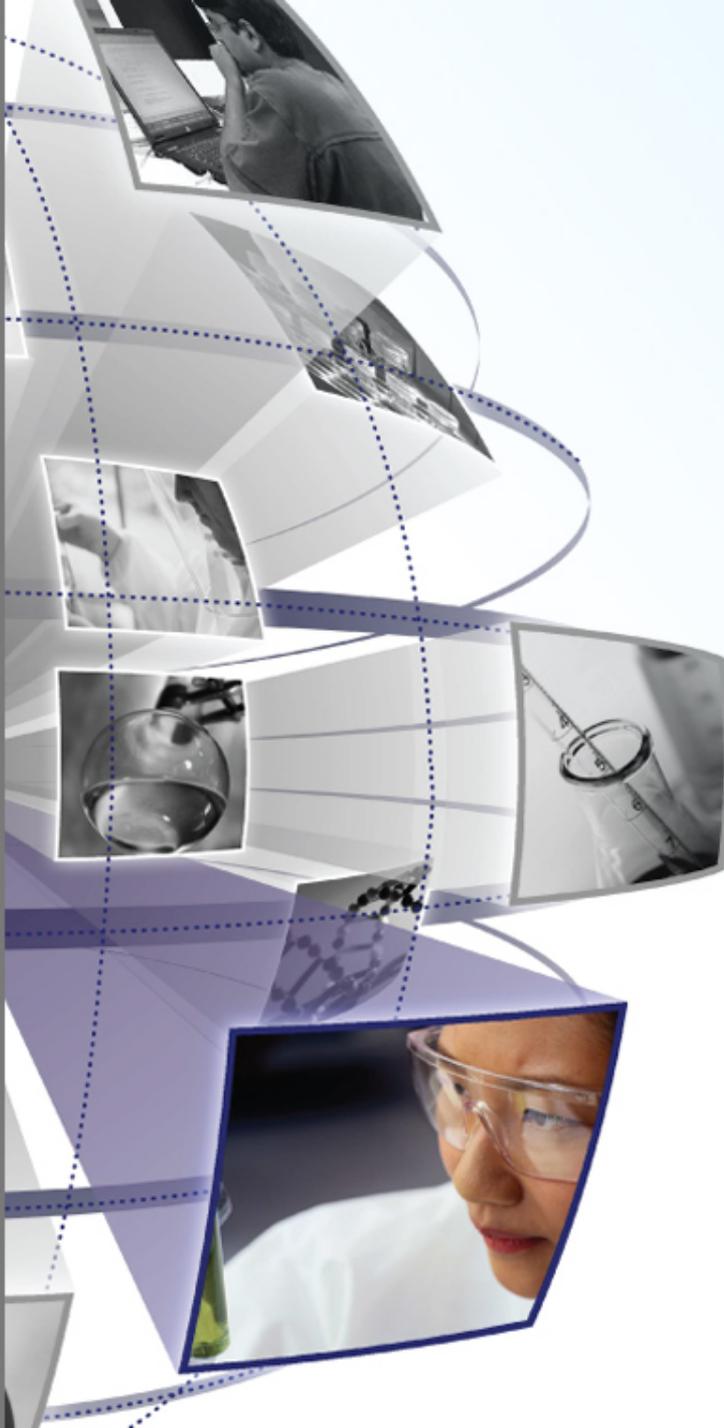




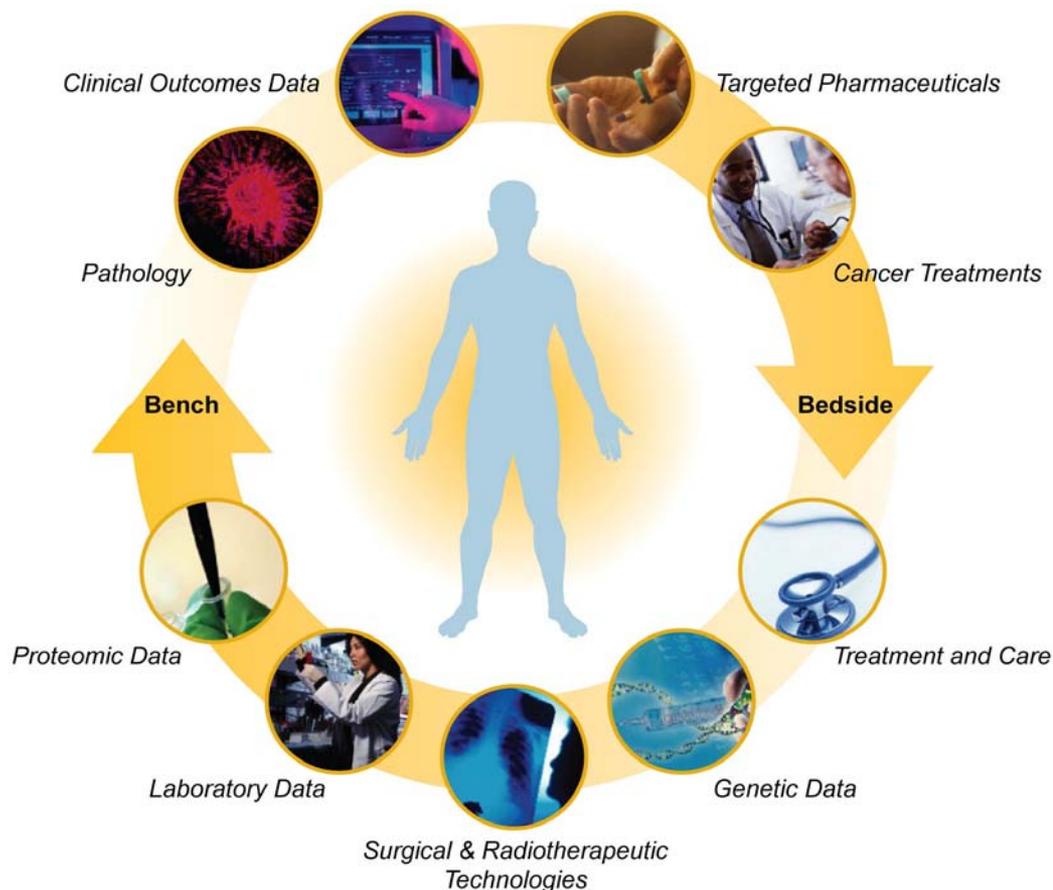
Personalized Medicine and Digital Health Networks in Cancer Research and Clinical Care

Ken Buetow, Ph.D.
Director,
**Center for Biomedical Informatics
and Information Technology**
National Cancer Institute

**AMIA Joint Summits on
Translational Science**
March 9, 2011



21st Century Biomedicine



- **Personalized, Predictive, Preemptive, Participatory.....**
- **Unifies** discovery, clinical research, and clinical care (bench-bedside-bench) into a seamless continuum
- **Results** in improved clinical outcomes
- **Accelerates** the time from discovery to patient benefit
- **Empowers** consumers in managing their health over a lifetime
- **Enables** a **Learning Health System**,

Redefining Cancer at a Molecular Level



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

CLINICAL PROTEOMIC TECHNOLOGIES FOR CANCER
Advancing Protein Science for Personalized Medicine

National Cancer Institute U.S.

CGEMS

Cancer Genetic Markers of Susceptibility

About CGEMS | News & Announcements | Resource Portal

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

NCI Alliance for Nanotechnology in Cancer

Developing Small Tools with a Big Impact on Cancer

Learn About Nanotechnology | Collaborate | Alliance in Action

NANOTECHNOLOGY HAS THE POTENTIAL TO FIGHT CANCER WHERE AND WHEN IT BEGINS

LEARN MORE

1 2 3 4

Exploring Nanotechnology | Understanding the Potential

Watch a Video Journey Into the World of Nanotechnology in Cancer

Discover how nanotechnology

THE IMPACT OF NANOTECHNOLOGY

National Cancer Institute National Human Genome Research Institute

THE CANCER GENOME ATLAS

About TCGA | What We Do | Publications | News Center | Launch Data Portal

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Sign up for updates



The Cancer Genome Atlas (TCGA) is a comprehensive and coordinated effort to understand the genetics of cancer using innovative technologies.

Cancer Bulletin Profile: Meet Dr. Raju Kucherlapati

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

TARGET

Therapeutically Applicable Research to Generate Effective Treatments

About TARGET | Areas of Research | Resources | Newsroom | Launch Data Portal

Promoting Discoveries Leading to Cures

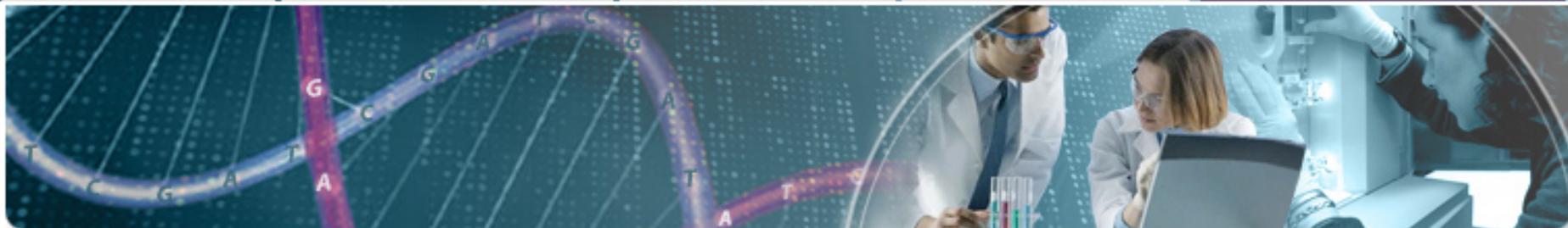
What is TARGET? The Therapeutically Applicable Research to Generate Effective Treatments (TARGET) Initiative seeks to harness the power of modern genomics technologies to rapidly identify valid therapeutic targets in childhood cancers so that new, more effective treatments can be developed and ultimately bring new hope to children and their families who face the devastating burden of these diseases.

[Learn more](#)

THE CANCER GENOME ATLAS


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[Publications](#)
[News Center](#)
[Launch Data Portal](#)


The Cancer Genome Atlas (TCGA) is a comprehensive and coordinated effort to accelerate our understanding of the genetics of cancer using innovative genome analysis technologies.

News



NEW* **CBS Where America Stands: Cancer**
 NIH Director, Dr. Francis Collins, is interviewed by Katie Couric on CBS Evening News, Jan. 28, drawing upon the discoveries being made by TCGA researchers to improve cancer treatments.

NEW* **In Tough Economic Times, NIH Head Looks to Clinic**
 NIH Director, Francis Collins, discusses his plans for NIH and how programs like TCGA will bring different approaches to cancer treatments. [Read more.](#)

Cancer Bulletin Profile:
 Meet Dr. Raju Kucherlapati


[View Article >](#)

TCGA Expanding
 to Study 20 or
 More Cancers

[Learn More](#)

TCGA Data Portal

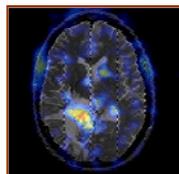

[Access TCGA Data Portal](#)



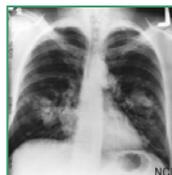
Enabling a rich, molecular definition of Cancer

Multiple forms of cancer

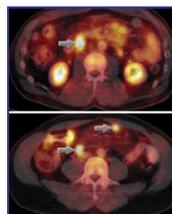
glioblastoma multiforme (brain)



squamous carcinoma (lung)



serous cystadenocarcinoma (ovarian)



(20 additional types planned)

Multiple Organizations

Biospecimen Core Resource

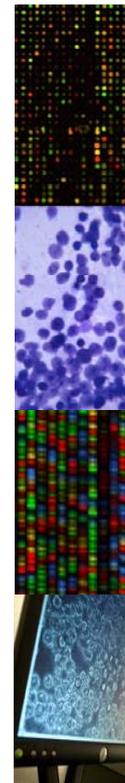
Cancer Genomic Characterization Centers

Genome Sequencing Centers

Genome Data Analysis Centers

Multiple data types

- Clinical diagnosis
- Treatment history
- Histologic diagnosis
- Pathologic status
- Tissue anatomic site
- Surgical history
- Gene expression
- Chromosomal copy number
- Loss of heterozygosity
- Methylation patterns
- miRNA expression
- DNA sequence





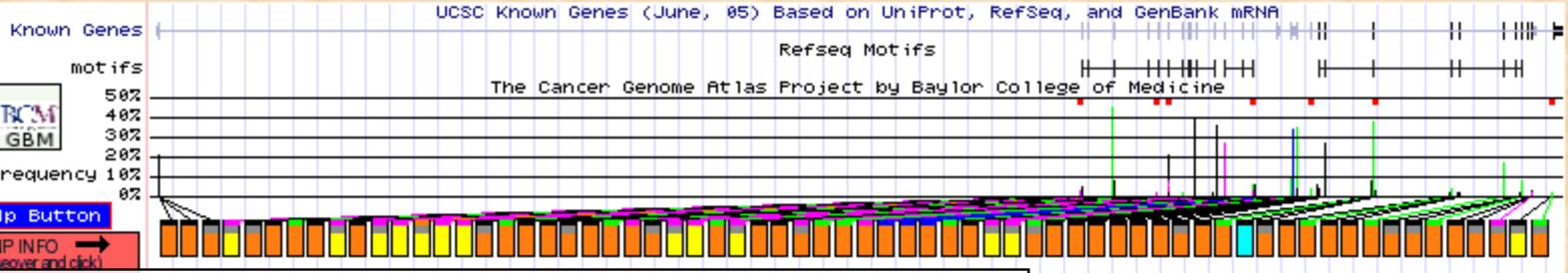
Integrating complex, multidimensional molecular data



All from their computer

Comprehensive Genomic Summary

chr7 (p11.2) 13 21.11 31.1 33 q34 35



Somatic mutation



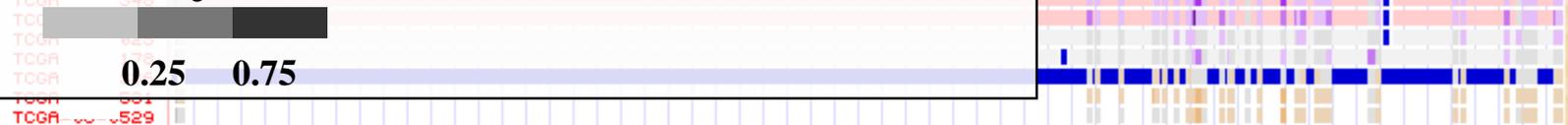
Exon-array expression



Copy Number (Tumor - Normal value)

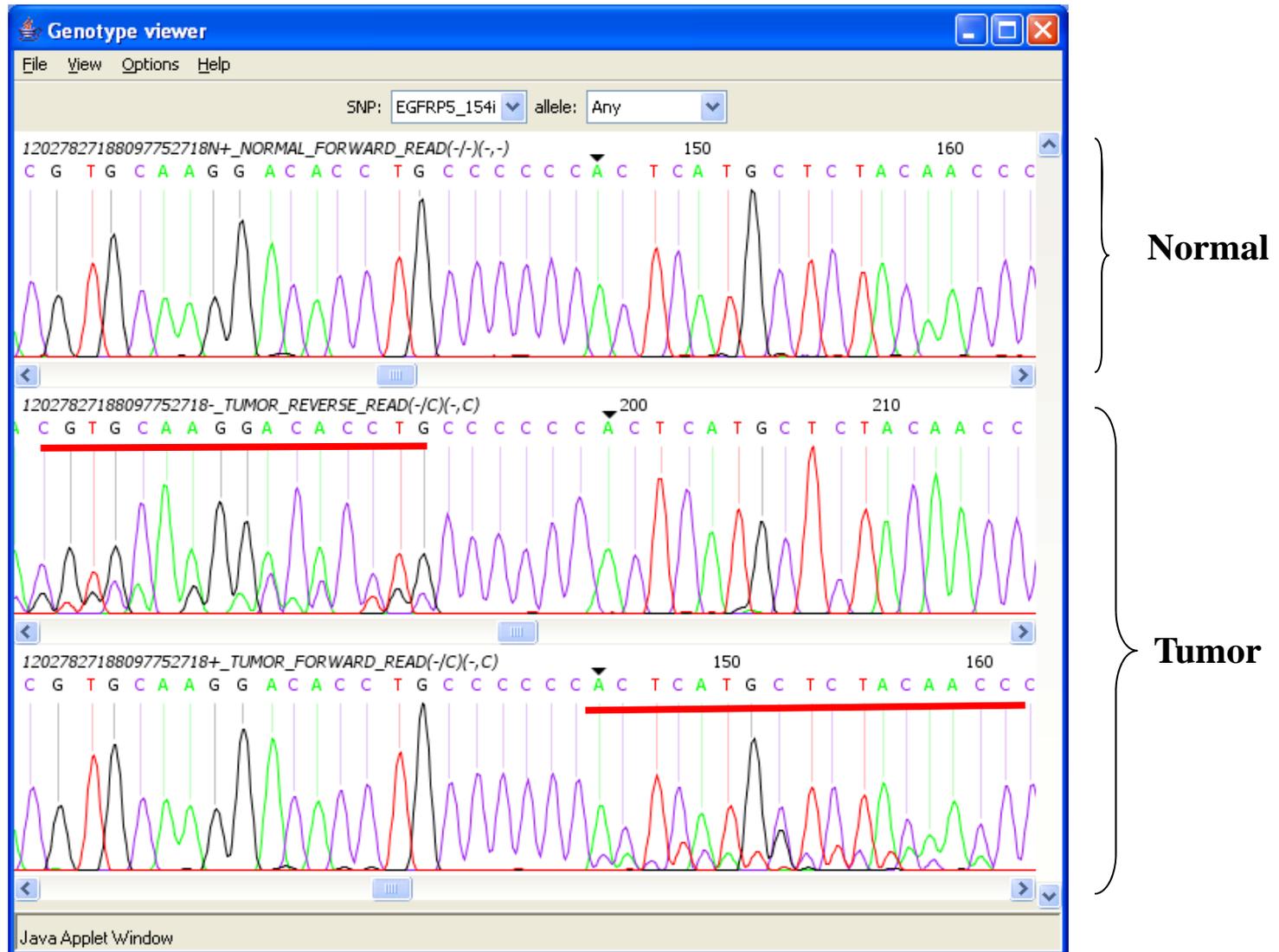


Methylation

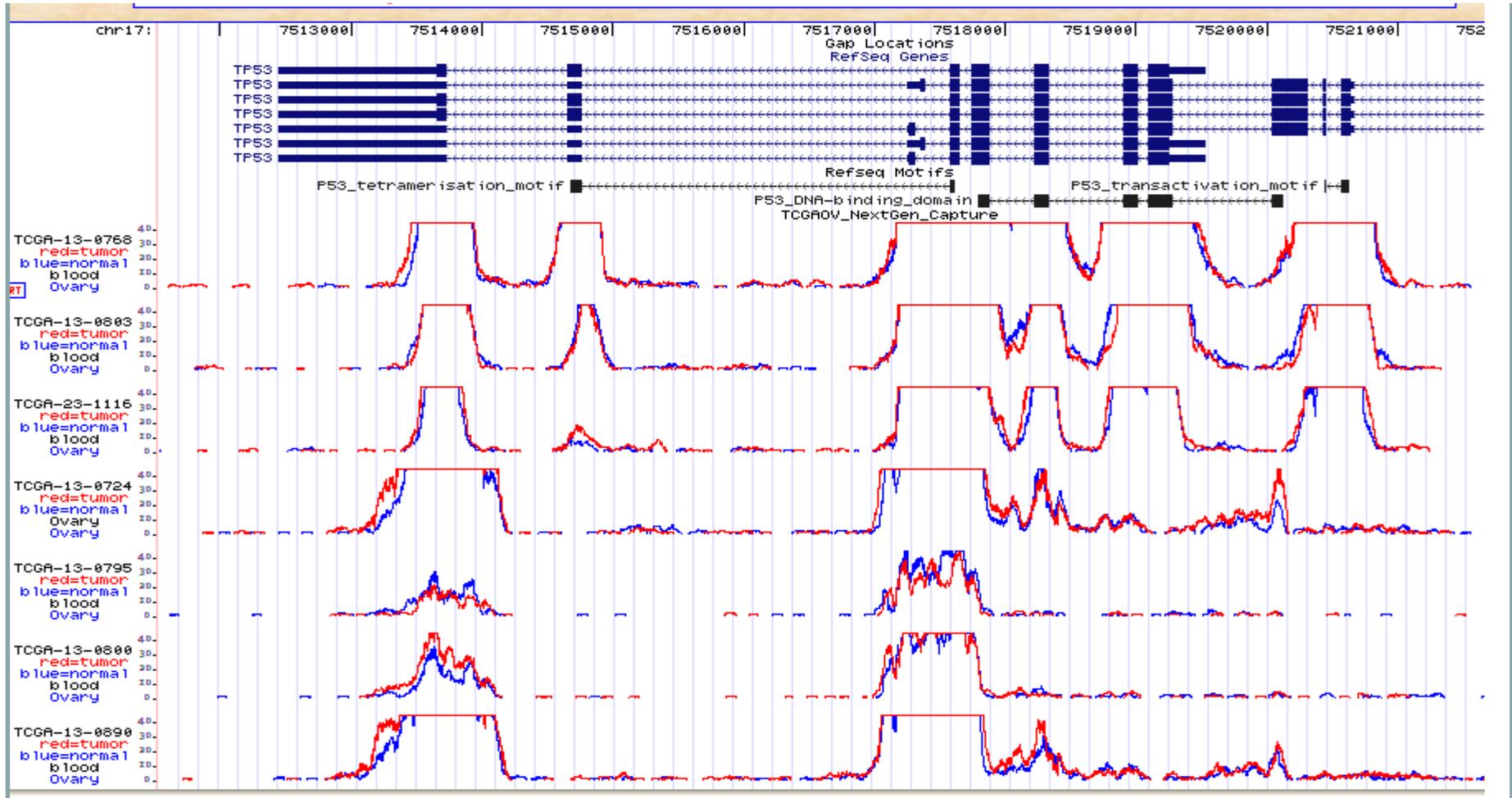


Putative Somatic Mutations can be Manually Reviewed

Eg: Frameshift Mutation in EGFR in Paired Tumor/Normal



Next-gen sequencing p53 analysis



Sample coverage maximized to 40x, height represents coverage
Red line=coverage for a tumor sample
Blue line=coverage for its matching normal

Protein structure view of EGFR mutations

Protein Structure 3D viewer - Mozilla Firefox

https://cgwb.nci.nih.gov/cgi-bin/3dViewer/Gene.cgi?proj=valid&sym=EGFR

National Cancer Institute
Protein Structure Viewer

Gene : EGFR GI : 29725609 1210 aa Also see GI : 41327736 41327732 41327734

Protein Motifs : 4 Solid : Pfam domain Pdb hits: 1 cyan 3D Structure Viewing region(s): 25 to 638
SNP LogE & SIFT: Red : Predicted Deleterious Blue : Predicted Tolerant Black : Undecided Gray : Not Analyzed
Phosphorylate: 29 Pubmed Tabular format

Click to get 3D viewer

Access proteins with alternative splicing

Done cgwb.nci.nih.gov

3D Structure Viewer

Protein Structure 3D Viewer - Mozilla Firefox

https://cgwb.nci.nih.gov/cgi-bin/3dViewer/ViewAA.cgi?proj=valid&gi=29725609&id=722&pdb=1yy9:A&sim=0.995&gstart=25&glen=613&phos=

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

GI: 29725609 Viewing region 25 - 638 99.5 % similar to Pdb: 1yy9 chain A 2 - 614 Help

1yy9

Big, highlighted atoms refer to the mutated amino acids (shown in red in the bottom panel). You can also click on the mutated amino acid (shown in red) to turn on or off a specific mutation

Sequence: Click on a letter once will turn on the spacefill. Double-click on the same letter will turn the spacefill off.

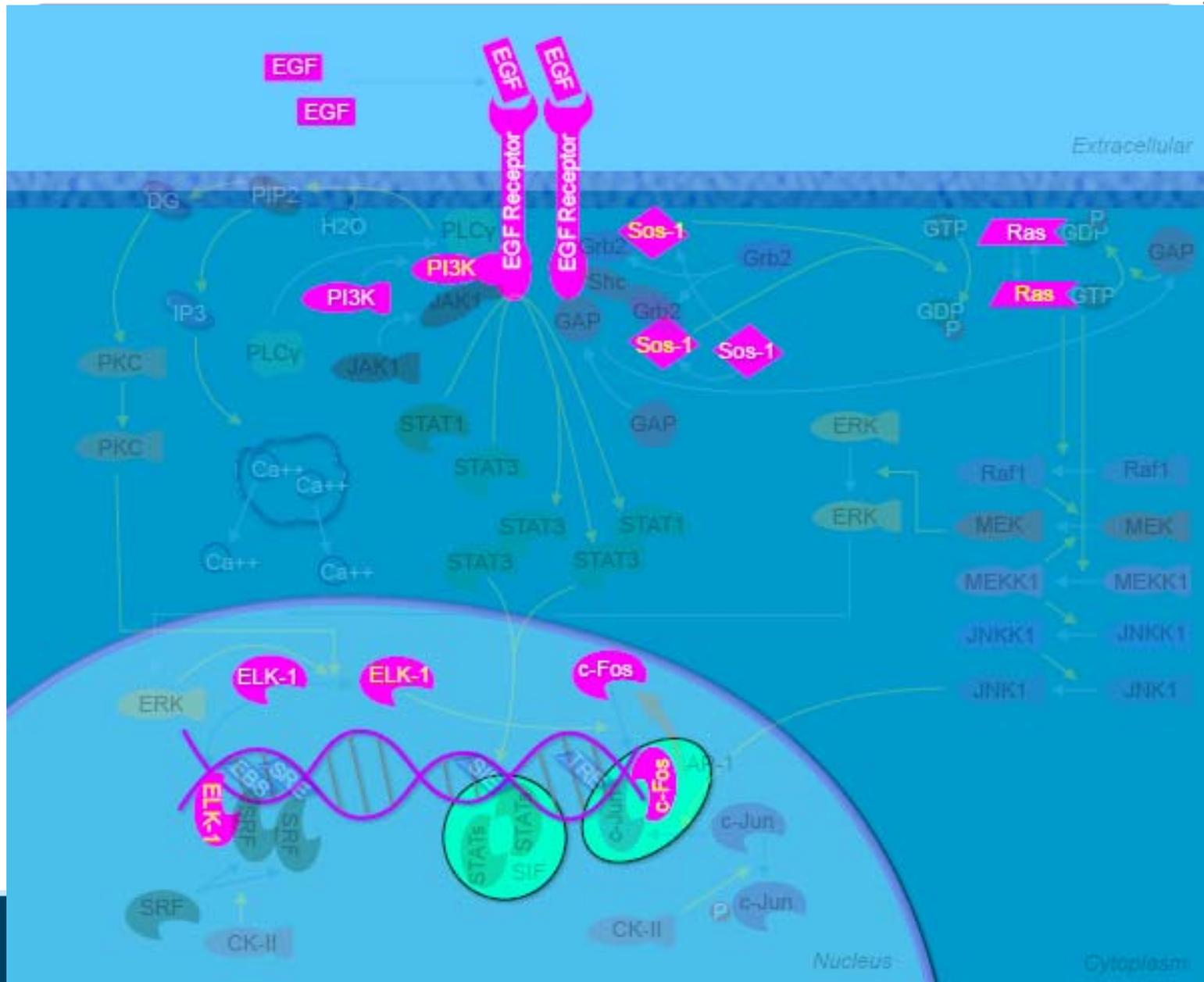
	EEKKVCQGTNKLTLQGFEDHFLSLQRMFNCCVVLGNLEITYVQRNYDLSFLKTIQEVAGYVLIALNT	71
	VERIPLLENLQIRGNMYEENSALAVLSNYDANKTGLKELPMRNLQEIHLGAVRFSNNPALCNVESIQWRD	142
143	IVSSDFLSNMSMLFQNHLSGSCQKCDPSPNGSCWGAAGEENCQKLTKIICAQQCSGRCRGKSPSDCCHNQCA	213
214	AGCTGPRESDCLVRKFRDEATCKDTCPLMLLYNPTTYQMDVNPPEGKYSFGATCVKKCPRNYVVTDHGSCV	284
285	RACGADSYEMEEDGVRKCKKCEGPRKVCNGIGIGEFKDSLSINATNIKHFKNCTSSISGDLHLPLVAFRGD	355
356	SFHTPPLDPQELDILKTVKEITGFLLIQAWPENRTDLHAFENLEIIRGRTKQHGQFSLAVVSLNITSLGL	426
427	RSLKEISDGDVIIISGNKNLCYANTINWKKLFGTSGQKTKIISNRGENKCKATGQVCHALCSPGCGWGPPEPR	497
498	DCVSCRNVSRGRRECVDKCKLLEGEPREFVENSECICQHPCELPQAMNITCTGRGPDNCIQCAHYIDGPHCV	568
569	KTCPAGVMGENNTLVWKYADAGHVCHLCHPNCTYGCTGPGLRGCP	614

Jmol

Jmol script completed

cgwb.nci.nih.gov

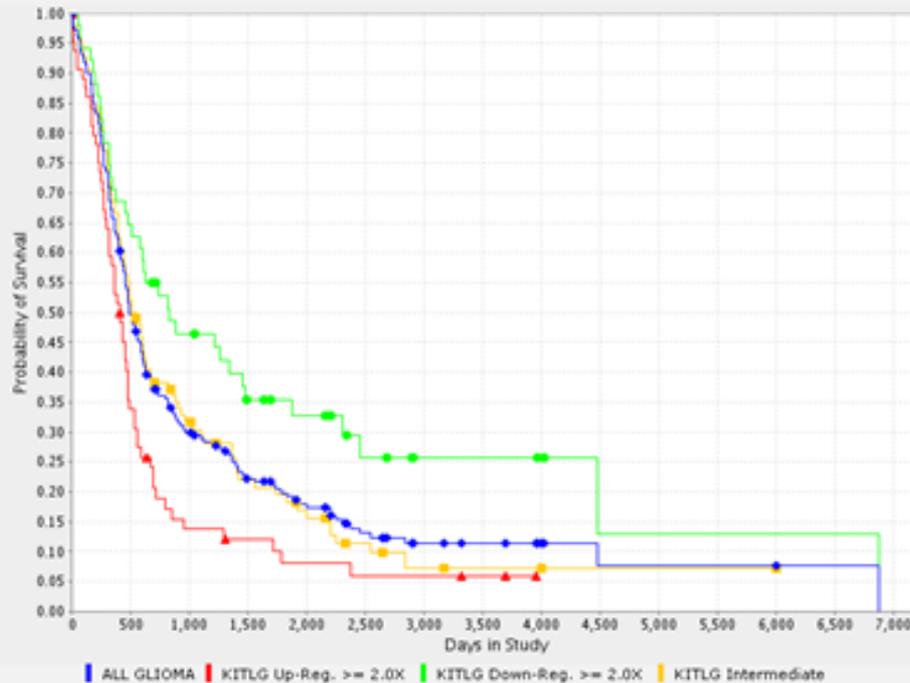
EGFR network mutation profile through CMA



Gene expression analysis related to clinical outcome



Kaplan-Meier Survival Plot for Samples with Differential KITLG Gene Expression



[View Clinical Reports](#)
[Upregulating Samples](#) [Downregulating samples](#) [Intermediate Samples](#)

Statistical Report:

KITLG
Reporter: 211124_s_at

Number of samples in group:

Up-Regulated	64
Down-Regulated	51
Intermediate:	96

Log-rank p-value(for significance of difference of survival between group of samples)

Up-Regulated vs. Intermediate:	0.0257
Up-Regulated vs. Down-Regulated:	2.0E-4
Down-Regulated vs. Intermediate:	0.0266

Administration:

- ◆ [View Results](#)
- ◆ [List Management](#)
- ◆ [Help](#)

News:

- ◆ **Data Version**
- ◆ TCGA newsletter - March 2008
- ◆ Number of Patients - 110
- ◆ Number of Expression Arrays - 985
- ◆ Number of Copy Number Arrays - 361

PatientDID Lists:

- ◆ ALL_PATIENTS
- ◆ Low_Survival
- ◆ Med_Survival
- ◆ High_Survival
- ◆ TP53_SomaticMut...
- ◆ EGFR_SomaticMut...
- ◆ PTEN_SomaticMut...
- ◆ RB1_SomaticMut...
- ◆ DST_SomaticMut...
- ◆ NF1_SomaticMut...
- ◆ CDKN2A_Somatic...
- ◆ PIK3R1_Somatic...
- ◆ CENPF_SomaticM...
- ◆ ITGB3_SomaticM...

Gene Lists:

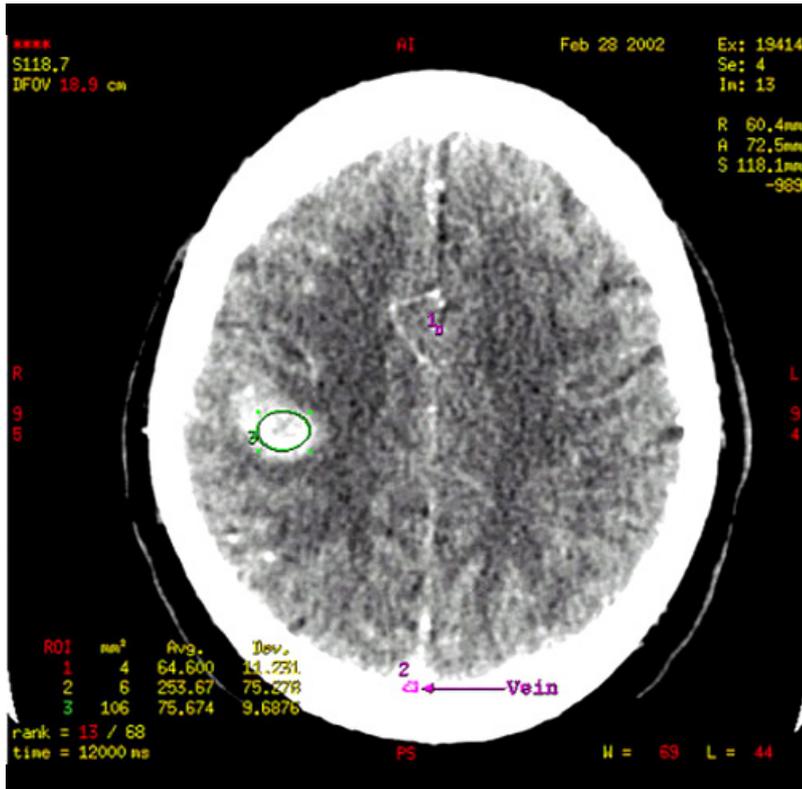
- ◆ TCGA Target Se...

Reporter Lists:

***Embracing the
complexity of
cancer at the
molecular level:***

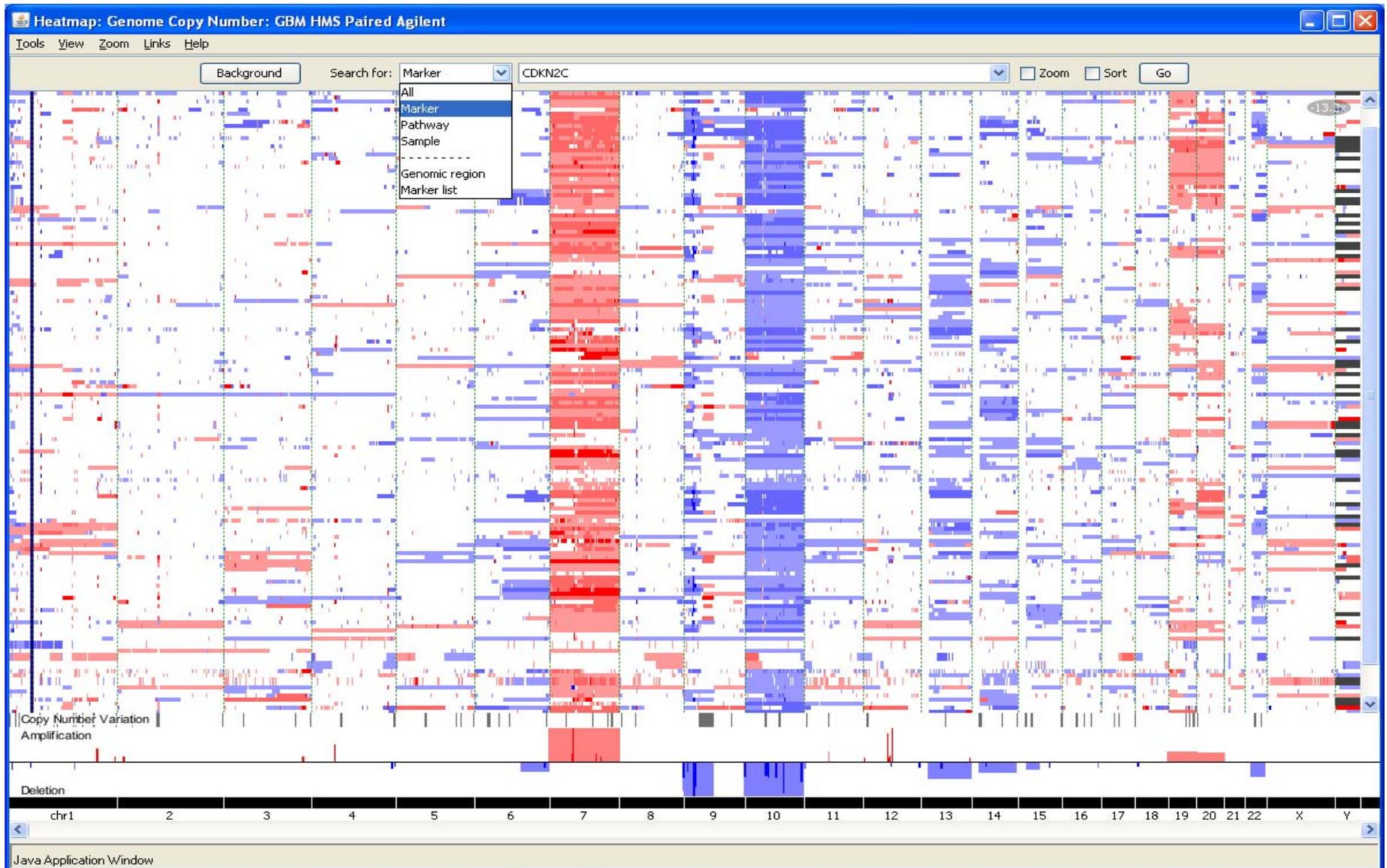
***An *in silico* exploration of
Glioblastoma Multiforme***

Glioblastoma Multiforme (GBM)

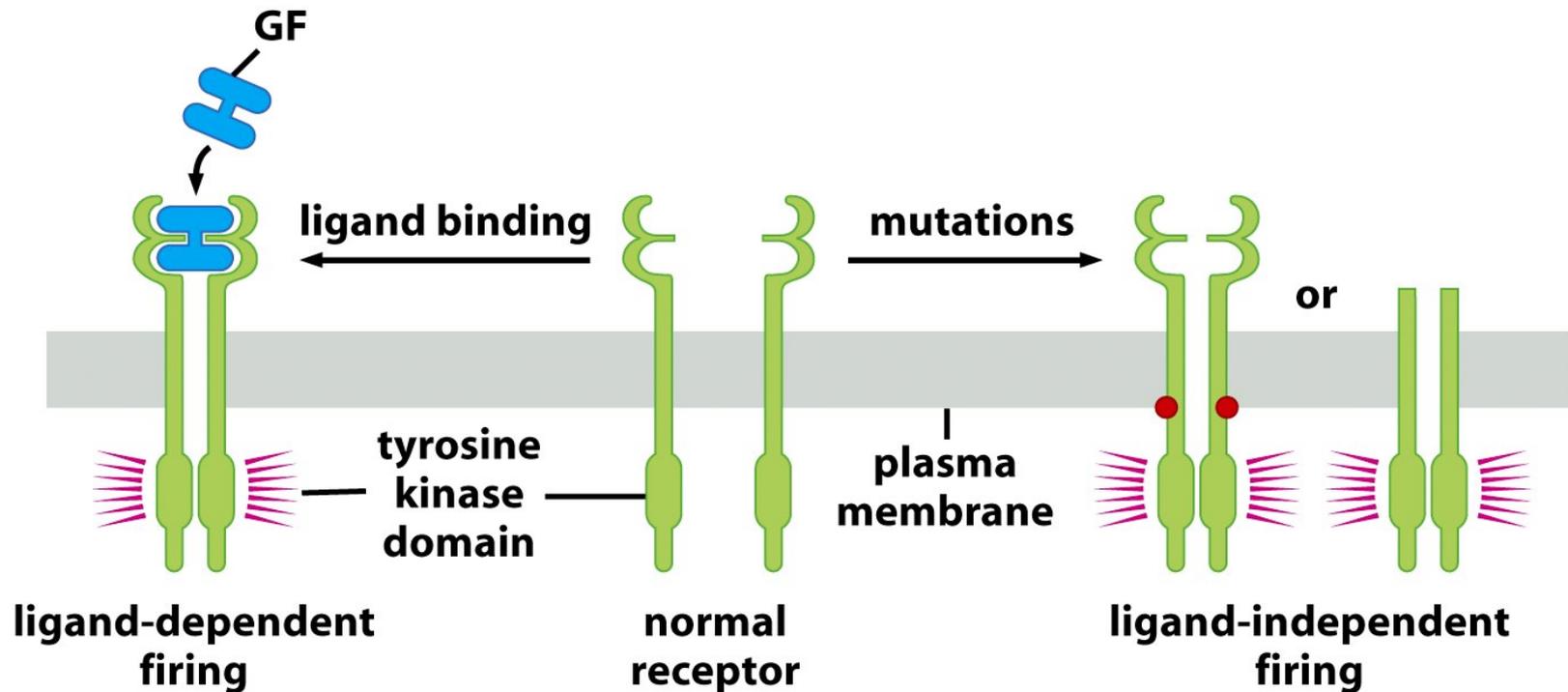


- **GBM is the most common type of brain tumor. High grade gliomas are incurable and tumors expressing a mesenchymal phenotype are the most aggressive form**

Chromosome 7 and EGFR seen as frequent targets of alteration in GBM



Constitutive activation of EGFR leads to abnormal growth



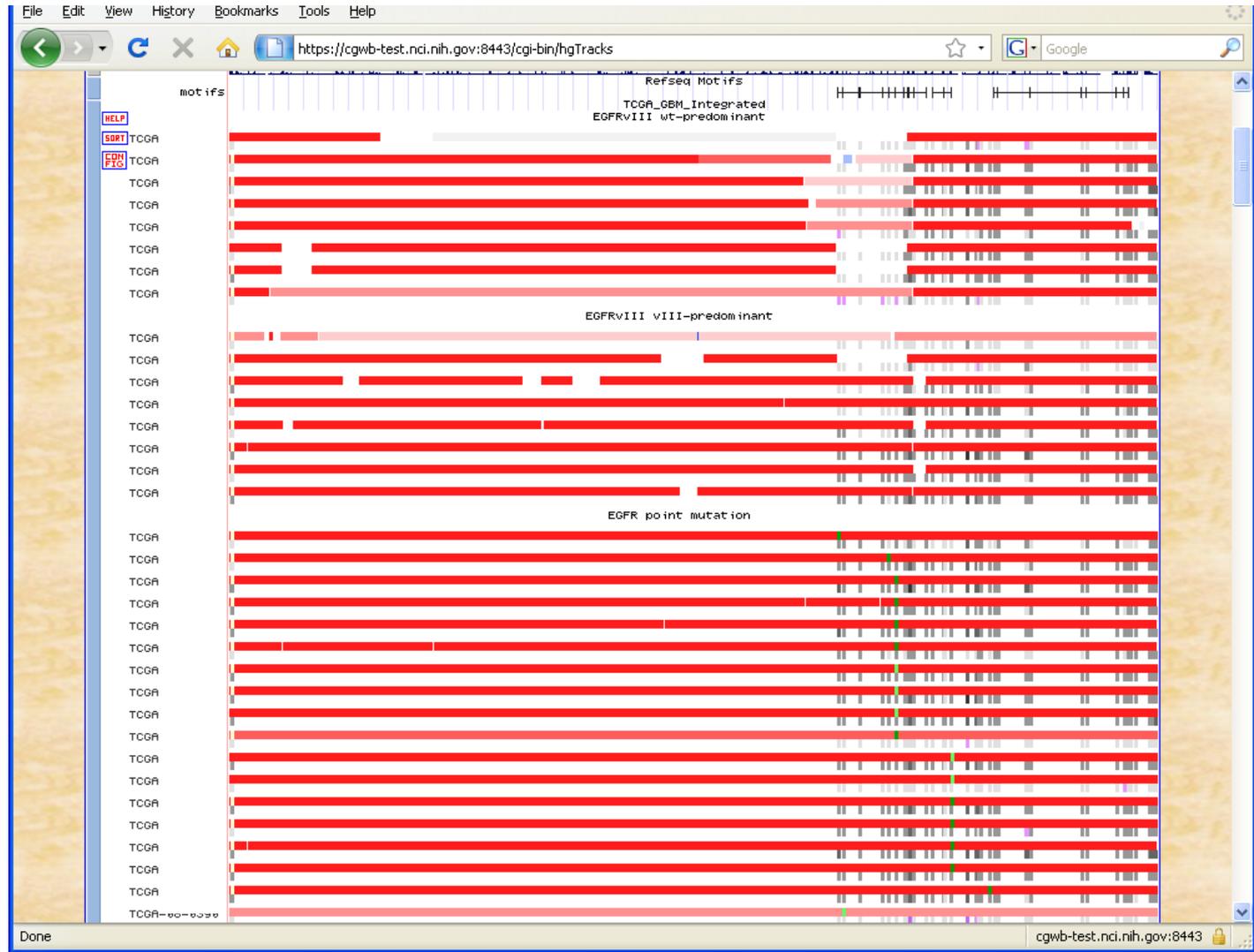
**“EGFR_{vIII}”
mutation**

Modified from *The Biology of Cancer* (© Garland Science 2007)

Add exon array to verify EGFRvIII expression correlates with CN

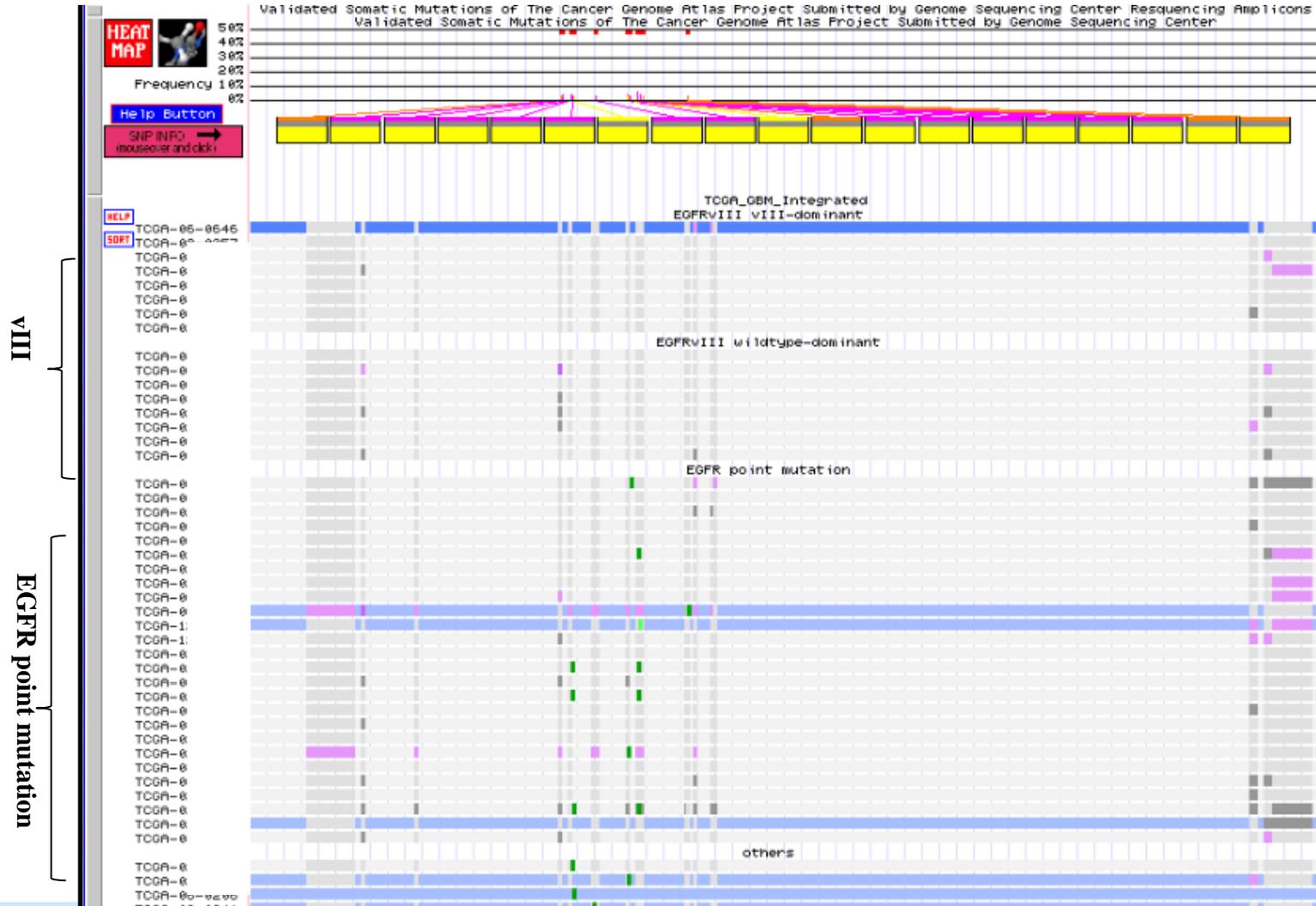
Top row: Copy Number + Somatic mutation + Methylation

Bottom row: Exon Array Expression



EGFR mutation subgroups viewed at the TP53 locus

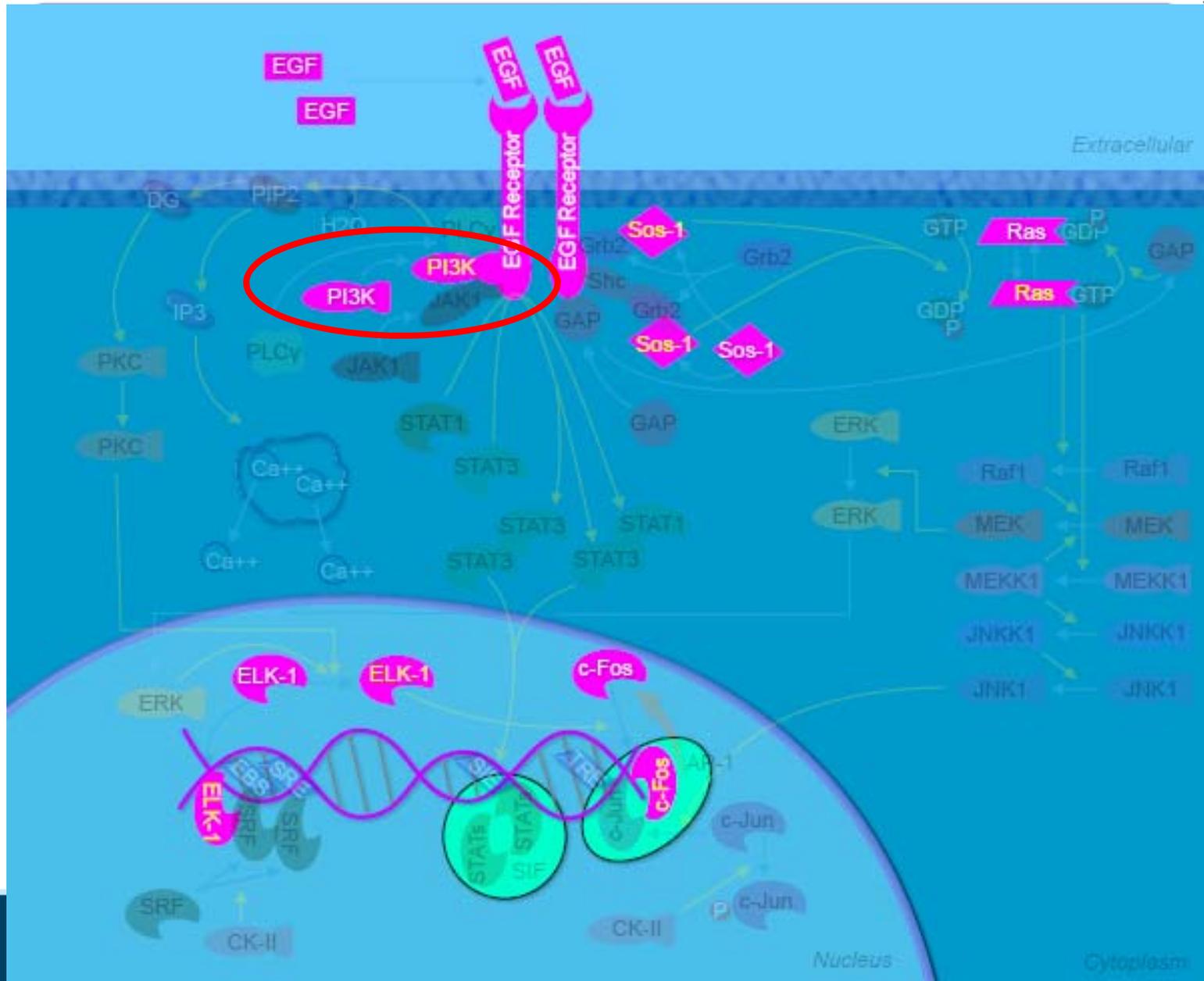
No mutation for EGFRvIII but 1/3 of EGFR point mutations have TP53 mutations
($p=0.036$)



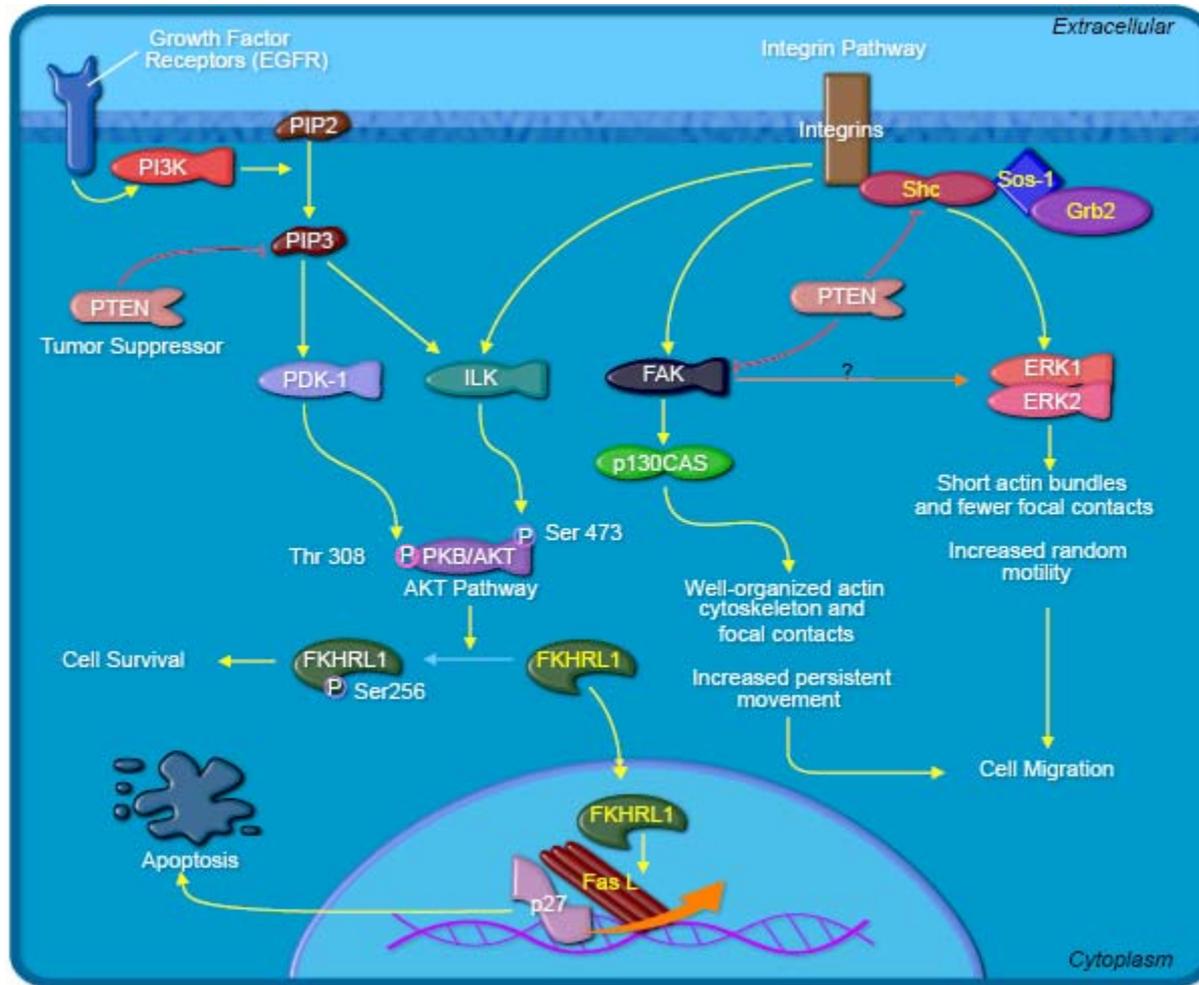
Mutations in EGFR vIII and TP53 may be anti-correlated

	EGFR amplification			No EGFR amplification		
	EGFR point mutation	EGFRvIII	No EGFR mutation	EGFR point mutation	EGFRvIII	No EGFR mutation
	18	12	37	7	0	79
TP53	5	0	4	3	0	35
Fraction:	28%	0%	11%	43%	N/A	44%

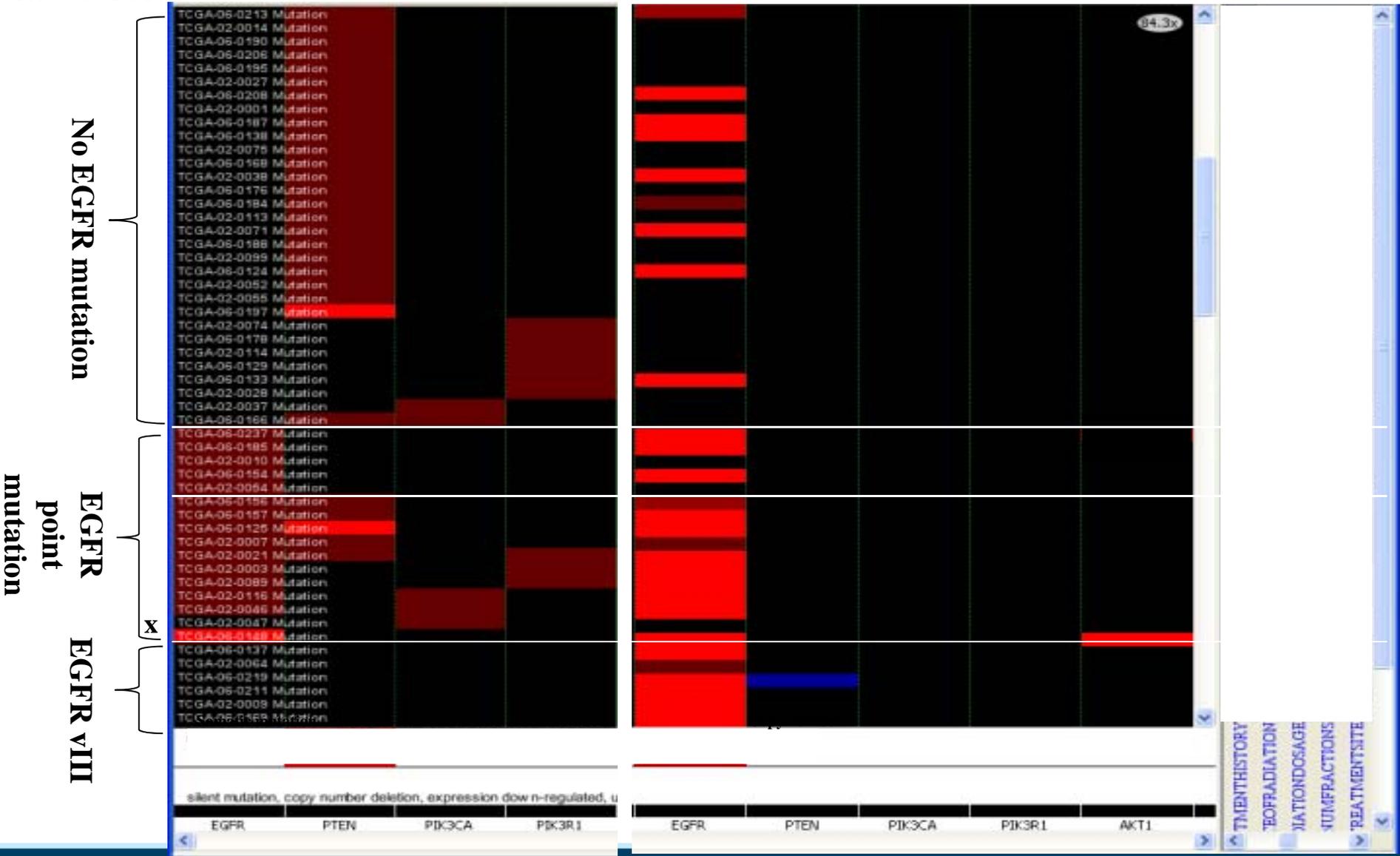
EGFR network mutation profile through CMA



Alterations in PI3K pathway through CMA



somatic mutations (left) and copy number (right) shows frequent co-occurrence of EGFR point mutations with other genes in PI-3K pathway but not the EGFR vIII mutations



Summary

- 1) No P53 mutations were found in amplified samples with EGFRvIII while significant levels of P53 mutation were found in amplified samples with EGFR point mutations. Suggests alternative molecular etiologies
- 2) EGFR point mutations co-exist with additional mutations in other genes involved in PI-3K pathway while EGFRvIII rarely have additional mutations in PI-3K pathway. This suggests the possibility of oncogene addiction in EGFRvIII tumors but not in tumors with EGFR point mutations even though both types of mutations target EGFR extracellular domains.



- Total Cancer Care
- » Overview
- » [Contact Information](#)
- » [How Do I Participate?](#)
- » [How Does Total Cancer Care Work?](#)
- » [Why Participate in Total Cancer Care?](#)
- » [Participating Institutions](#)
- » [Research Partnerships](#)
- » [Leadership & Governance](#)
- » [Evidence-Based Oncology Program](#)

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Overview

What is Total Cancer Care?

Total Cancer Care is Moffitt Cancer Center's comprehensive approach to cancer that enables researchers and caregivers to identify and meet all the needs of a patient and his or her family during the patient's lifetime and for future generations.

In 2003, Moffitt Cancer Center began developing Total Cancer Care, which is a holistic plan to improve the standard of cancer care by providing individualized, evidence-based treatment decisions based on the large-scale integration of information technology, scientific discovery and health outcomes. This approach will provide evidence-based guidelines to improve care and outcomes for cancer patients throughout the state of Florida and beyond. Total Cancer Care addresses cancer as a public health issue and takes a holistic approach by encompassing all aspects of the disease, including preventive measures such as the study of genetic predispositions, impact of

- Moffitt News**
- 3/3/2011 [Moffitt Cancer Center Appoints Vice President/Chief Nursing Officer And Vice President/Chief Health Informatics Officer](#)
 - 3/2/2011 [Moffitt Cancer Center Recognizes Colorectal Cancer Awareness Month](#)

The Washington Post



We are using a patient's genome to protect against heart attacks and stroke.

Each person responds differently to medicine. Using DNA, our doctors match heart patients with the right blood thinner. It's one of the many ways we are tailoring medicine to the unique characteristics of each patient.

VanderbiltHealth.com/breakthroughs

VANDERBILT  UNIVERSITY
MEDICAL CENTER

The promise of discovery

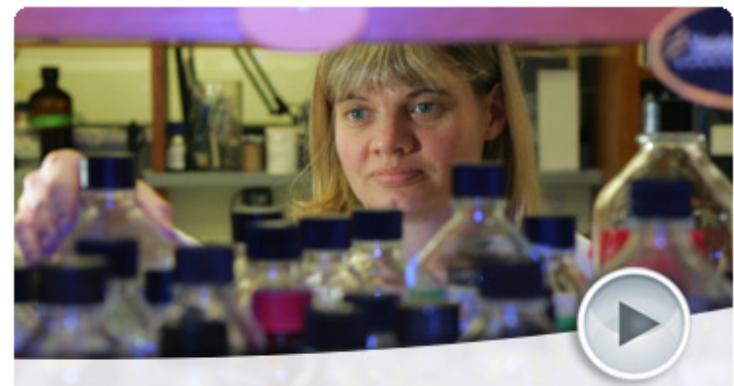


VANDERBILT UNIVERSITY MEDICAL CENTER

Quick Links: [Children](#) [Cancer](#) [Heart](#)

[Careers](#) [Volunteering](#) [Media](#)

General Information	My Health at Vanderbilt	Conditions, Diseases and Procedures	Information about a Doctor	Giving	Healthcare Breakthroughs	Quality Answers
-------------------------------------	-----------------------------------------	-----------------------------------------------------	--------------------------------------------	------------------------	------------------------------------------	---------------------------------



Video: Making Medicine Work for Each Person

Vanderbilt University Medical Center The Promise of Discovery

Discovery science is like "pulling back a curtain" to see what's behind it. You then find something completely new. You find something that nobody has seen before. At Vanderbilt University Medical Center, discovery science is "pulling back curtains" in the major diseases and conditions of our time.

Learn more about how Vanderbilt is reshaping healthcare.

.....

Developing new surgical tools

.....

New hope for people with melanoma

.....

Fighting lung cancer with molecular medicine

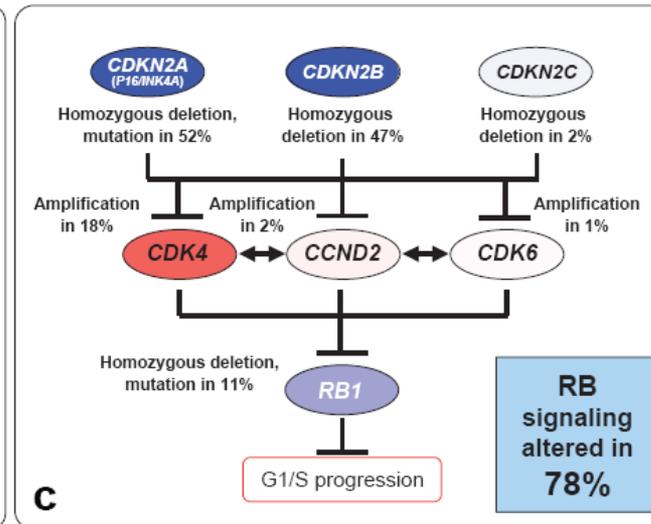
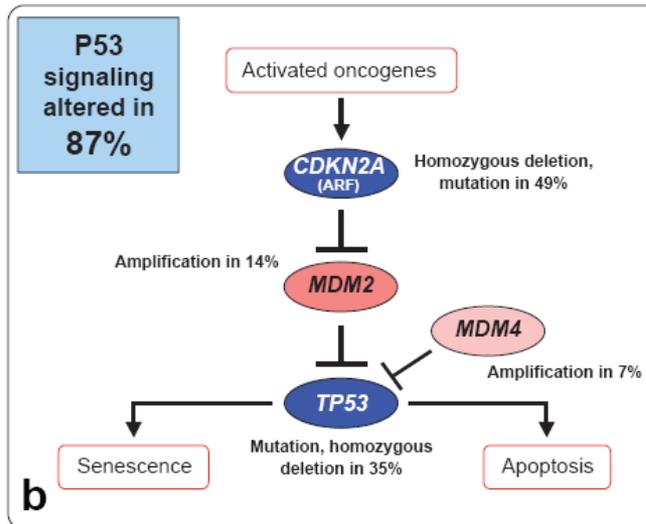
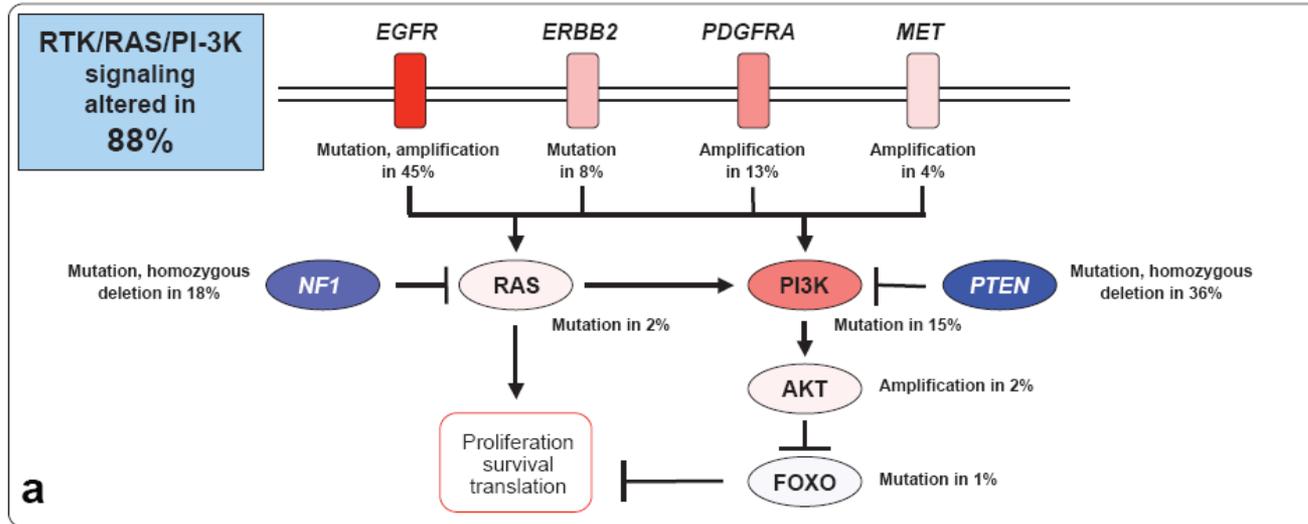
.....

Using genetics for smarter prescriptions



Learn about Vanderbilt's DNA databank
Vanderbilt BioVU

GBM Results: Pathways



Patient selection for HER2 Tx required tissue screen and allowed only 1 of 4 women to participate



Calculated Sample Size And Study Duration	Hypothetical HER2+ Prevalence	Required “Screened” Population
1250 → 52 mos	100%	1250
	50%	2500
	25%	5000

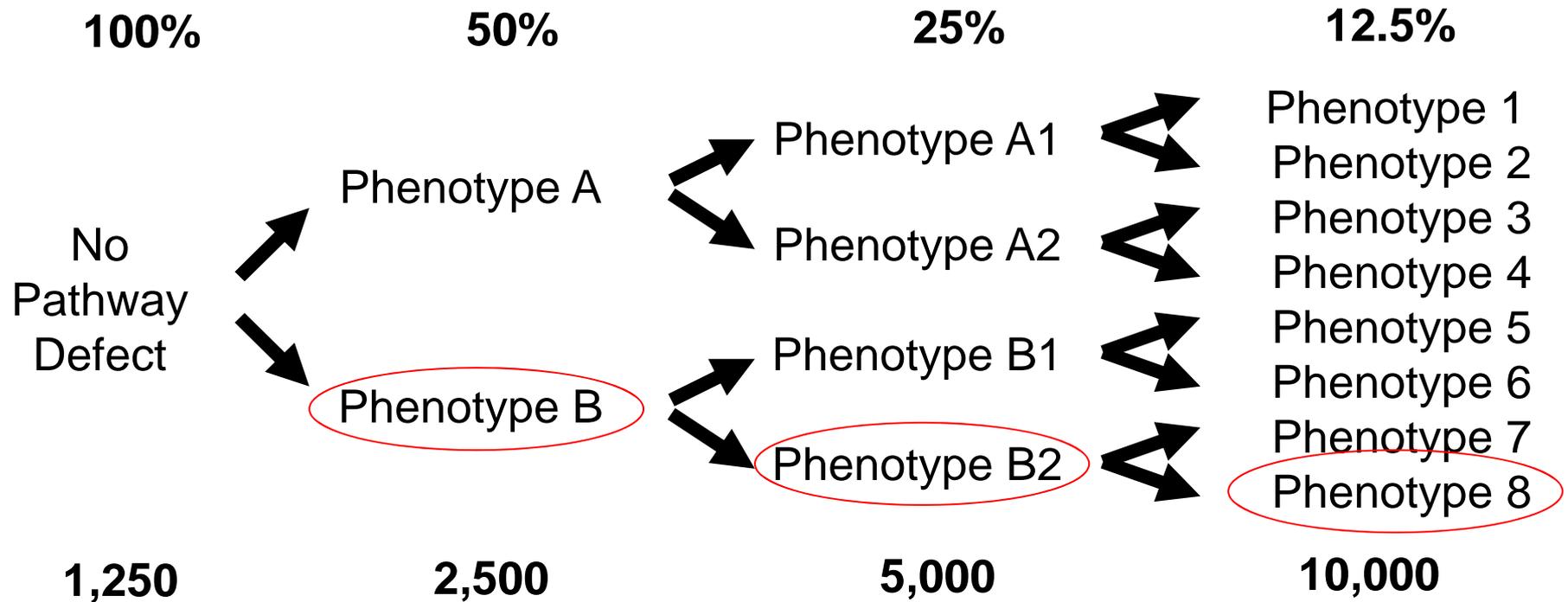
* *Need a obtain a suitable specimen, wait for test results. (Results were obtained in days to weeks)*

* *Need to screen many patients.*

Size of Population with Pathway to Inhibit*



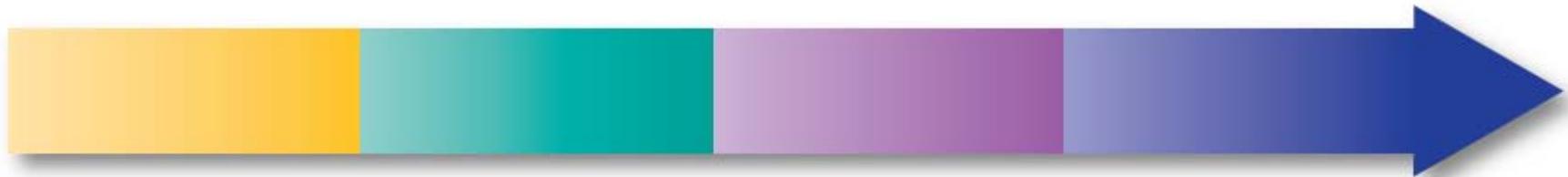
Population fraction containing signature



Size of Population Needed To Screen

Courtesy H. Kim Lyerly, M.D., Director

20th Century Research > Care Paradigm



Discovery

- Biological pathways
- Target identification and validation

Product Development

- Candidate selection and Optimization
- Pre-clinical testing
- Phase I, II, III
- New Drug application and Approval

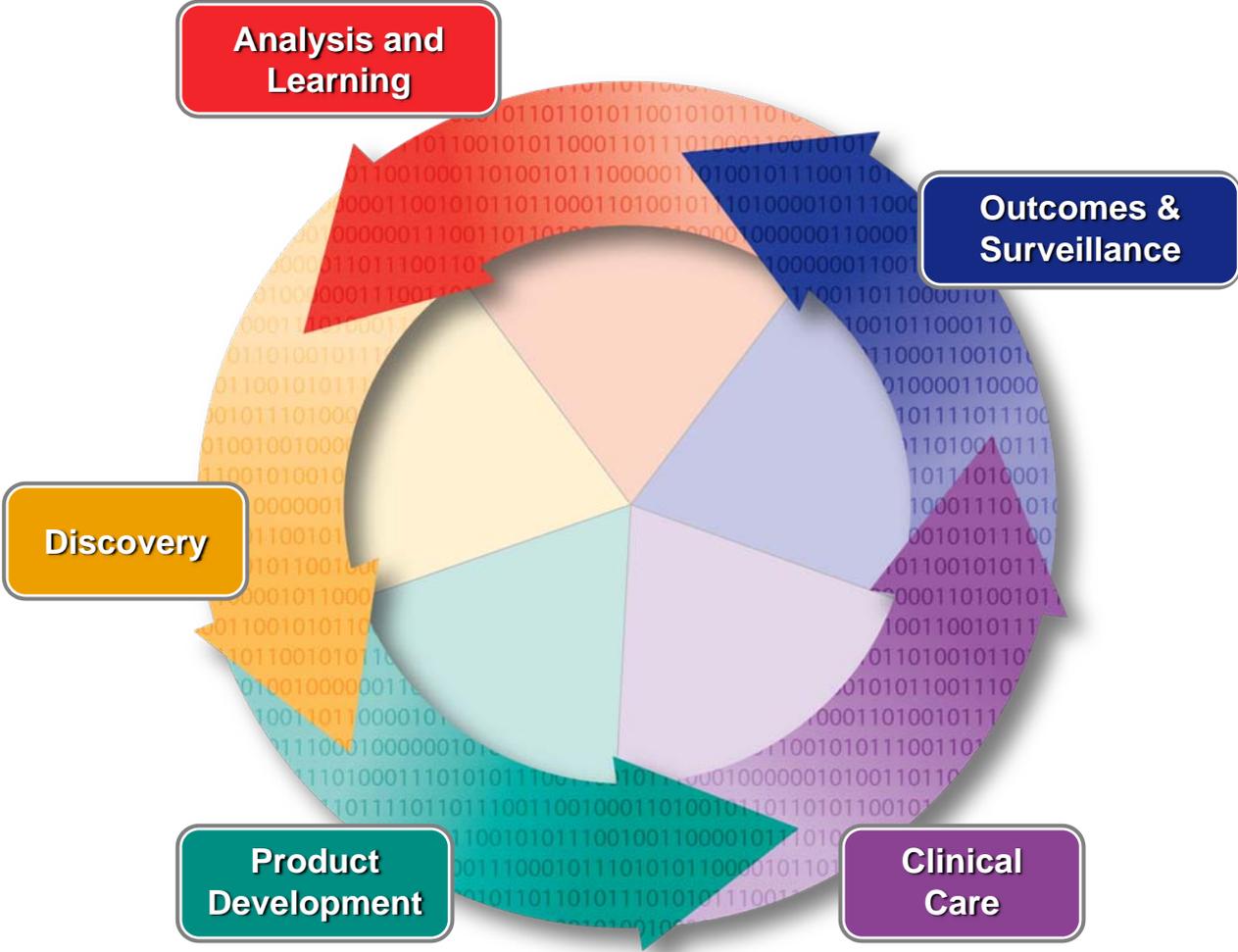
Clinical Care

- Product launch
- Clinical adoption

Outcomes & Surveillance

- Reporting of serious/fatal ADRs
- Re-labeling (or recall) as needed
- Additional indications as warranted

21th Century Learning Health System





“We are now poised for the third big transformation, which will come from behavioral changes, as all participants in the **ecosystem – patients, physicians, payers, companies and more – revisit and realign their practices in order to improve health outcomes.”**

Ernst & Young, Progressions 2011



- Pharma 1.0: The “Blockbuster” model
- Pharma 2.0: Cost-efficient, diversified product/market model – portfolios of more-targeted drugs in strategic therapeutic areas (chronic conditions, cancer)
- **Pharma 3.0: The health outcomes **ecosystem** – supplementing the 2.0 model, companies will shift focus from solely on units sold to include ability to improve outcome. Trend driven by:**
 - **Health care systems lack of sustainability**
 - **New technology**

Ernst & Young, Progressions 2011



“This growing pool of data will be generated across the *ecosystem* through multiple new channels, such as

- electronic health records,
- social media,
- online communities,
- wireless devices and
- smartphones,

meaning that no single entity will own or control all of the data about any company, product, disease state or patient behavior.”

“While value in the future will be determined by data, data alone is not the answer. Instead, value will come from developing insightful solutions with the data.”

Ernst & Young, Progressions 2011



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have you seen this?

- 13684 volunteers
- 631 researchers
- 263 active studies
- 56 institutions

[[see more](#)]

what is researchmatch?

It is a registry of volunteers willing to learn more about research studies. Research needs both volunteers and researchers. ResearchMatch helps bring these two groups together in a secure and convenient way. [more]

how do I get involved?

Signing up is free and anyone can join. Learn more about ResearchMatch and join the registry today!

[REGISTER NOW!](#)

what's new?

[YouTube Video - Participating in Research](#)

[Baystate Medical Center joins volunteer clinical trial match \(ResearchMatch\)](#)

want to see more? click [here](#).

CTSA Clinical & Translational Science Awards

The Clinical and Translational Science Awards (CTSA) is a registered trademark of DHHS.

ResearchMatch is a Clinical and Translational Science Awards (CTSA) initiative funded by the [National Center for Research Resources](#), part of the [National Institutes of Health](#). Powered by UMLS through the National Library of Medicine ([see more](#))

caBIG[®] and the Love Army of Women



caBIG[®] is partnering with the Love/Avon Army of Women to build a **consumer-controlled** online cohort of **one million women**, called the Health of Women (HOW) Study



AOW is Speeding National Research Investigations...



- **Sister Study: NIH/NIEH study to determine how environment and genes affect breast cancer risk**
 - 5,000 women needed... **54,411 total responses from AOW**
 - 1600 recruited in 48 hours
 - 2300 recruited in 2 weeks
- **Variations in Health Needs of Breast Cancer Survivors: NIH-funded study to reduce disparity in cancer burden due to sexual orientation**
 - 100 lesbian, bisexual women required... **15,412 responses from AOW**
 - 158 recruited

And Local Studies...



- **BEAM Study: Breast Estrogen and Methylation investigation at Northwestern University and Johns Hopkins University**
 - 300 women required... **10,617 responses from the AOW**
 - 23 at NU in 16 months
 - 34 at JHU in 5 months
- **Obesity Study: Controlled diet and exercise study at UCLA monitoring markers of risk for breast cancer**
 - 20 participants needed... **16,466 total responses from the AOW**
 - 125 recruited
 - Fully enrolled in **12 hours**

With Targeted Populations



- **Milk Study: Biomarker study recruiting lactating women scheduled for a breast biopsy; conducted at UMass, funded by Avon**
 - 250 women needed... **62,826 total responses from AOW**
 - 31 recruited in 24 hours... **representing a 6 month acceleration in recruitment**
 - 324 recruited to date
 - Study enlarged to 1000 based on response

AOW/caBIG[®] Collaboration: Health of Women Study (HOW)



- **Members of AOW are invited to join the HOW study and respond to periodic secure online questionnaires concerning health history**
- **Authorized researchers access data and design study protocols based on profiles and data of potential research participants**
- **Database enables “interactive” and “dynamic” process – as researchers conceive new projects and women add more health information, new theories can be generated and additional opportunities for participation arise**



Love-Avon Health Of Women Study - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites

Address <https://how.armyofwomen.org/HOW/PatientSaveReproductiveHistory.do>

Go Links Contribute Edit in Contribute Post to Blog

Google Search Share Sidewiki Check Translate AutoFill domain...

About HOW Join HOW About Us FAQ Privacy Policy My Account

Logout Contact Us Army of Women Help

 **The Health of Women Study (HOW)**

About Me My Reproductive Health **My Health as of Today**

MY HEALTH AS OF TODAY Font Size [T](#) [T](#) [T](#) [View / Print](#)

Please note we will be asking more detailed questions related to this topic in future modules

Compared to a year ago, how would you rate your health, in general now? (Select only one.)

- Much better than a year ago
- Somewhat better now than one year ago
- About the same
- Somewhat worse now than a year ago
- Much worse than a year ago
- I'd rather not say

The following questions are about activities you might do during a typical day. Does your health limit you in these activities? If so, how much? (Select one response for each item.)

Activity	Yes, limited a lot	Yes, limited a little	No, not limited at all	I'd rather not say
Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling or golf	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lifting or carrying groceries	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Climbing several flights of stairs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Climbing one flight of stairs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bending, kneeling, stooping	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Walking more than one mile	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Walking several blocks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Walking one block	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bathing and dressing yourself	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Enter your height and weight

Height: Feet: Inches:

Weight: pounds

Have you ever used any tobacco products?

- Yes, previously

Army of Women Health of Woman Study



Invitation sent out in escalating batches to current AOW population (262,047) between 12/8/09 and 12/28/09

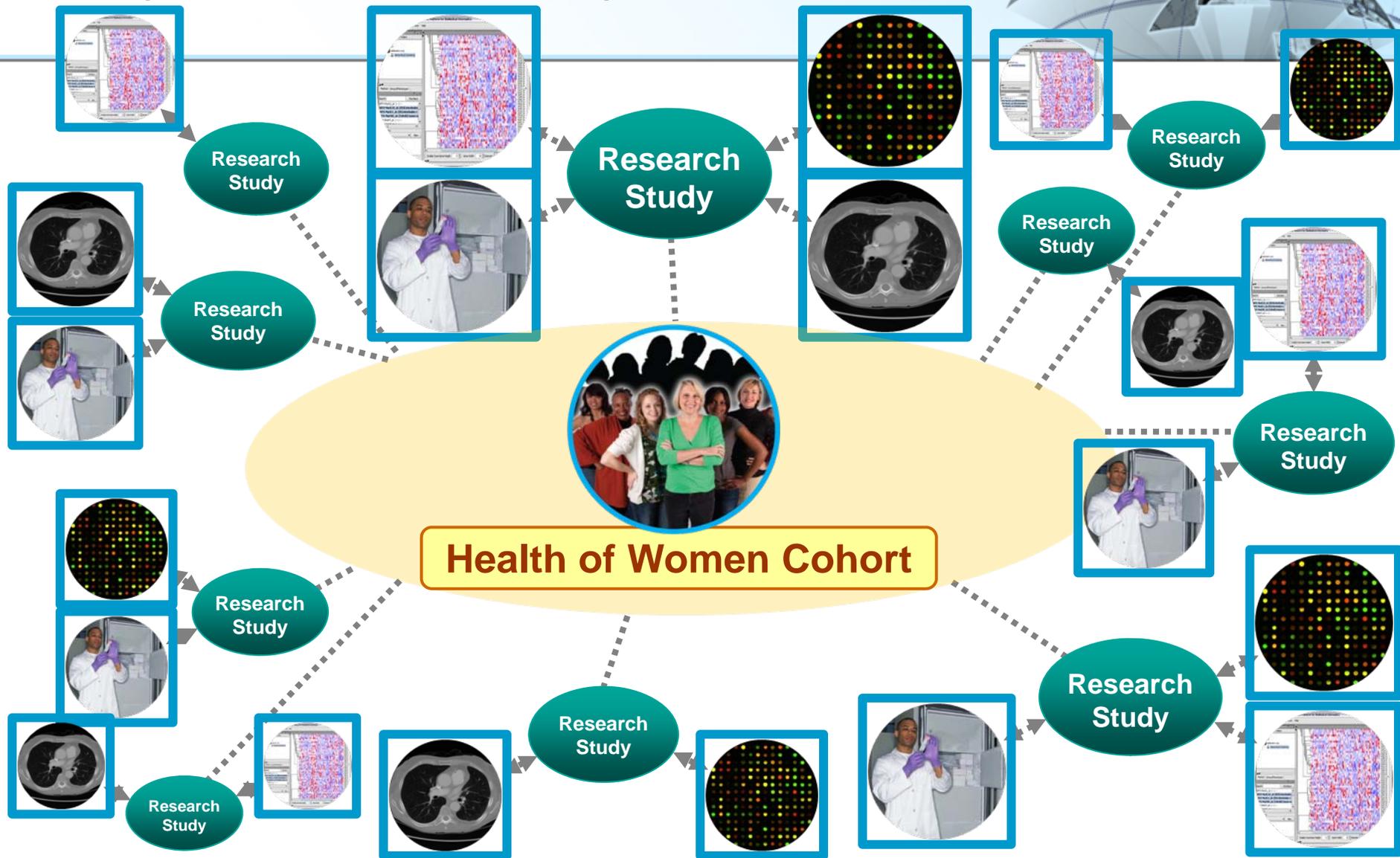
In response to this **single e-mail** invitation

- 30% viewed the invitation
- 57% who viewed the invitation clicked yes they were interested

By 2/11/10

- 28,032 users (62% of those who clicked yes)
- 25,162 have completed and submitted first module

Army of Women "Ecosystem"



Panacea Biotec – “a research-based health management company”



Individualised Health Management Plan (IHMP) - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://bestonhealth.com/idmp/idmpmain.asp

Wikipedia (en)

Individualised Health Management P...

Best on Health
The Actionable Knowledge Health Portal

Biotech SEZ
Best on Health
Subsidiary of Panacea Biotec Ltd.

[Log In](#) | [Registration](#) | [Individualised Health Management Plan](#) | [Search](#) | [Feedback](#) | [Products](#) | [Home](#) | [Guided Tour](#)

Welcome Tuesday, March 08, 2011

Article Quick Jump

Anxiety

Allopathy

Management System

Allopathy
Ayurveda
Homeopathy
Yoga

Children & Adolescents

Immunisation
Breast-Feeding
Nutrition & Children
Birth Details
Vaccination Schedule

Pathfinder

Arthritis
Asthma
COPD
Heart Diseases
Diabetes
Depression
Anxiety

Health & You

First Aid
Diet & Nutrition

Individualised Health Management Plan



Treatment or management of any disease or condition is not just about medication. It is about understanding the individual's disease, medical history, his special preferences, his age and state of health and then using this information to devise a unique management plan that is holistic.

At IHMP, our endeavour is to create such a holistic plan by individualising each aspect that goes into the management of a disease right from diet to systematic monitoring through investigations.

Take a look at how IHMP can help you create such an individualised plan for each important aspect of your disease management.

About Individualised Health Management Plan (IHMP)

Yoga
Yoga can be individualised to **complement your current treatment** and **reduce the side-effects** sizeably. Read more about our special section on scientifically validated yogasanas and techniques for different diseases and conditions. [... know more](#)

Registered Members

User ID

Password

[forgot password !!!](#)

Not Registered YET ???

Create your own Exercise Plan using bestonhealth's Individualised Exercise Planner.

Frequently Asked Questions (FAQs)

21st Century Biomedical Research Still Faces Huge Data/Knowledge Challenge

- 21st Century research is based on a continuum – from bench to bedside and back, and makes use of digital “data” of all kinds – biological, molecular, clinical, laboratory, pharmacy, etc. – to drive knowledge.
- But..... at present, these data are still:
 - Of varying quality;
 - Non-conformant to standard vocabularies;
 - Frequently incomprehensible or prohibitively laborious to translate from one discipline to another.
- Unlike almost all sectors in today’s knowledge economy, biomedicine has no means for efficient **collection, aggregation, integration, analysis, interpretation, and transmittal** of data so that it can be converted into practical, useful knowledge by anyone other than the original author.

Ecosystem to create “Translatable Informatics” Framework

- an open information technology framework – comprised of standards, specifications, vocabularies, and code bases – that enables users to capture, aggregate, integrate, analyze, interpret, and transmit data through open interfaces between different repositories, institutions, or other sources of data.
- facilitates the translation of data into information at all points of the biomedical life cycle (discovery science, translational science, clinical development, clinical care, population science.)

Translatable Informatics generates the flow of information necessary to sustain all participants in the biomedical ecosystem.

Translatable Informatics Ecosystem “interests”

- **Pharmaceutical companies** need a reusable clinical trials infrastructure to avoid “re-creating” every clinical trial de novo, especially for molecularly targeted drugs in which patient subgroups must be identified early in the process.
- **Research institutions** need a common framework to use data trapped within their own different departments and laboratories, to fuel collaborations and accelerate time to discovery.
- **Individual researchers** need “liquid data” at their fingertips that can be used to form or validate research hypotheses, empowering them to leverage more diverse and/or larger datasets than those they have themselves generated.
- **Clinical care providers** need to mobilize the clinical data already in their systems to measure the efficacy of their current care, to improve clinical outcomes, and to fuel research by correlating clinical profiles with molecular data.
- **Patient advocacy organizations** need cost-effective platforms to gather clinical information from their patient population as well as accompanying research data generated from those populations, to help physicians determine most effective care and to help drive therapy-focused research by academics and pharmaceutical companies.

The Role of the Commercial IT Sector

- **Software developers and systems integrators need to provide products and services customized to the biomedical market.**
- **Since the use of TI requires only *open, defined interfaces* between systems, it does not disrupt the development and commercialization of proprietary information technology products and services.**
- **Such IT companies will benefit from:**
 - The creation of a “common market” evolved from the fragmented components of the different sectors;
 - The reduction of risk that results from having a core collection of non-viral, open source code that can be reused

Requisites for Translatable Informatics

- **Data Standards:** Shared data standards ensure that data generated at different locations and by different applications is accessible/meaningful.
- **Grid or network:** A grid that provides the “backbone” to which applications and data sources can connect, and allows researchers to access shared data via the use of web-query tools.
- **Policies for Data Sharing:** Numerous legal, ethical, security, and cultural constraints must be addressed to enable the requisite collection, aggregation, integration, analysis, interpretation and transmission of data for collaborative research. Policies that promote broad-based information sharing under appropriate access terms are needed for compliance with HIPAA (Health Insurance Portability and Accountability Act), government regulations, and institutional policies.

caBIG[®] has prototyped the requisites

Semantically-aware Services Oriented Architecture

- **Semantically-aware Service Oriented Architecture (sSOA) supports the challenges of integrating diverse classes of information distributed across a distributed, heterogeneous cancer research and care community**
- **In addition to data integration, sSOA enables the coordination of functionality between the various information systems that reside within those organizations and enable collaborative data processing and work flow execution**
- **Services can be implemented in a largely standalone fashion to allow for the rapid creation of composite applications via service marshalling or integrated with existing applications**
- **Leverages and extends existing information models such HL7 RIM and the unified health care delivery/regulatory model BRIDG**

Services Aware Interoperability Framework (SAIF)

HL7 architectural approach and framework for the development and use of HL7 standards from a Services Oriented Architecture (SOA) perspective.

- Human-readable statement about APIs facilitating use and interconnection
- Machine-testable definitions expediting review and assuring uniformity
- Platform-independent specifications
- Expanded metadata infrastructure to support latest paradigms in biomedical informatics, including the semantic web
- Robust services framework to support integration

NCI Enterprise sSOA *Periodic Table of Services*

"PROCESS"	R Registration	Pt Protocol	Oc Study Outcomes	Po Patient Outcomes	E Eligibility	Ae Adverse Event	Hx Hx and Physical	Dx Discharge Note	Ds Decision Support	Ra Referral and Authorization	
"CAPABILITY"	Cr Credentialing	S Specimen	Tp Treatment Plan	I L Rx Image Lab Pharmacy			Sc Scheduling				
"CORE"	Sd SDTM	Qr Data Query	C Correlation	O Organization	P Person	Pa Protocol Abstraction	D Disease	A Agent	Mp Master Problem List	Ay Allergy	
"Infra / UTILITY"	Km Knowledge Management	Cm Contract Management	Ev Enterprise Vocabulary	Va Validation	Tx Translation	Au Audit	Id Tr Aa Py Id Management Trust Management Authorization Authentication Policy				

Usage Patterns for NCI Services

- **Service Specifications:** NCI services layered service specifications (conceptual model, platform independent model and platform specific model) for organizations wishing to build or adapt products that can interoperate with NCI services
- **Reference Implementations:** NCI provides reference implementations of these services that provide Application Programming Interfaces implemented in many technologies

All NCI specifications and reference implementations are made available via a non-viral Open Source license that explicitly allows for commercial, closed source reuse and derivative works

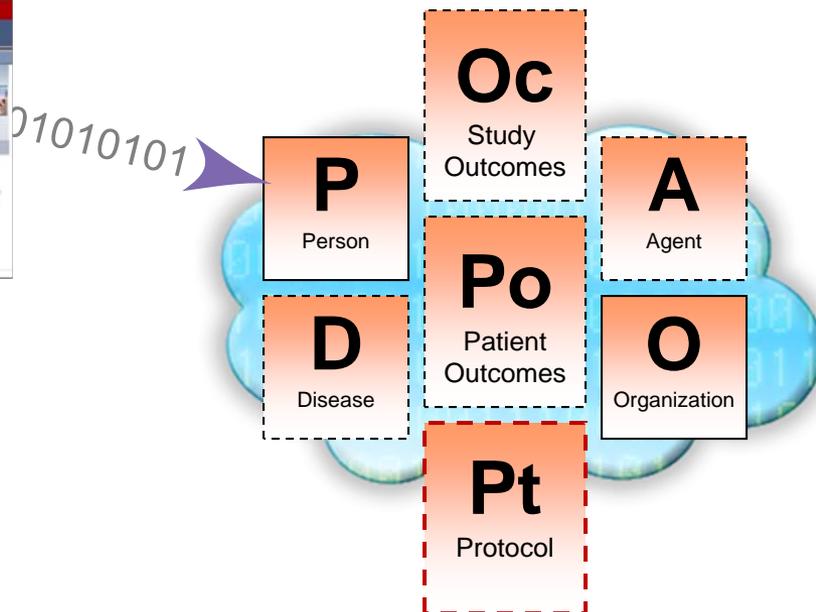
Technology Bindings Utilized by NCI Services

NCI Services are designed to be readily accessed using a variety of technologies. These include:

- Application Programming Interfaces: Commonly implemented as Remote Enterprise Java Beans (EJB's), but increasingly including API's that utilize .NET frameworks
- Grid Services: Access via the NCI's semantically-aware SOA infrastructure, caGrid
- Web Services: Access via WS-I compliant web services
- REST APIs: Simple APIs that allow for easy connection to services but can't utilize the advanced semantic capabilities of caGrid
- Accessible via CONNECT Gateway

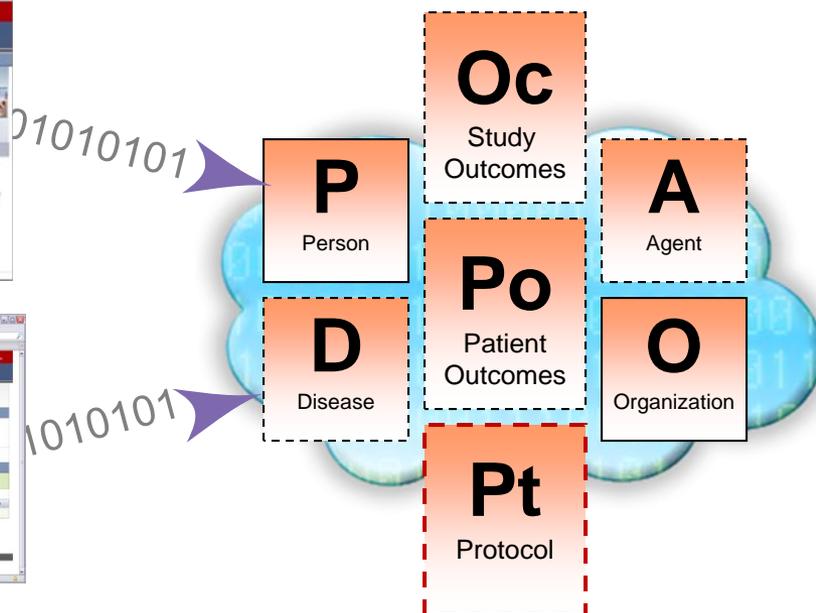
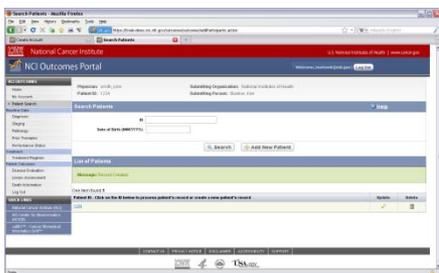
NCI/SAIC/Microsoft *e-Health for All* Collaboration

NCI Enterprise Services were created to support the systematic collection of the NCI's Clinical Research Portfolio through the **Clinical Trials Reporting Program**



NCI/SAIC/Microsoft *e-Health for All* Collaboration

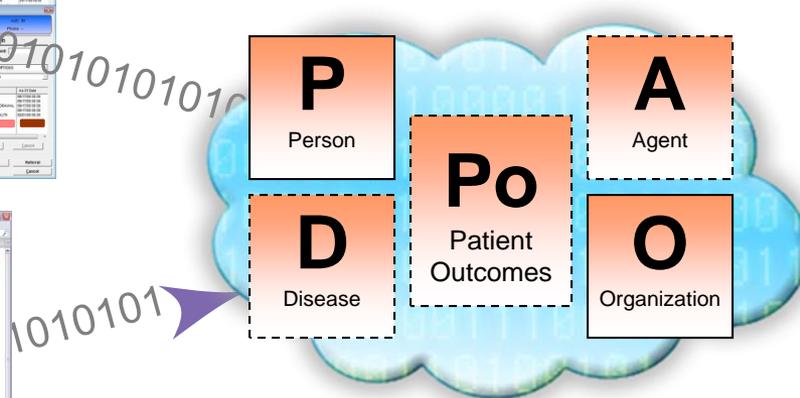
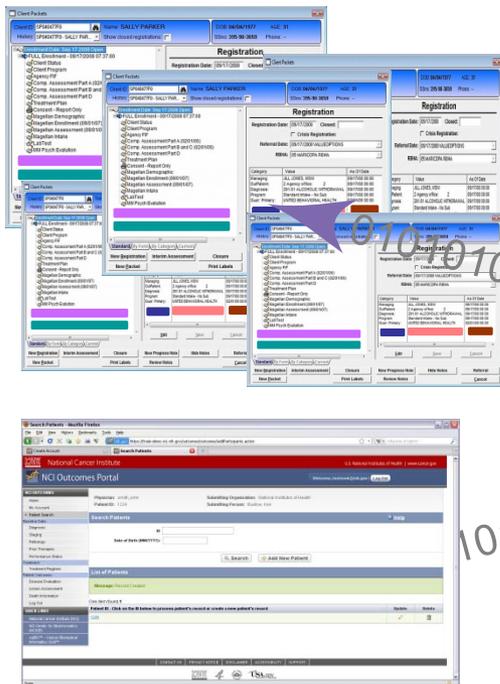
NCI Enterprise Services were created to support the systematic collection of the NCI's Clinical Research Portfolio through the **Clinical Trials Reporting Program**



The core of the **Clinical Trials Reporting Program** services represent the information need for a modular, **Ultra-light Electronic Health Record**

NCI/SAIC/Microsoft *e-Health for All* Collaboration

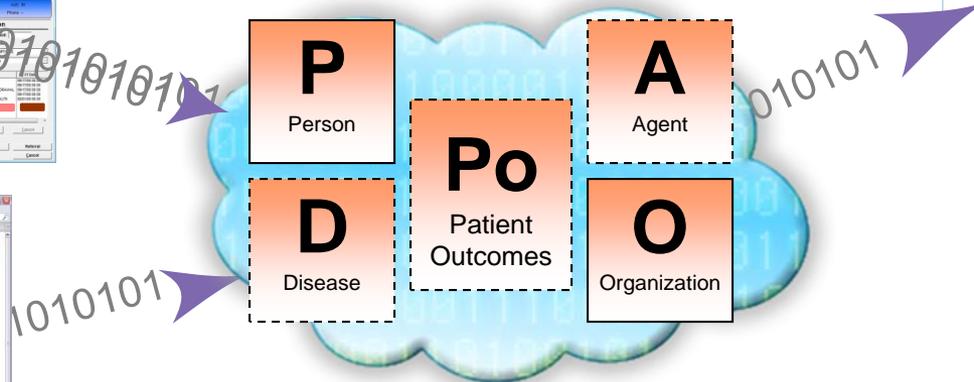
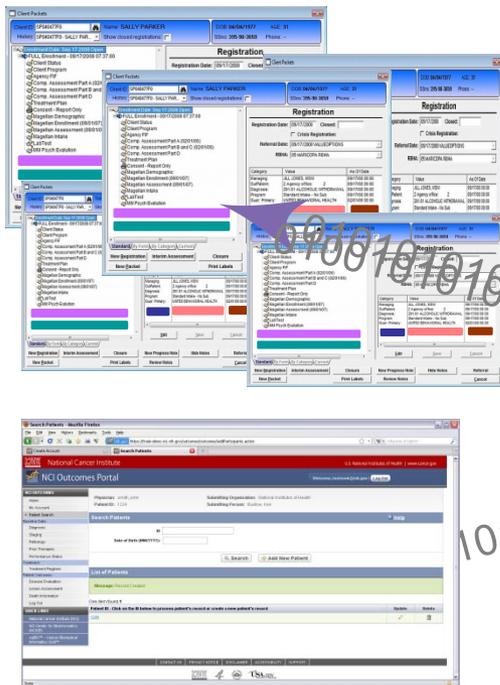
NCI Enterprise Services provide **specifications** and **reference implementations** for health information exchange



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NCI/SAIC/Microsoft *e-Health for All* Collaboration

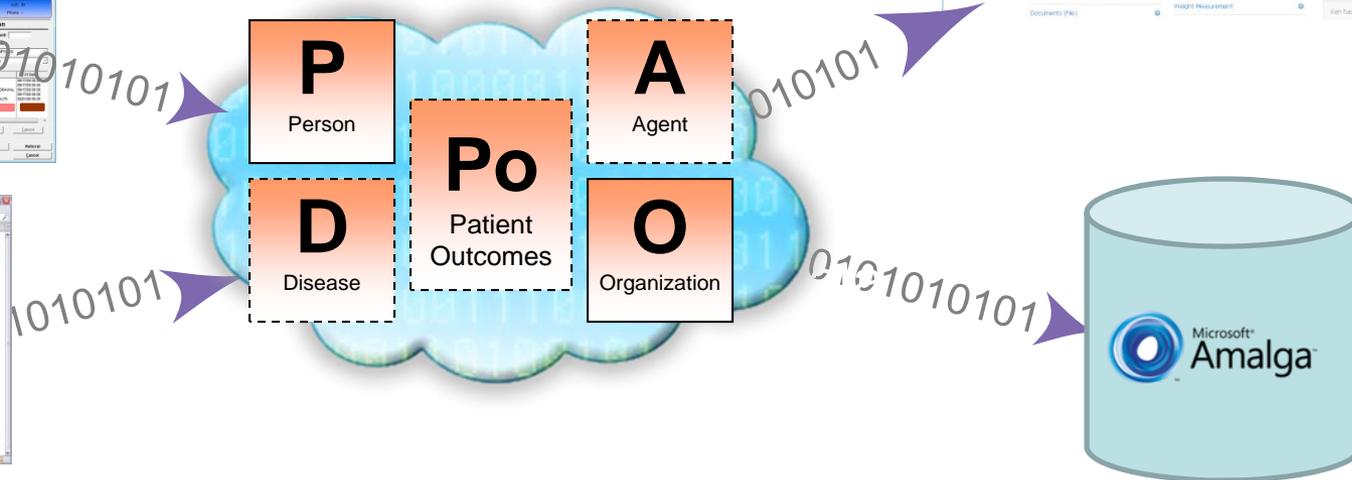
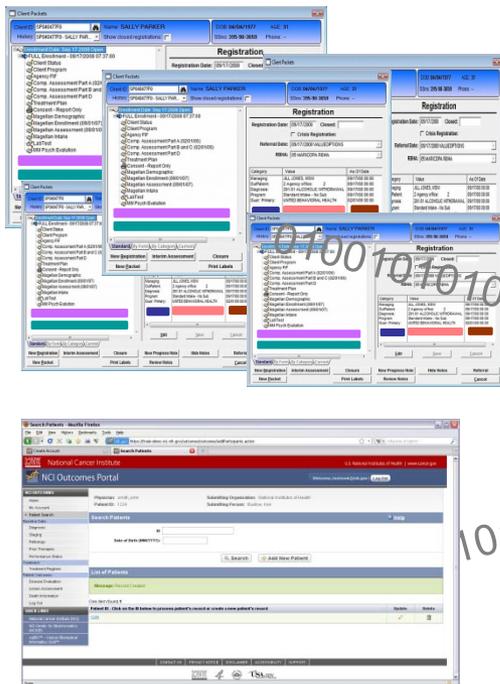
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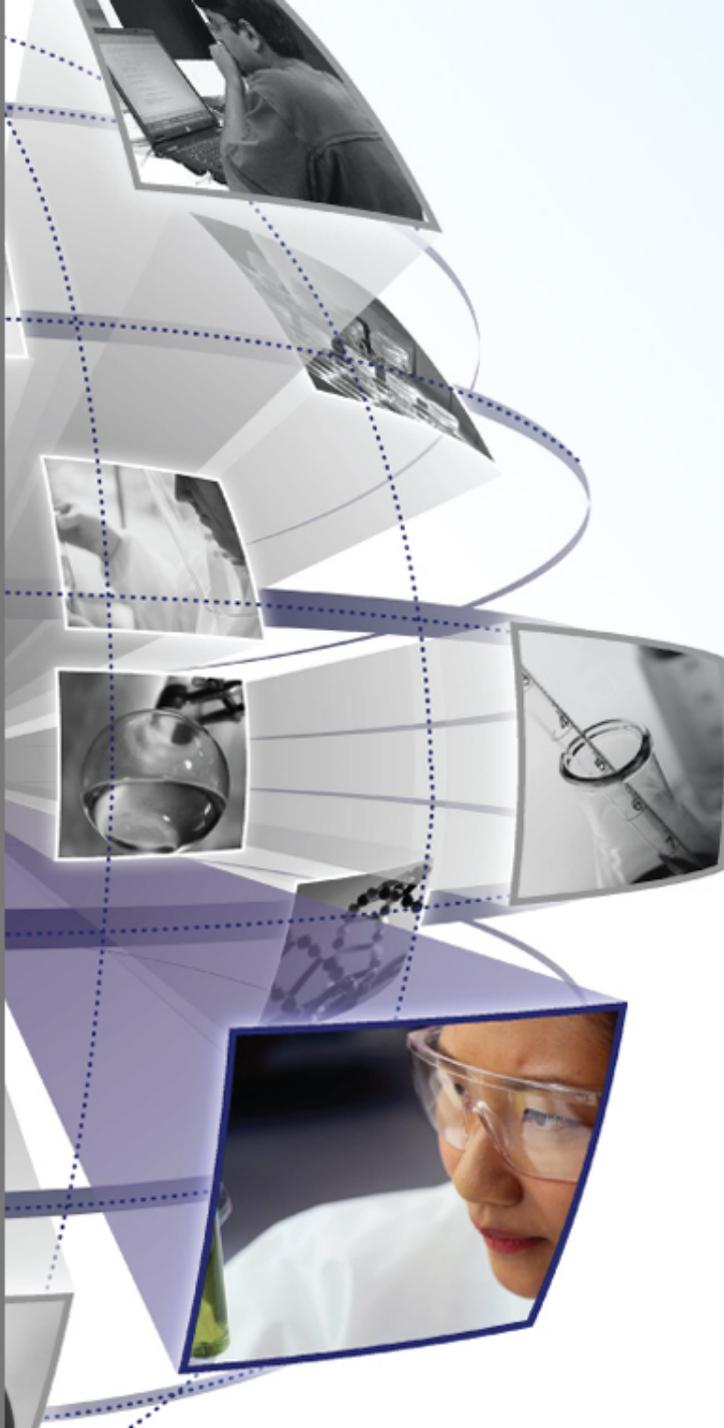
Services support the electronic transmission of health information to **patient-controlled health records**

NCI/SAIC/Microsoft *e-Health for All* Prototype

NCI Enterprise Services facilitate generation **health information utilities** to support research, quality, and CER



Services support the electronic transmission health information to **patient-controlled health records**



caBIG[™]
cancer Biomedical
Informatics Grid[™]

Prototyping a Rapid Learning Healthcare System:

The Cancer e-Life Collaboration



CancerONE Provider Portal



National Cancer Institute

U.S. National Institutes of Health | www.cancer.gov

CancerONE Connect

Login

Welcome to CancerONE Connect

This portal gives you resources to better manage your patients' information and clinical care.

Join today to receive alerts and news tailored to your areas of interest!



[View Demo +](#) (5 min)

Get Started

Create an account by verifying your credentials through a simple sign up. [Open Account +](#)

 Protecting the privacy and security of your patient records. [Learn More +](#)

Resources available allow you to:

-  **Create or Update Patient Records:**
Create or update a patient record using the NCI's web-based Patient Outcomes Data Service (PODS)
[Click here to see how +](#)
-  **Share Patient Records:**
Send information or test results to your patient or another provider
[Click here to see how +](#)
-  **Find Clinical Trials:**
Match your patient with a clinical study
[Click here to find out how +](#)
-  **Match Profiles:**
Compare your patient with other patients of similar profile
[Click here to learn how +](#)



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Provider Capture of Information



National Cancer Institute

U.S. National Institutes of Health | www.cancer.gov

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ALERT: Tarceva (erlotinib) May 2009 (5/8/2009) [+](#)

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Panel looks at Environmental Cancer Risks [Read More +](#)

MRI scans accurately spot spread of cancer: study [Read More +](#)

Substance Found to Kill Cancer Stem Cells [Read More +](#)

Protecting the privacy and security of your patient records. [Learn More +](#)

Publications:

NCI's Cancer Information Service (CIS): Get the latest and most accurate cancer information for patients, their families, the public, and health professionals online or speak to an information specialist (1-800-4-CANCER) [Read More +](#)

NCI Publications Online: Order comprehensive research-based information for patients and their families, health professionals, cancer researchers, advocates, and the public. [Read More +](#)

PubMed: Access 20 million citations for biomedical literature from MEDLINE, life science journals, and online books maintained by the U.S. National Library of Medicine. [Read More +](#)

NCI Cancer Bulletin: Read the NCI's biweekly online newsletter designed to provide useful, timely information about cancer research to the cancer community. [Read More +](#)



Create or Update Patient Records:

Create or update a patient record using the NCI's web-based Patient Outcomes Data Service (PODS)

[Launch +](#)

to your patient or another provider
[Launch +](#)

 **Find Clinical Trials:**
Match your patient with a clinical study
[Launch +](#)

 **Match Profiles:**
Compare your patient with other patients of similar profile
[Launch +](#)

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“ultra-light” oncology EHR: an on-ramp to electronic health for community practices

The screenshot shows a web browser window titled "Diagnosis" with the URL <https://trials-demo.nci.nih.gov/outcomes/outcomes/executeDiagnosis.action>. The page header includes the National Cancer Institute logo and the text "National Cancer Institute" and "U.S. National Institutes of Health | www.cancer.gov". Below the header is the "NCI Outcomes Portal" with a user greeting "Welcome, mulairee@mail.nih.gov" and a "Log Out" button.

The main content area is titled "Diagnosis" and includes a "Help" link. It displays the following information:

- Physician: User, CBIIT
- Patient ID: TestPt00002
- Submitting Organization: Organization by Hari
- Submitting Person: Mulaire, Edmond

The "Diagnosis" form contains the following fields and buttons:

- Diagnosis:** A text input field with a "Look Up" button.
- Diagnosis Date:** A date input field with a calendar icon and the format "(mm/dd/yyyy)".
- Buttons:** "Save" and "Cancel" buttons.

The left sidebar contains a navigation menu with the following sections:

- NCI OUTCOMES**
 - Home
 - My Account
 - Patient Search
- Baseline Data**
 - Diagnosis (selected)
 - Staging
 - Pathology
 - Prior Therapies
 - Performance Status
- Treatment**
 - Treatment Regimen
- Patient Outcomes**
 - Disease Evaluation
 - Lesion Assessment
 - Death Information
 - Log Out
- QUICK LINKS**
 - National Cancer Institute (NCI)
 - NCI Center for Bioinformatics (NCICB)
 - caBIG™ - Cancer Biomedical Informatics Grid™

The footer contains a navigation bar with links for "CONTACT US", "PRIVACY NOTICE", "DISCLAIMER", "ACCESSIBILITY", and "SUPPORT". Below the navigation bar are logos for the NCI, USA.gov, and the caBIG logo.

Information-driven Care



National Cancer Institute

U.S. National Institutes of Health | www.cancer.gov

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[Launch +](#)

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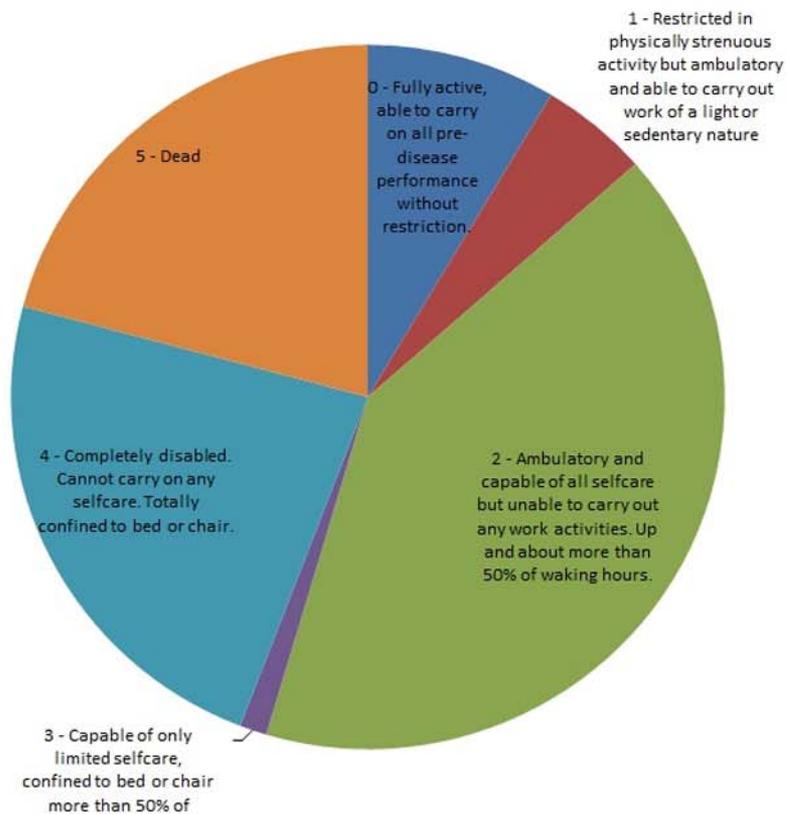
Microsoft SAIC
From Science to Solutions

cancer Biomedical Informatics Grid®

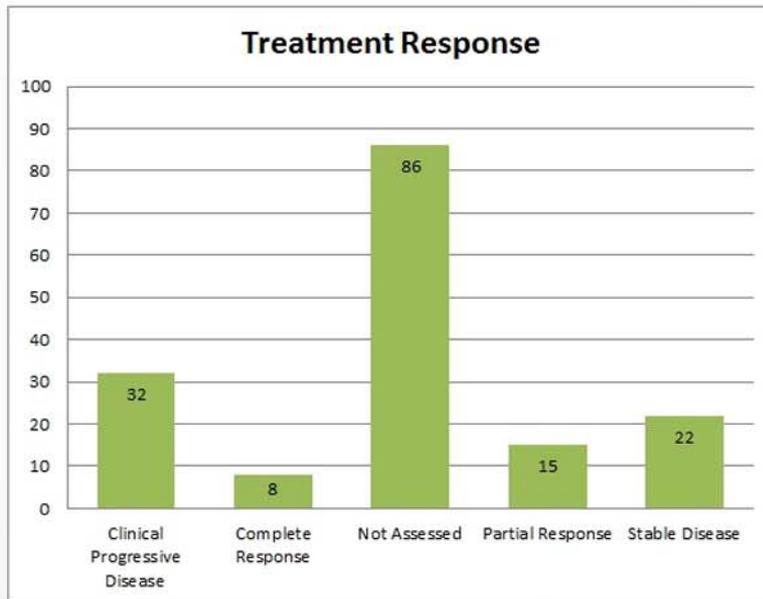


Gender <input type="checkbox"/> <input type="button" value="Female"/> <input type="button" value="Male"/>	Race <input type="checkbox"/> <input type="button" value="Asian"/> <input type="button" value="Black_or_African_American"/> <input type="button" value="White"/>	Age <input type="checkbox"/> <input type="button" value="20 - 24"/> <input type="button" value="25 - 29"/> <input type="button" value="30 - 34"/> <input type="button" value="35 - 39"/> <input type="button" value="40 - 44"/> <input type="button" value="45 - 49"/> <input type="button" value="50 - 54"/> <input type="button" value="55 - 59"/> <input type="button" value="60 - 64"/> <input type="button" value="65 - 69"/> <input type="button" value="70 - 74"/> <input type="button" value="75 - 79"/> <input type="button" value="80 - 84"/> <input type="button" value="85 - 89"/> <input type="button" value="90 - 94"/> <input type="button" value="95 - 99"/> <input type="button" value="0 - 4"/> <input type="button" value="100 - 104"/> <input type="button" value="15 - 19"/>	AJCC Stage <input type="checkbox"/> <input type="button" value="1"/> <input type="button" value="2"/> <input type="button" value="4"/> <input type="button" value="3"/>	Drug <input type="checkbox"/> <input type="button" value="Carboplatin"/> <input type="button" value="Cisplatin"/> <input type="button" value="Etoposide"/> <input type="button" value="Paclitaxel"/> <input type="button" value="Vinorelbine"/>
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ECOG Performance Assessment



Response to Chemotherapy Drugs Lung Cancer Patients



My Cancer e-LIFE: supporting a new model of Advocacy

Your Favorite Advocacy Organization

http://www.YourFavoriteAdvocacyOrganization.org

SEARCH

About Us | Cancer Facts and Figures | Membership | Advocacy Toolbox | Press Room | Events and Calendar | Newsletter

Welcome to Your Favorite Advocacy Organization

In collaboration with the research community, we are transforming our fundamental approach to fighting cancer. Together, we are dedicated to improving the lives of cancer patients and eliminating cancer through research and education.

Get Information About:

- ➔ Types of Cancer
- ➔ Treatment Options
- ➔ Clinical Trials
- ➔ Publications

My Cancer eLIFE

A one-stop shop for managing my health information

Learn more

Contribute your knowledge to help conquer cancer



ABOUT US

NETWORKS NETWORKS



Join today and *Contribute* to help conquer cancer

- ◆ Share your information (if you wish) with cancer researchers and other cancer survivors
- ◆ Access information, **tools**, and **communities** to help you live with cancer
- ◆ **Track** day-to-day experiences such as side effects, etc
- ◆ **Share** information with your doctor(s)



TOOLS & COMMUNITY



Access information, tools, and communities to help you live with cancer

TRACK



Track day-to-day experiences such as side effects, etc. wellness, learning and more

SHARE



Share information with cancer researchers and other cancer survivors and with your doctors.

SIGN IN

Get Started

All health records you create through the community are stored in Microsoft HealthVault, a security-enhanced service that lets you gather your health records online.



Join now to connect with cancer survivors and help cancer researchers

FOLLOW US



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Contribute your knowledge to help conquer cancer



HOME MY MEDICAL INFORMATION HEALTH JOURNAL RESOURCES **SHARE** ABOUT US

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Access my Record

[Home](#) > [Share](#) > Ask your doctor to help

E-mail

Print

E-mail address:

Dear Doctor,

I would like an electronic copy of my health information.

[SEND](#) ➔

3 SIMPLE STEPS TO CONTRIBUTE

- 1 Use the form on the left to ask your doctor to share your information
- 2 Your doctor will then accept the invitation and share information
- 3 Consent to share information you provide



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Connects with Microsoft HealthVault™

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Cancer Care Summary

Date: 04/23/2010

Author: National Cancer Institute

Diagnosis

Diagnosis Date: Apr 23, 2010

Diagnosis Name: clear cell sarcoma of the kidney

Diagnosis Result Code: CDR0000043303

Pathology

Pathology Description: Pathology Description text ...

Pathology Grade: G2

Pathology Grade System: Gleason

Contribute your knowledge to help conquer cancer



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My health journal

Home > Health Journal > Weekly View

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Week of January 3 - January 9, 2010

View journal Weekly

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
January 3 2010	January 4 2010	January 5 2010	January 6 2010	January 7 2010	January 8 2010	January 9 2010
MOOD Happy	MOOD Happy	MOOD Happy	MOOD Just OK	MOOD Depressed	MOOD Just OK	MOOD Happy
SLEEP -----	SLEEP -----	SLEEP -----	SLEEP Medium quality 5 hours	SLEEP Poor quality 3 hours	SLEEP Poor quality 4 hours	SLEEP -----
PAIN Moderate	PAIN -----	PAIN -----	PAIN -----	PAIN Severe	PAIN Moderate	PAIN -----
NOTES	NOTES	NOTES	NOTES	NOTES Couldn't even get dressed or leave the house Sharp stabbing pains in the back of my neck	NOTES Pain prevented sleep for 3 hours	NOTES
ADD ENTRY	ADD ENTRY	ADD ENTRY	ADD ENTRY	ADD ENTRY	ADD ENTRY	ADD ENTRY

CONFIGURE HEALTH JOURNAL



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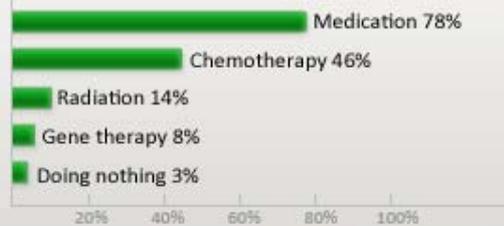
[CONNECT WITH PEOPLE IN THIS GROUP](#)

[NARROW OR WIDEN THIS GROUP](#)

There are **1,797** females over the age of 65 with Stage II Colon cancer in the Cancer Knowledge Alliance database.

MEDICAL TREATMENTS [SEE ALL](#)

What treatments are they getting for their cancer?



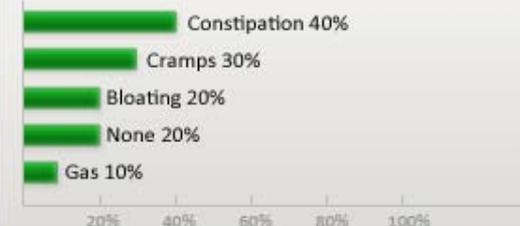
DIAGNOSED [SEE ALL](#)

How long have they been diagnosed?



SYMPTOMS [SEE ALL](#)

What symptoms do they have?



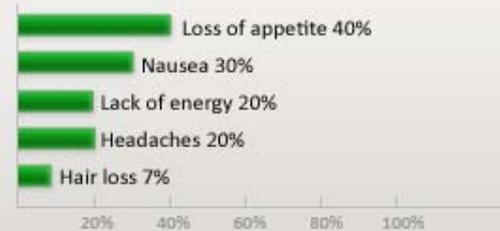
NON-MEDICAL TREATMENTS [SEE ALL](#)

What non-medical things are they doing ?



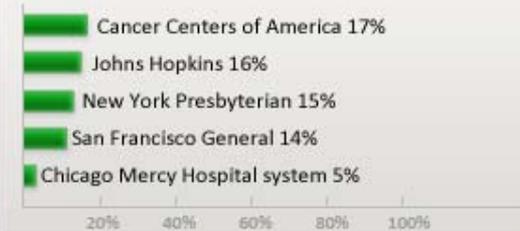
SIDE EFFECTS [SEE ALL](#)

What treatment side effects are they experiencing?



TREATMENT LOCATION [SEE ALL](#)

Where are they being treated?



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Consent to share your data

[Home](#) > [Share](#) > Consent to share

Share your data with researchers

Share my de-identified data with researchers. No data will be shared that could identify you

I AGREE

I DO NOT AGREE

View our [Privacy Policy](#) to see how we protect your information

WHY SHARE MY INFORMATION?

The more information that researchers have, the more likely it is that they will be able to find better treatments, prevention methods or even a cure!

Contribute your knowledge to the search for the cure.



Join now to connect with cancer survivors and help cancer researchers

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Joining Provider and Patient Information



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Current News:

Panel looks at Environmental Cancer Risks [Read More +](#)

MRI scans accurately spot spread of cancer: study [Read More +](#)

Substance Found to Kill Cancer Stem Cells [Read More +](#)

Protecting the privacy and security of your patient records. [Learn More +](#)

Publications:

NCI's Cancer Information Service (CIS): Get the latest and most accurate cancer information for patients, their families, the public, and health professionals online or speak to a specialist (1-800-4-CANCER)

NCI Publications Online: Order research-based information for families, health professionals, researchers, advocates, and the public

PubMed: Access 20 million citations of biomedical literature from MEDLINE, life science journals, and online books maintained by the U.S. National Library of Medicine

NCI Cancer Bulletin: Read the online newsletter designed to provide timely information about cancer research to the cancer community. [Read More +](#)

Create or Update Patient Records:

Create or update a patient record using the NCI's web-based Patient Outcomes Data Service (PODS)

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Share Patient Records:

Send information or test results to your patient or another provider

[Launch +](#)

Find Clinical Trials:

Match your patient with a clinical study



Match Profiles:

Compare your patient with other patients of similar profile

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Microsoft SAIC

cancer Biomedical Informatics Grid®

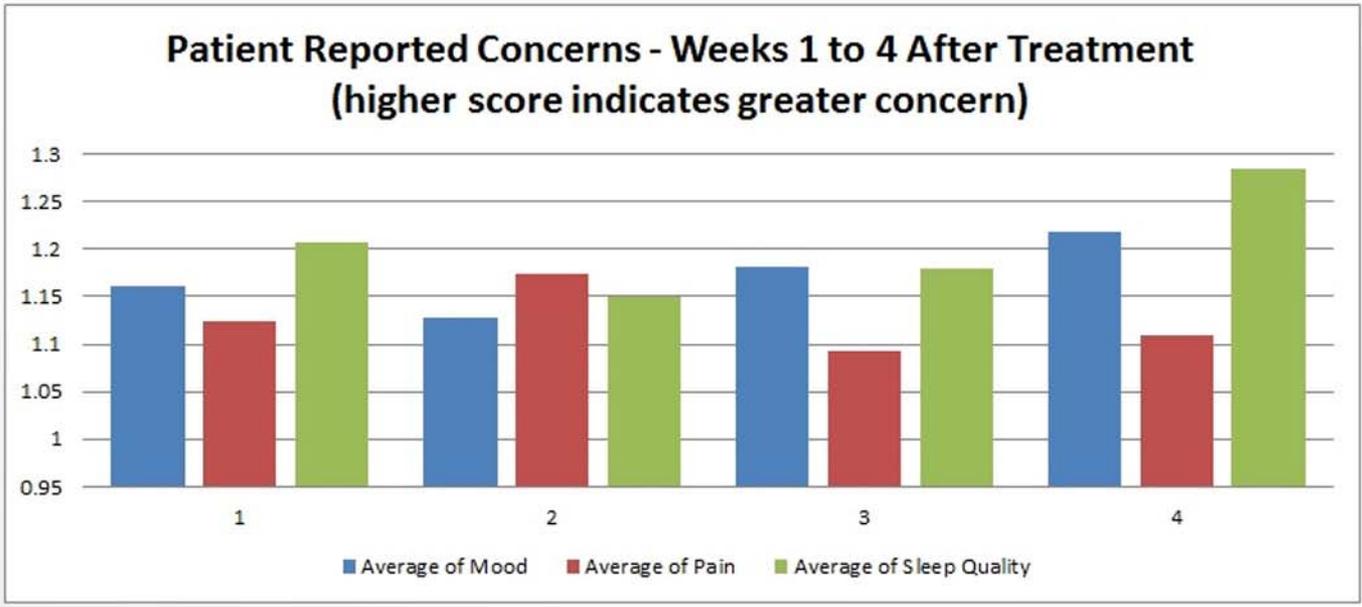


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Patient Reported Outcomes Treatment Delay > 30 Days

Dx-to-Treatment Days > 30

Diagnosis	Patients
breast cancer	9
colon cancer	4
colorectal cancer	5
hematopoietic/lymphoid cancer	5
kidney/urinary cancer	2
lip and oral cavity cancer	4
lung cancer	12
ovarian epithelial cancer	2
pancreatic cancer	4
prostate cancer	12
skin cancer	4
thyroid cancer	3
uterine corpus cancer	3
Grand Total	69

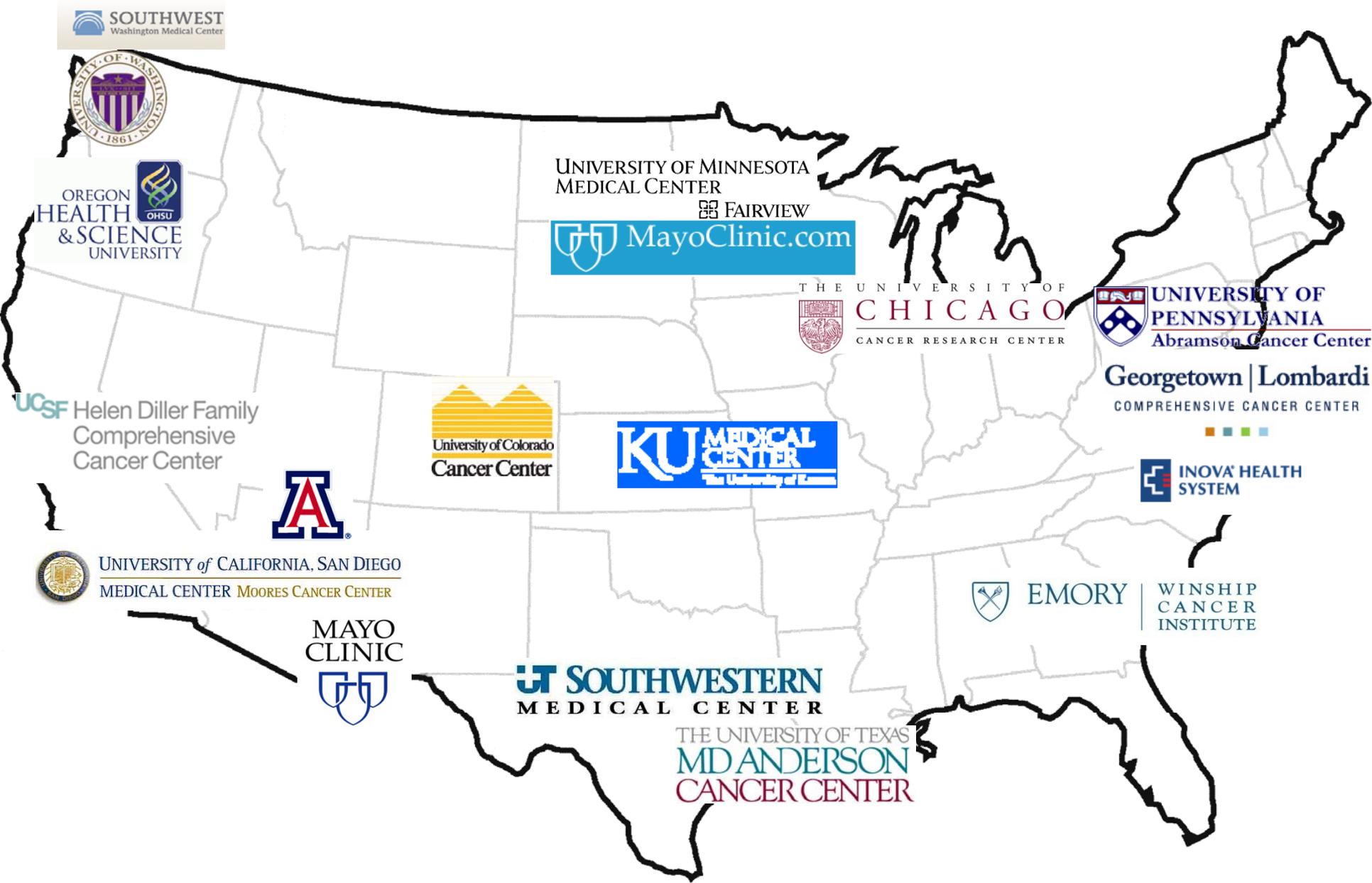


**The I-SPY TRIAL (Investigation of
Serial studies to Predict Your
Therapeutic Response with
Imaging And moLecular analysis):**

A national study to leverage biomarkers
in predicting response to combinatorial therapy for
women with Stage 3 breast cancer.

(PI Laura Esserman, UCSF)

Projected I-SPY 2 study sites



I-SPY Adaptive Trial Outline



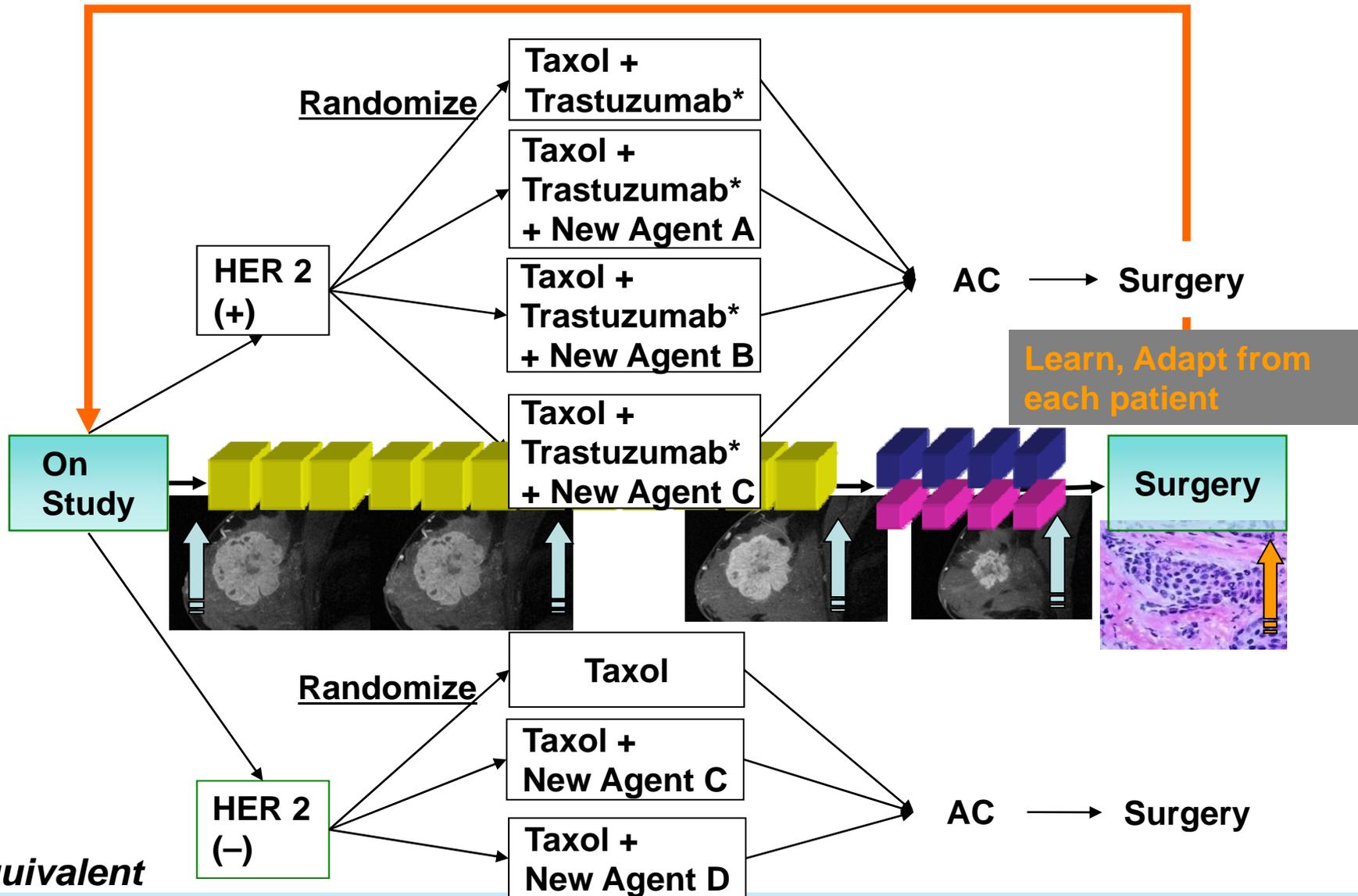
Accrual: Anticipate 800 patients over 3–4 years

Enroll ~20 patients per month

Participating Sites: 15–20 across US and Canada

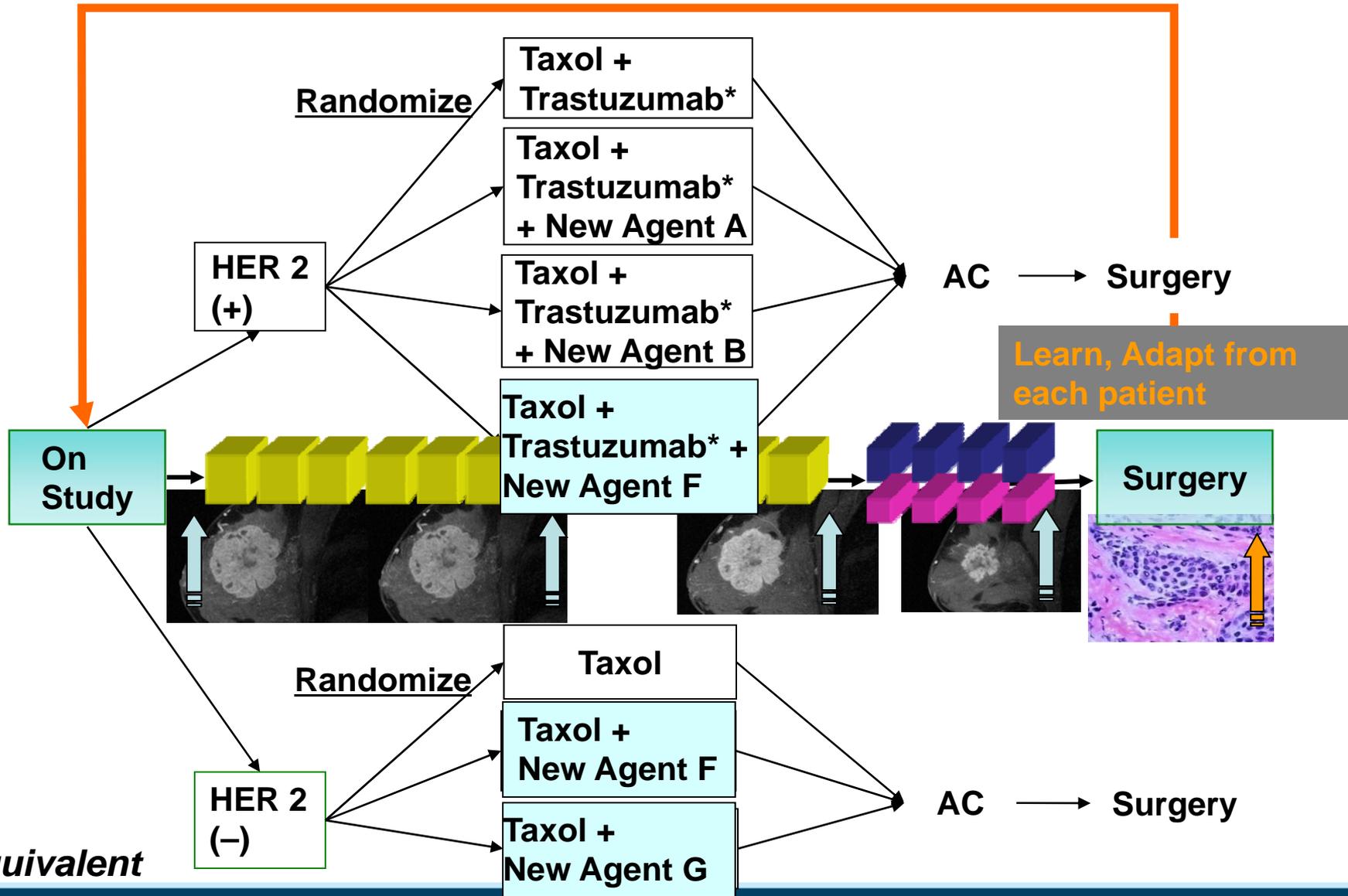
I-SPY Adaptive Trial:

Introduce several new agents for a given profile



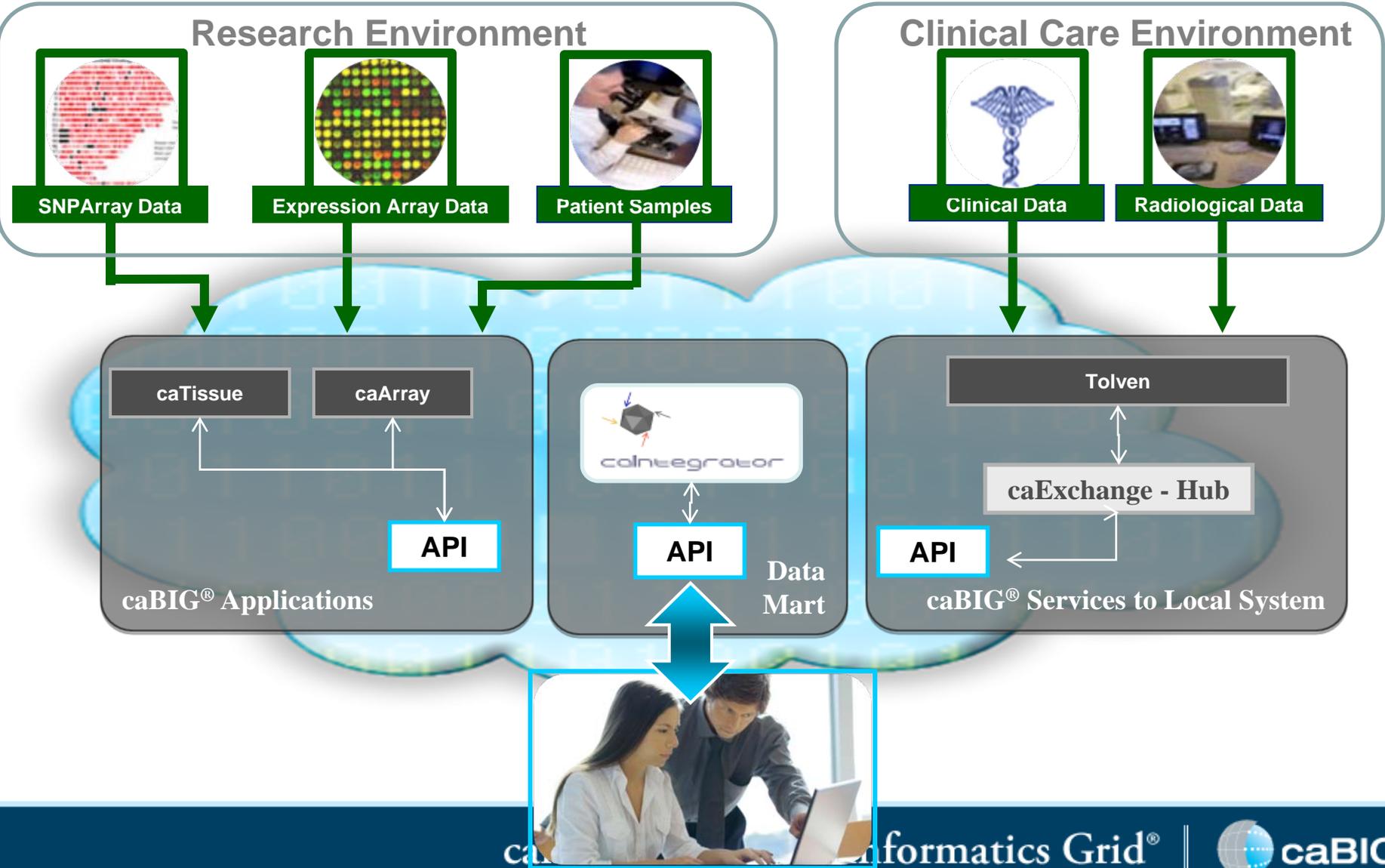
I-SPY Adaptive Trial:

Introduce several new agents for a given profile



**Or Equivalent*

I-SPY TRIAL IT Infrastructure



Summary



- **Opportunities exist right now to use data in new ways to transform research and clinical care**
 - It's a unique moment – many trends are converging
 - Technology now offers possibilities not feasible ever before
 - We can work differently – using information technology and seamless flow of data – to accelerate research AND improve clinical care
- **Participants from every sector have a contribution to make** – consumers, providers, industry, government, academe – to conquer cancer