

Emerging Role of CIRP in Cancer Research

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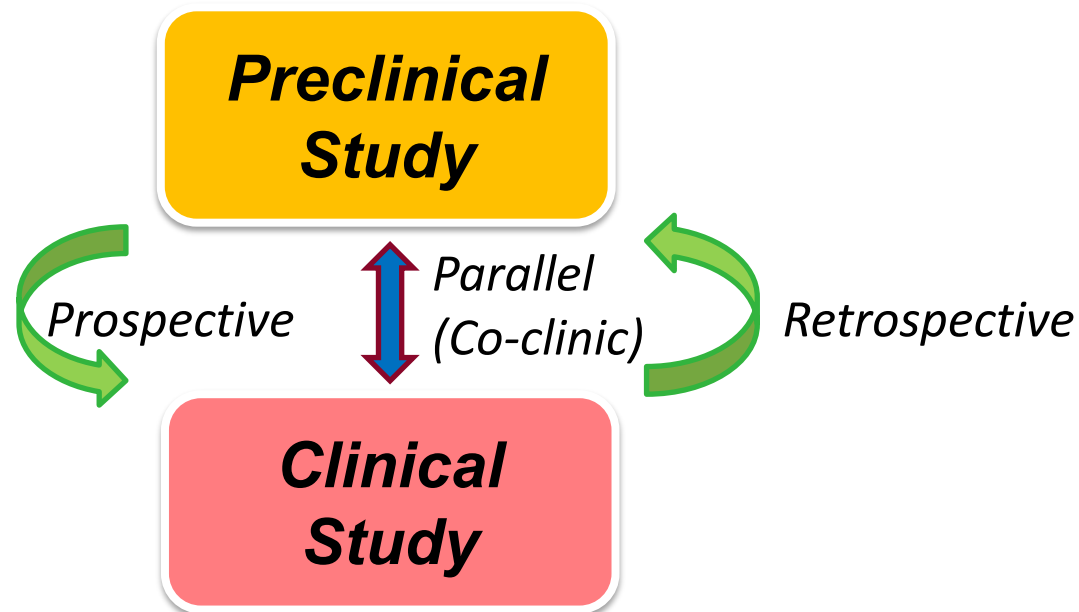
Scope of presentation

- Scientific rationale**
- About PAR-16-385**
- CIRP organization**
- Outreach and leveraging**

Scientific Rationale

Rationale

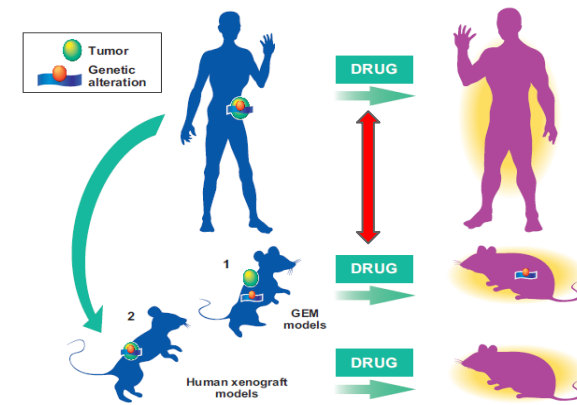
- ❑ Precision medicine requires better animal models & novel research,
- ❑ Preclinical study is linked to clinic study via multiple pathways,
- ❑ Quantitative imaging (QI) as a non-invasive tool.



Collins FS, and Varmus H, *A new initiative on precision medicine*, NEJM, 372:793 (2015)

Background

Co-clinical trials: investigations in patients and in parallel (or sequentially) in mouse or human-in-mouse models (GEMMs or PDXs) of cancer that mirror the genetic and biology of the patients malignancies or precancerous lesions.



Nardella et al, Cancer Discovery 2011:1:108

Progresses:

2009: NCI U01s: *Integration of Mouse Models into Human Cancer Research*,

2012: first co-clinical trial report on NSCLC,

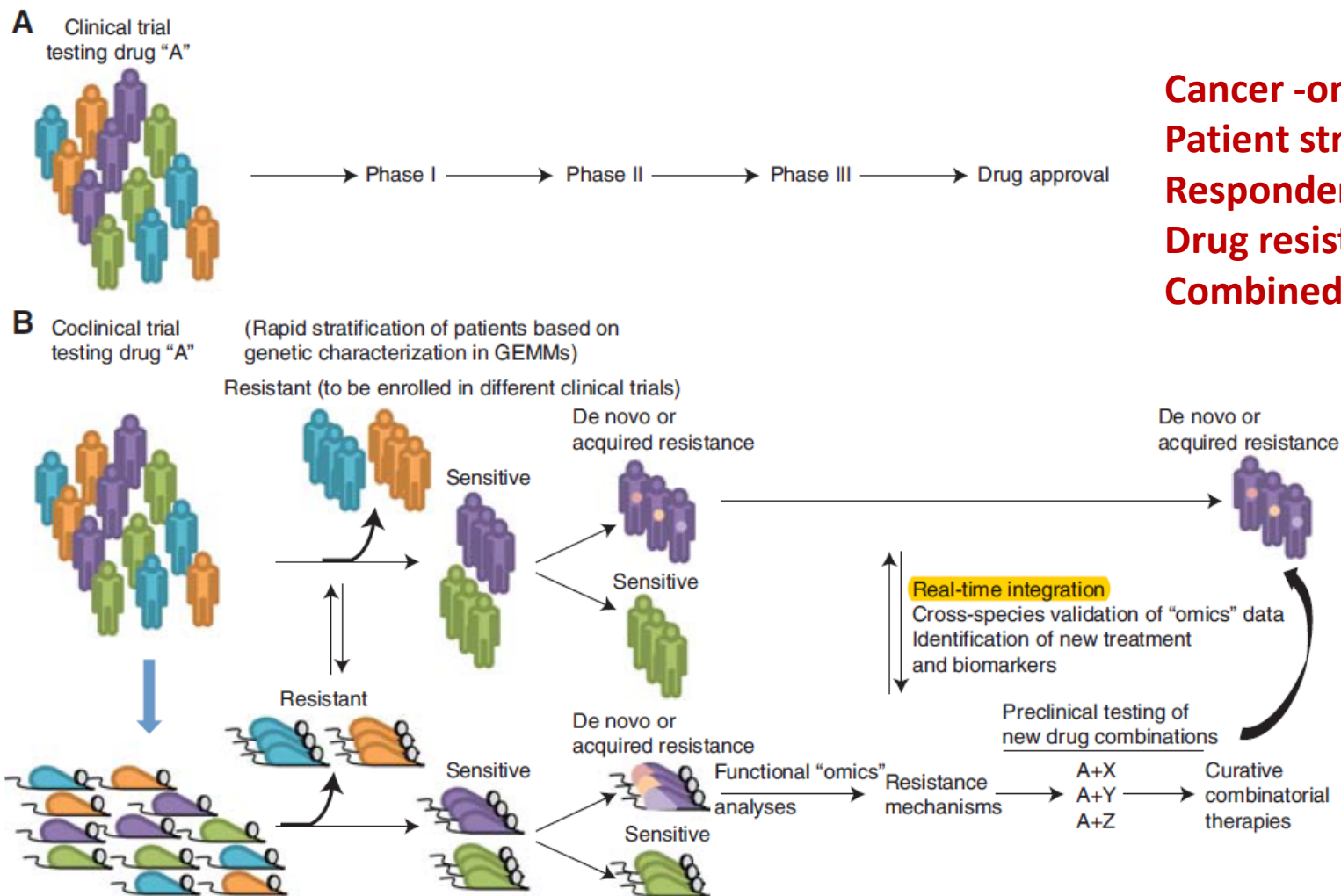
2015: NCI U24s: Co-clinical Imaging research resources, [PAR-16-385](#),

2018: NCI U24s reissued: Co-clinical Imaging research resources.

Related resources: NCI patient-Derived Models Repository, EurOPDX consortium, IMODI consortium (France), Co-clinical trials centers, mouse hospitals.

NCI initiatives: PDXnet (2017), Biological comparison of PDXs (2016),

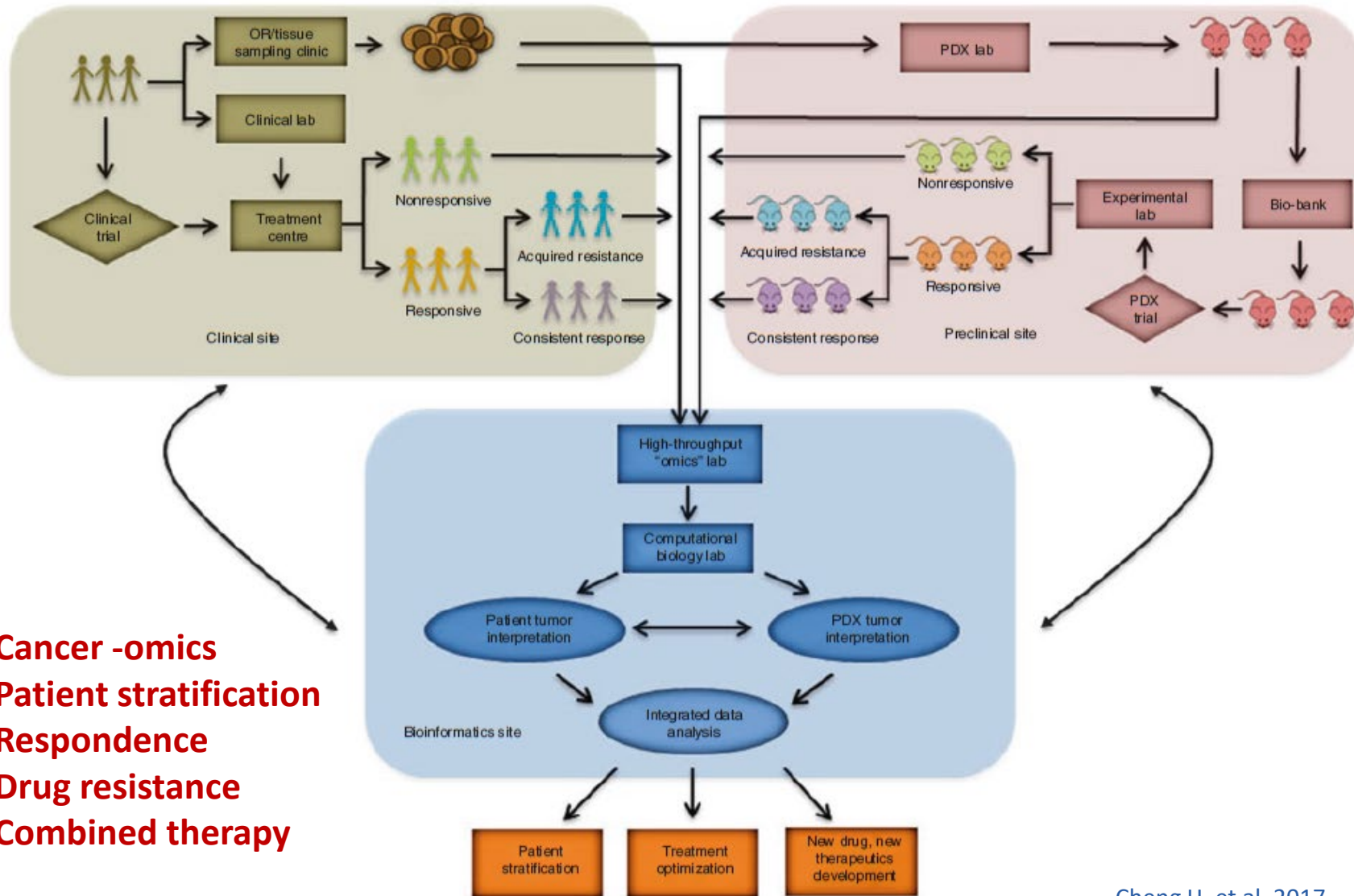
GEMMs-based co-clinical trial platform



Cancer -omics
Patient stratification
Response
Drug resistance
Combined therapy

Chen M, et al, Code Spring Harb Perspect Med, 2017

PDX-based co-clinical trial platform



Cheng H, et al, 2017

Problem and opportunity

- ❑ **Pre-clinical imaging methods are definitely non-standardized**
 - Methods (time, modality, animal issues)
 - Output data file formats, image processing
 - Comparison/conversion to clinical methods
- ❑ **Quality studies now need dedicated physicists**
 - Few biological laboratories have one
 - “Physicist-free” but reliable/reproducible methods needed
- ❑ **Sophisticated mouse models of human tumors can best help develop targeted therapeutics**
- ❑ **Resources needed to develop this area**

About PAR-16-385

Scientific direction

Develop co-clinical imaging research resources that will encourage a consensus on how quantitative imaging (QI) methods are optimized to improve the quality of imaging results for co-clinical trials:

- ❑ Use clinical available QI methods,
- ❑ Optimize these QI methods at preclinical setting.

Four essential elements

❑ Co-clinical interventions:

Known intervention
Therapeutic or prevention
Prospective or retrospective

❑ GEMMs or PDXs models:

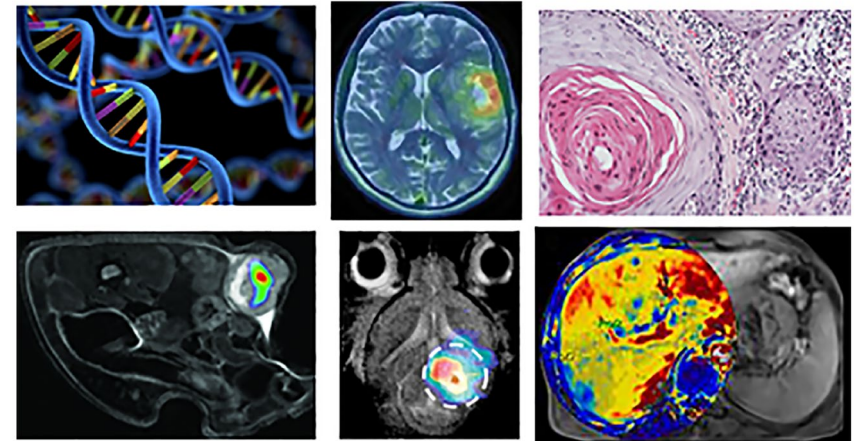
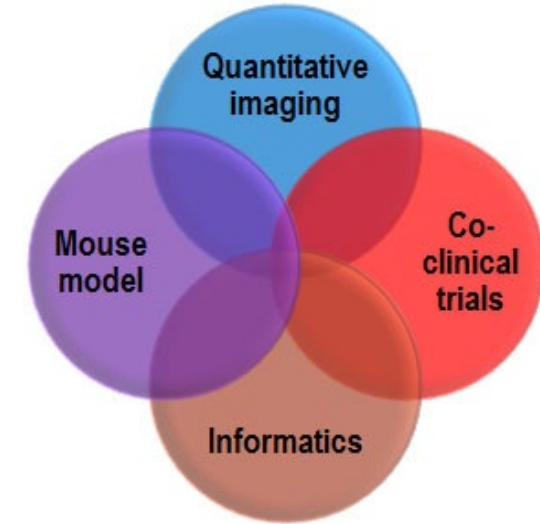
Mice, available, credentialed, validated

❑ Quantitative imaging:

Preclinical identical to clinic one
New methods require IND or IDE
User developed software tools allowed

❑ State-of-art informatics:

Encourage data integration
Encourage to use TCIA, NCIP hub
Encourage to contribute to OMF, QIN, EDRN, etc.



Deliverable

Demonstrate the *functionality* of a web-accessible resource before the 3rd quarter of year 5 :

❑ **Web-accessible functional information:**

- Co-clinical imaging data
- Methods & software tools
- Workflow documentations
- Results from co-clinical investigations

❑ **Demonstrating the functionality:**

- Strategy to create the resource
- Accessibility by research community,
- Permitting research community to use and improve the proposed QI methods
- Software challenge

This is a U24 mechanism

This is a resource program, not a R01,

- Research on improvement of the capability of resources,
- Provide resource to serve biomedical research.

This is an “assistance” mechanism, not an “acquisition” mechanism,

This is a cooperative agreement, not a grant:

- Substantial programmatic involvement with the awardees is anticipated.
- Your institution and program staff will work jointly in a partnership role with program staff.

Investigators responsibilities

- ❑ Organization and scientific direction,
- ❑ Identification of problems and implementation of corrective action,
- ❑ Monitor and report actual progress annually,
- ❑ Participate on the Steering Committee, other cross team Working Groups in scheduled teleconference meetings, and annual meetings,
- ❑ Abide by the decisions of the Steering Committee.

Program responsibilities

- ❑ Participate on the Steering Committee,
- ❑ Coordinate and facilitate the management of network and WGs,
- ❑ Assist in explore network wide consensus approaches,
- ❑ Make recommendation on setting specific research milestones to be met yearly,
- ❑ Reviewing the progress of the individual teams and the network.

CIRP teams: to be growing

Washington University School of Medicine in St. Louis

Co-Clinical Imaging Research Resource (C2IR2)

HOME ABOUT RESEARCH SOP DIRECTORY DATA REPOSITORY CONTACT US

Welcome to the Co-Clinical Imaging Research Resource

The objective of the C2IR2 is to develop, optimize, and implement quantitative imaging (QI) methodologies to advance the science and clinical practice of precision medicine.

About the C2IR2

What Can I Find On This Site?

- Standard Operating Procedures**
Data collection and operational procedures for three resource cores will be made available here: Preclinical Imaging, Co-Clinical Imaging, and Clinical Imaging.
- Supported Co-Clinical Trial Projects**
The C2IR2 works in tandem with co-clinical research projects such as the Co-Clinical Trial in Triple Negative Breast Cancer.
- Publications and Data**
As publications and public study data become available, the C2IR2 will publish or link to those resources here.

WUSTL: Kooresh Shoghi

Multi-parametric MRI & FDG-PET

Hybrid PET/MRI

TNBC co-clinical trial neoadjuvant treatment

PDXs Models

The Duke Preclinical Research Resources for Quantitative Imaging Biomarkers

Center for In Vivo Microscopy

HOME SPECIFIC AIMS TEAM SIGNIFICANCE MICRO-CT MRI FUNDING SHARED DATA

Welcome to Duke Preclinical QIBA!

Posted on October 1, 2017 | 1 comment

Quantitative imaging approaches have been standardized at clinical levels by the Quantitative Imaging Biomarkers Alliance (QIBA), but standards for preclinical imaging do not exist. Compared to clinical (human) imaging, the technical challenges are significantly more difficult (due to both higher spatial resolution and cardio-respiratory motion) for the optimization of mouse model quantitative imaging.

The goal of this project is to design, optimize, and apply preclinical quantitative imaging with micro-MRI and micro-CT to support a multi-institutional phase II randomized sarcoma treatment clinical trial.

Posted in Uncategorized | Comment

Duke: Cristian Badea

Micro-MRI & micro-CT

Stand-alone micro-MRI, micro-CT

Soft tissue sarcoma co-clinical trials

Immune checkpoint inhibitors & RT

GEMMs model



CIRP Organization

CIRP organization

Structure:

- ❑ Steering Committee
- ❑ Working Groups

Objectives:

- ❑ Explore how to develop best means for design and implement QIs for co-clinical trials,
- ❑ Develop web-accessible research resources,
- ❑ Outreach strategies to research community
- ❑ Interact with OMF to ensure credentialed and validated mouse models are employed,
- ❑ Interact with QIN on best practices for QIs,
- ❑ Plan annual meetings, joint meeting with OMF, and/or QIN.

Steering Committee

- Two representatives from each team: two votes,
- Program representation: three program staff: 1 combined vote,
- Rotating annual chair,
- Other may be invited to participate, depending on the subject,

Working Groups

- ❑ **Three directions:**
 - Animal models and co-clinical trials
 - Imaging acquisition and data process
 - Informatics and outreach
- ❑ **Provide “open science” means to address common issues,**
- ❑ **Network-wide groups,**
 - Each team contributes members to each working group
- ❑ **Develop consensus on guidelines and standards.**

Communications

- ❑ Scheduled teleconferences
- ❑ Face-to-face meetings
- ❑ Consensus documents
- ❑ CIRP Hub

Co-Clinical Imaging Research Resources Program Network (CIRP) [cirphub]

Overview Members Resources Forum Projects Calendar Announcements Activity

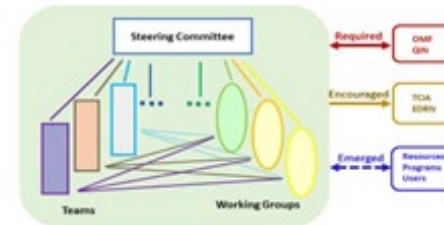
About CIRP

The Co-Clinical Imaging Research Resources Program network (CIRP) is based on a trans-NCI initiative (PBAR-16-385), which invites Cooperative Agreement applications to develop research resources that will encourage a consensus on how quantitative imaging methods are optimized to improve the quality of imaging results for co-clinical trials. Projects include optimization of pre-clinical quantitative imaging methods, implementation in co-clinical trials, and creating a web-accessible research resource that contains all the data, methods, workflow documentation, and results collected from cancer therapeutic or prevention co-clinical investigations. To achieve the goals of the CIRP, applicants are encouraged to organize multi-disciplinary teams with experience in mouse models research, human investigations, imaging platforms, quantitative imaging methods, decision support software and informatics to populate the research resource. Each resource contains four essential elements: animal models, co-clinical trials, quantitative imaging, and informatics.

Four essential elements



Network Structure



Teams

Washington University at St Louis, Koorosh Shoghi (kshoghi@wustl.edu)
Duke University, Cristian Badea (Cristian.Badea@duke.edu)

Team websites

Washington University at St Louis: <https://c2ir2.wustl.edu/>



Duke University: <https://sites.duke.edu/cirphub/>



Application info

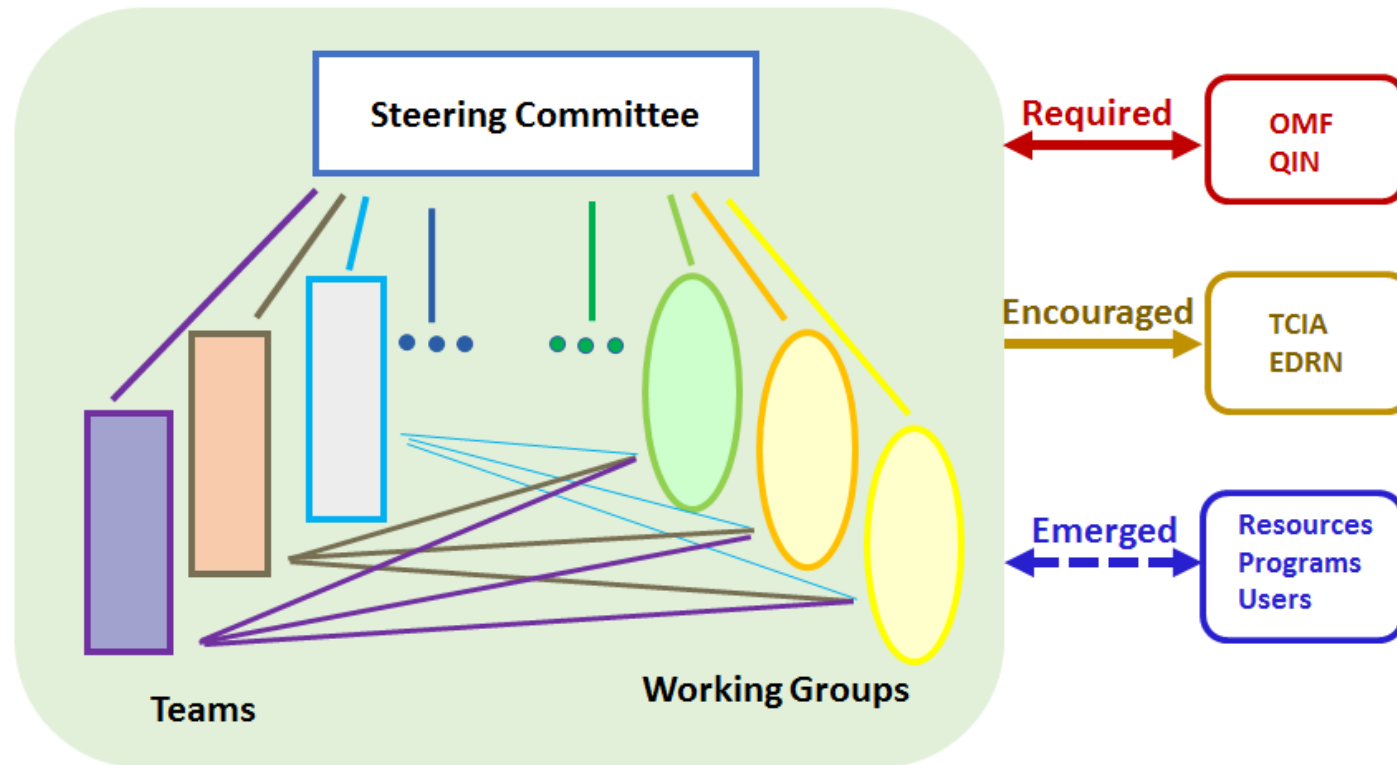
1. Pre-submission consultation template
2. FAQ



Outreach & Leveraging

CIRP outreach

- ❑ To ensure Best practices for every CIRP element
- ❑ To address unmet need in cancer community
- ❑ To provide better support to cancer research
- ❑ More...



Related NCI programs & resources

OMF

EDRN

PDMR

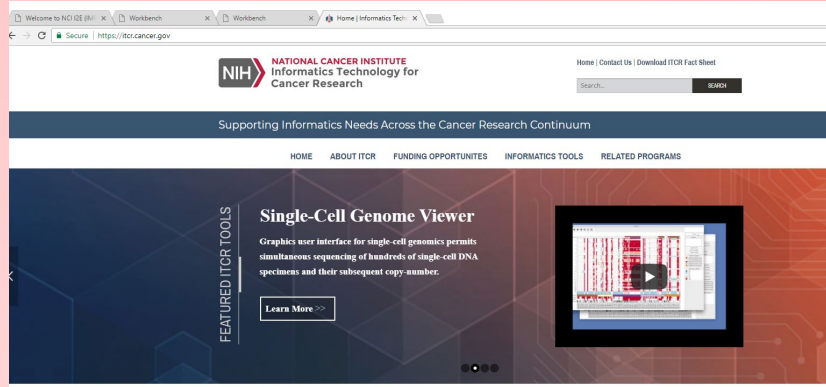
QIN

TCIA

Collection	Cancer Type	Modalities	Subjects	Location	Metadata	Access	Status	Updated
CTCAC-CCBCC	Clear Cell Carcinoma	CT	5	Kidney	Yes	Public	Ongoing	2018/02/13
CTCAC-CM	Cataplasma Malignoma	CT	1	Brain	Yes	Public	Ongoing	2018/02/13
CTCAC-GBM	Glioblastoma Multiforme	CT, MR, PT	16	Brain	Yes	Public	Ongoing	2018/02/13

Potential informatics tools: Adoption? Development?

Informatics Technology for Cancer Research (ITCR) program



Network (U01s,U24s)
&
Funding opportunities

<https://itcr.cancer.gov/>

FUNDING OPPORTUNITIES

ITCR has issued four Funding Opportunity Announcements aimed at successive stages of informatics technology development.



Algorithm Development

PAR-15-334 Development of Innovative Informatics Methods and Algorithms for Cancer Research and Management (R21)

[Read More >>](#)



Prototyping & Hardening

PAR-15-332 Early-Stage Development of Informatics Technologies for Cancer Research and Management (U01)

[Read More >>](#)



Enhancement & Dissemination

PAR-15-331 Advanced Development of Informatics Technologies for Cancer Research and Management (U24)

[Read More >>](#)

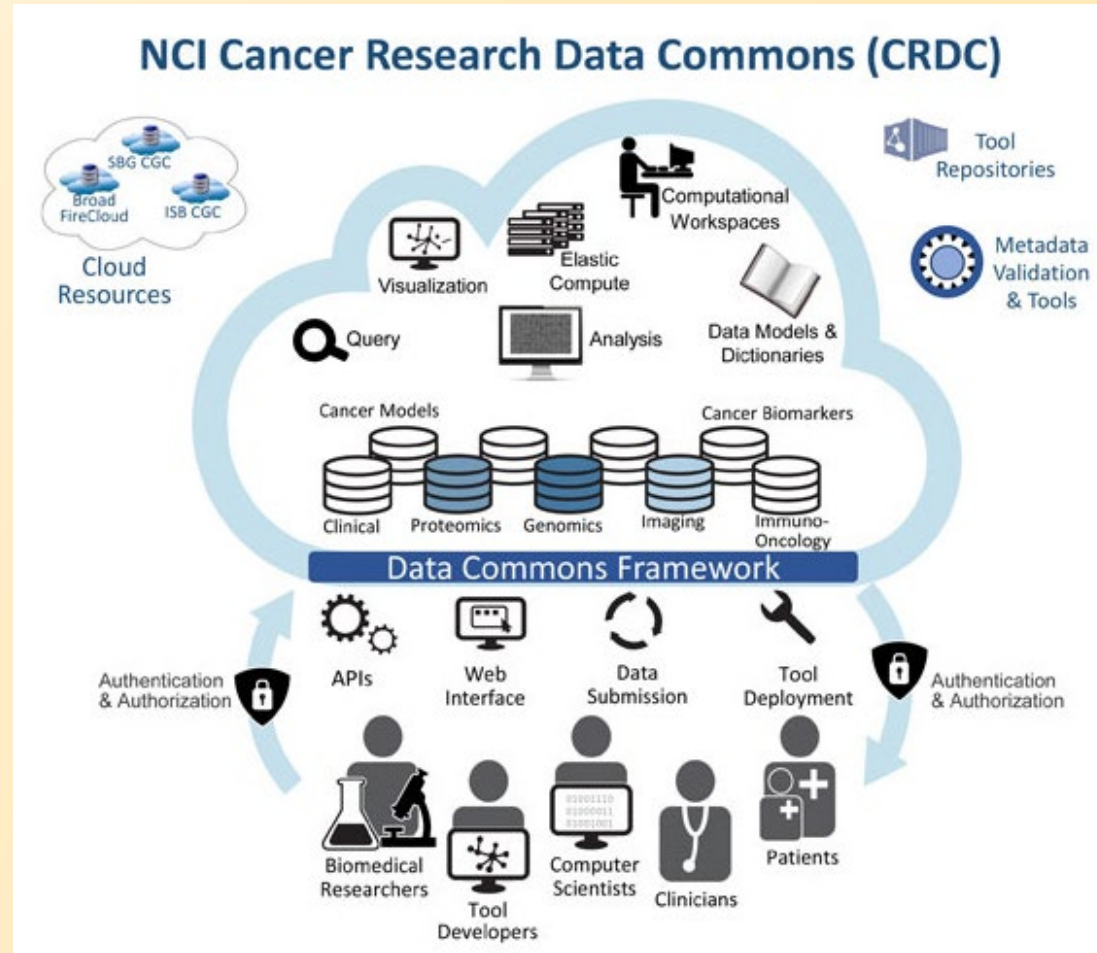


Sustainment

PAR-15-333 Sustained Support for Informatics Resources for Cancer Research and Management (U24)

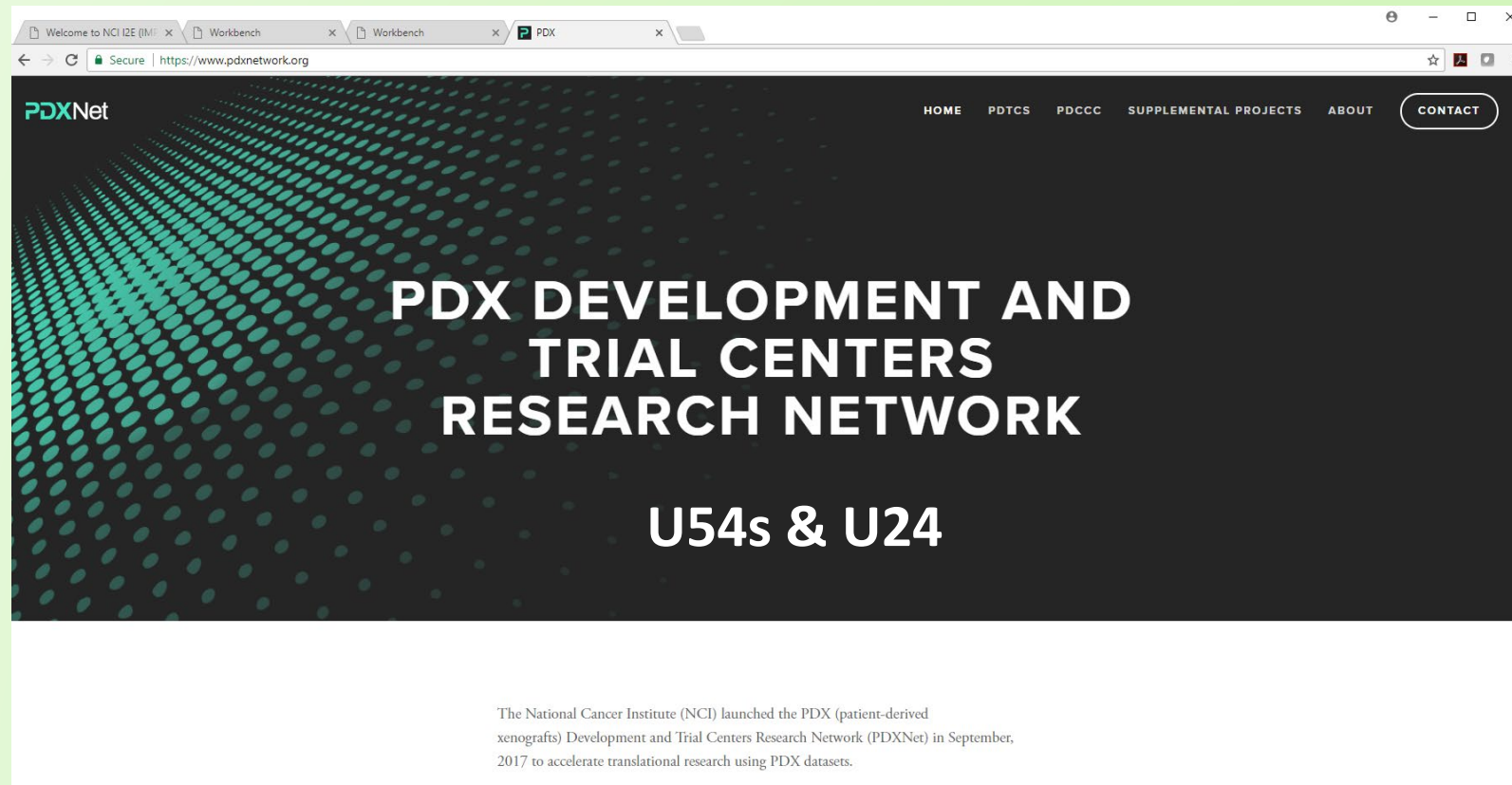
[Read More >>](#)

Data storage & achieving: Coming on the horizon...



<https://cbiit.cancer.gov/ncip/cancer-data-commons>

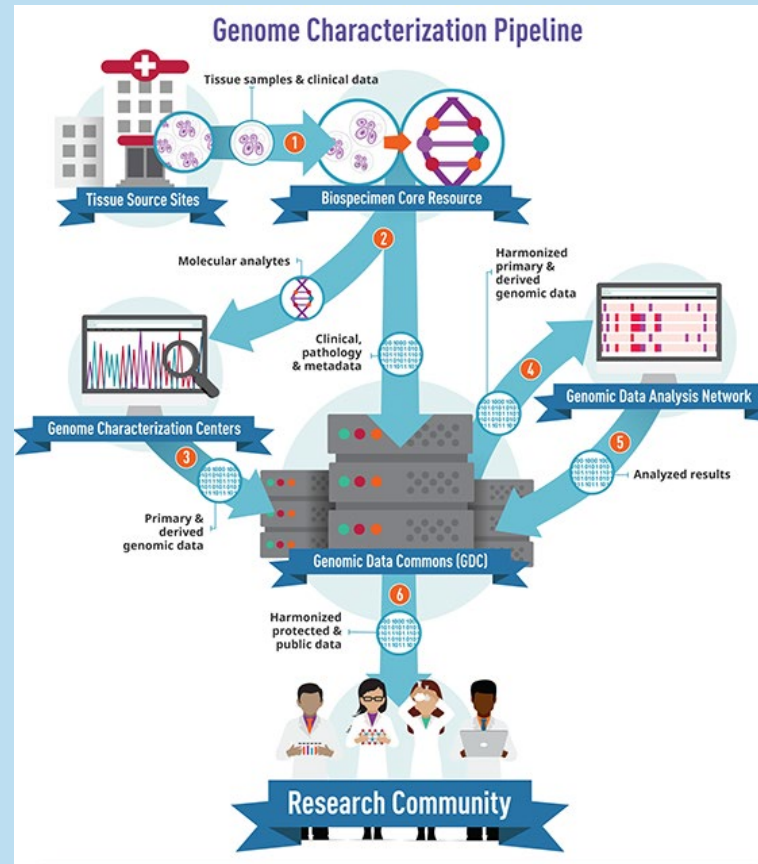
Unmet needs from cancer community: Potential users . . .



<https://www.pdxnetwork.org/>

Cancer -omics standards: Adoption? Implementation?

Genomic Data Analysis Network Centers (GDAN) U24s



<https://www.cancer.gov/about-nci/organization/ccg/funding>

Summary

- ❑ Co-clinical quantitative imaging is emerging into cancer research as essential non-invasive tools,
- ❑ CIRP encourages a consensus on how quantitative imaging methods are optimized to improve the quality of imaging results,
- ❑ CIRP will leverage standards or progress achieved by other existing NCI resources and programs to reaffirm best practices in every CIRP element,
- ❑ CIRP will outreach to broad cancer community to address emerging unmet needs,
- ❑ CIRP will outreach to potential users to provide better support to cancer research.

URLs for Reference

1. CIRP hub: <https://nciphub.org/groups/cirphub>
2. OMF: <http://oncologymodels.org/>
3. QIN:
https://imaging.cancer.gov/programs_resources/specialized_initiatives/qin/about/default.htm
4. TCIA: https://imaging.cancer.gov/informatics/cancer_imaging_archive.htm
5. EDRN: <https://edrn.nci.nih.gov/>
6. PDMR: <https://pdmr.cancer.gov/models/database.htm>
7. CBIIT Research Data Commons: <https://cbiit.cancer.gov/ncip/cancer-data-commons>
8. PDXnet: <https://www.pdxnetwork.org/>
9. GDAN: <https://www.cancer.gov/about-nci/organization/ccg/funding/>
10. ITCR: <https://itcr.cancer.gov/>



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www.cancer.gov

www.cancer.gov/espanol