficacy

Macro Anatomy

Micro Anatomy
Biochemical

Systemic

Targeted

Therapy

Contact Information:

Keyvan Farahani, PhD

farahani@nih.gov

(301) 451 2651

<http://imaging.cancer.gov>