



**BIGHEALTH**  
CONSORTIUM™

***“Linking Research and Care to Make  
Personalized Medicine a Reality”***

**Roundtable Workshop**

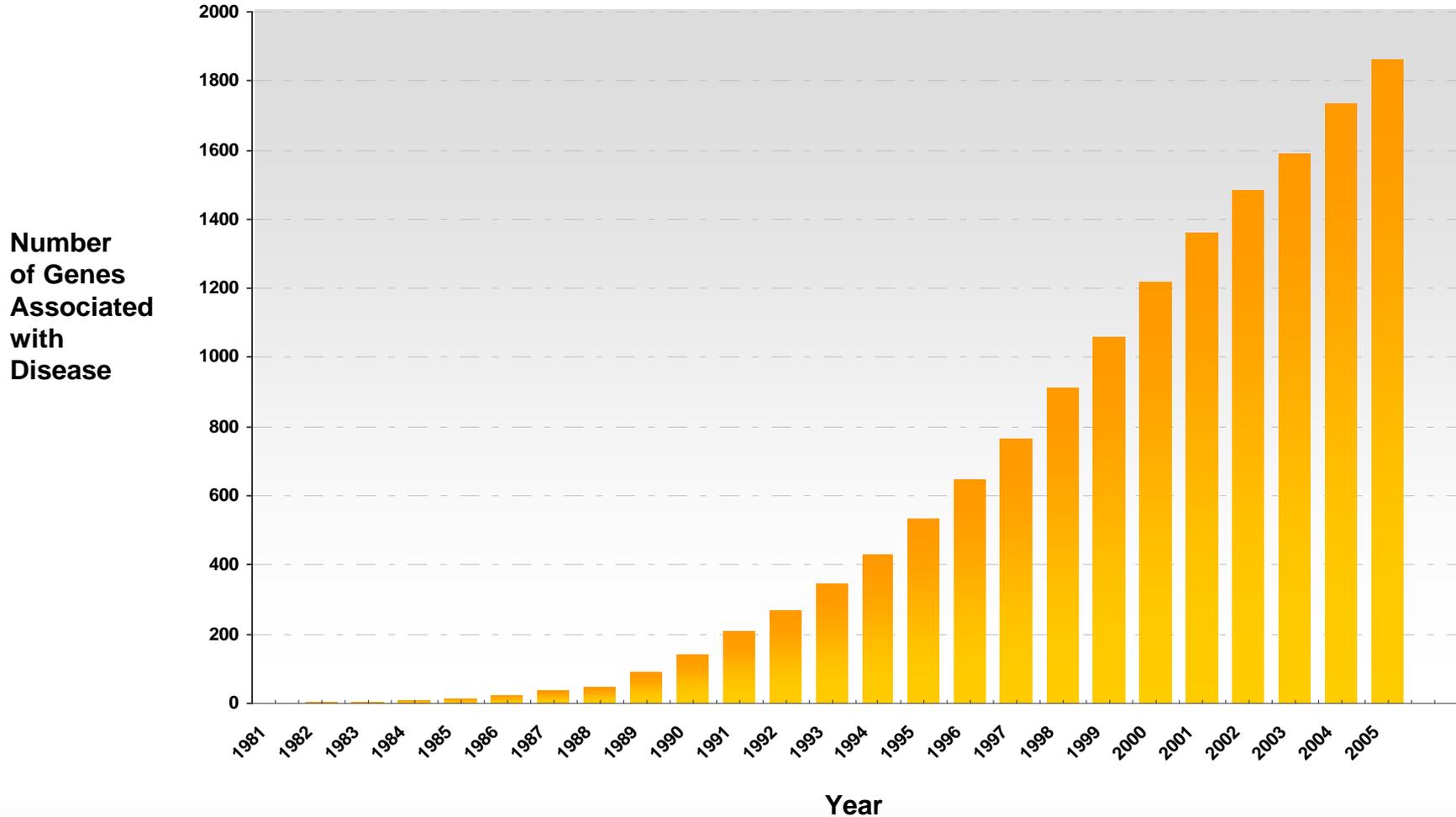
*September 10, 2008*

# Achieving Personalized Medicine

*“It’s hard to be patient...”*

# The Best of Times: Scientific Transformation

## Cumulative Pace of Disease Gene Discovery 1981-2005



# The Best of Times: Molecular Dx/Rx Products Are Emerging

**Table 2 A growing personalized medicine cabinet**

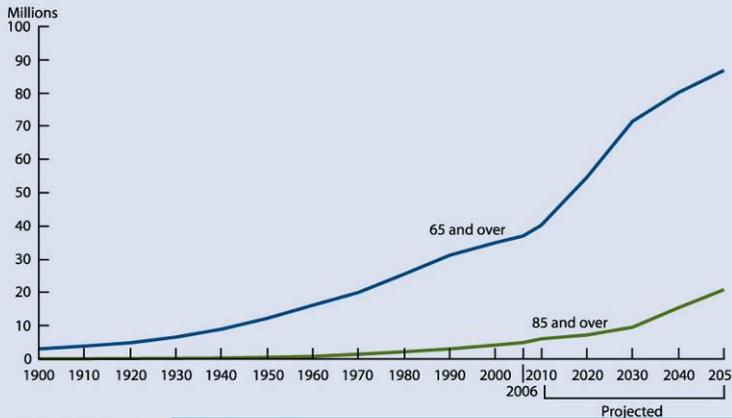
Drug/indication	Drug developer	Test/selected product developers	Comments
<b>Testing required by FDA</b>			
Erbix/colon cancer	Imclone	EGFR pharmDX/DAKO Cytomation	IHC to determine EGFR presence or absence. Test also recommended, but not required, for use with Erbix in head and neck cancer
Selzentry/HIV AIDS	Pfizer	Trofile (CCR5 tropism)/ Monogram Biosciences	Amplification of patient HIV genome, creation of artificial viral particles and infection assay
Vectibix <sup>®</sup> /colon cancer	Amgen	EGFR expression KRAS/DxS	The test is required in Europe. KRAS mutations may be relevant in a variety of other cancers
Herceptin/breast cancer	Genentech/Roche	HER2 overexpression/various	Can be done by FISH or IHC but apparently variation in accuracy is possible between labs. Test also useful for prescribing GSK's Tykerb (lapatinib)
<b>Testing recommended by FDA</b>			
Imuran (azathioprine)/autoimmune diseases and transplants	GSK	Thiopurine methyltransferase variants/various	Enzyme activity and/or genotyping
Tegretol (carbamazepine)/epilepsy and bipolar disorder	Various	HLA-B 1502 variant found in people of Asian ancestry/various	Boxed warning recommends that patients with Asian ancestry receive a genetic test before starting treatment, because their risk of serious adverse reactions is 10 times that (1 to 6 per 10,000) of European ancestry
Tarceva (erlotinib)/NSCLC	Genentech/OSI	EGFR pharmDX/DAKO Cytomation	Impact of testing on treatment still unclear because too few patients were tested in trials
Camptosar (irinotecan)/colon cancer	Pfizer	UTG1A1 variants/Third Wave	Third Wave has a marketing relationship with Genzyme Genetics for this test
Elitek (rasburicase)/cancer	Sanofi-Aventis	G6PD deficiency/various	Beutler fluorescent-spot test
Coumadin/anticoagulant	Various	CYP2C9 and VKOR (vitamin K epoxide reductase) variant genotyping/Clinical Data, Genelex (Seattle) and Roche	There is much debate about whether and how to test

**Selected drugs for which informational tests are available**

Ziagen (abacavir)/HIV AIDS	GSK	HLA-B 57:01 variants	Predictive value for hypersensitivity reaction
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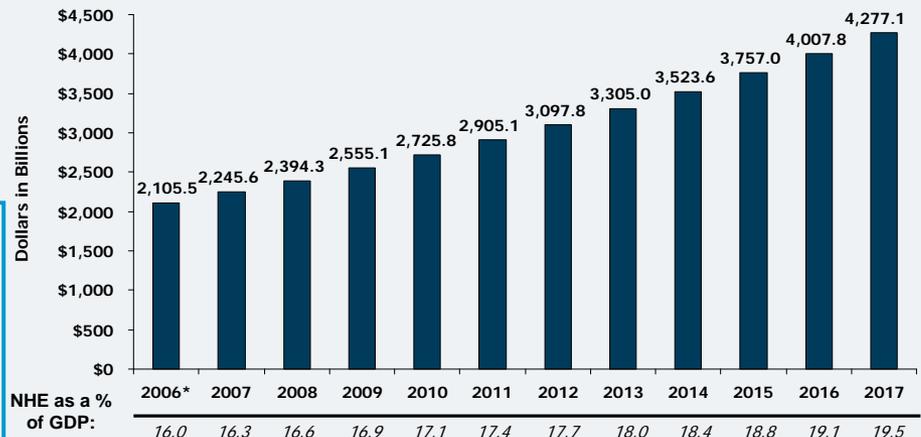
# The Worst of Times: Health Care Faces Daunting Challenges

Number of people age 65 and over, by age group, selected years 1900–2006 and projected 2010–2050



Note: Data for 2010–2050 are projected.  
Reference population: These data are based on the 2006 population.  
Source: U.S. Census Bureau, Dec 2006

## Projections of National Health Expenditures and Their Share of Gross Domestic Product, 2006-2017



\*2006 are actual data from the 2006 National Health Expenditure Accounts; 2007-2017 are projected data from the 2006 National Health Expenditure Accounts.

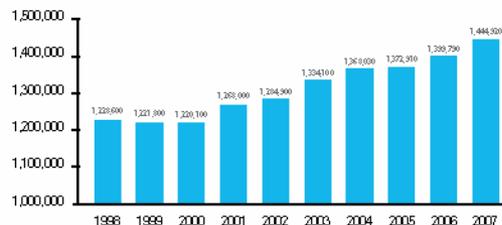
Source: Centers for Medicare and Medicaid Services, Office of the Actuary, National Health Statistics Group, at [http://www.cms.hhs.gov/NationalHealthExpendData/03\\_NationalHealthAccountsProjected.asp#TopOfPage](http://www.cms.hhs.gov/NationalHealthExpendData/03_NationalHealthAccountsProjected.asp#TopOfPage) (see Projected; NHE Historical and Projections, 1965-2017, file nhe65-17.zip) and <http://www.cms.hhs.gov/NationalHealthExpendData/> (see Historical; NHE summary including share of GDP, CY 1960-2006; file nhegd06.zip).



### Why It's Important: the Human and Economic Burden of Cancer

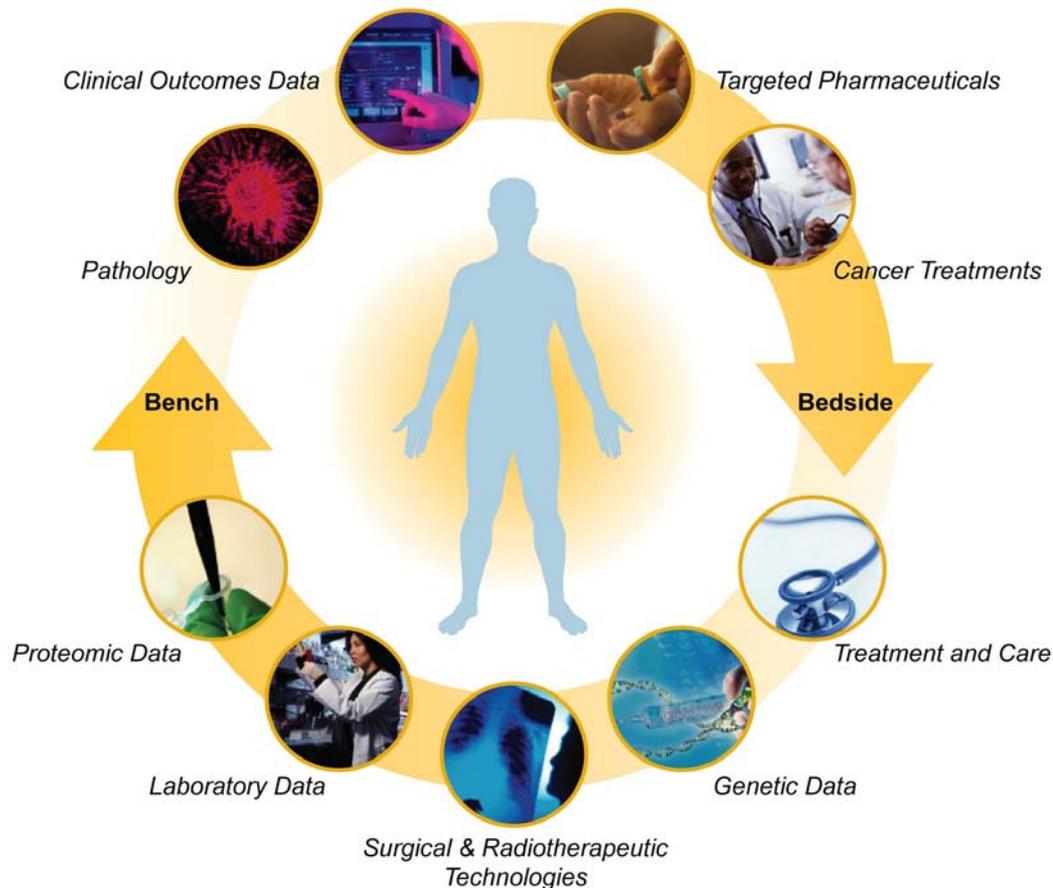
- 1,444,920 Americans were diagnosed with cancer in 2007
- 559,650 Americans died of cancer in 2007
- \$206.3 billion was spent on healthcare costs for cancer in 2006

Estimated Number of New Cancer Cases in the United States from 1998 to 2007



\*Data source: American Cancer Society, Cancer Facts and Figures, 1998 to 2007 based on NCI SEER and NCI SEER data.

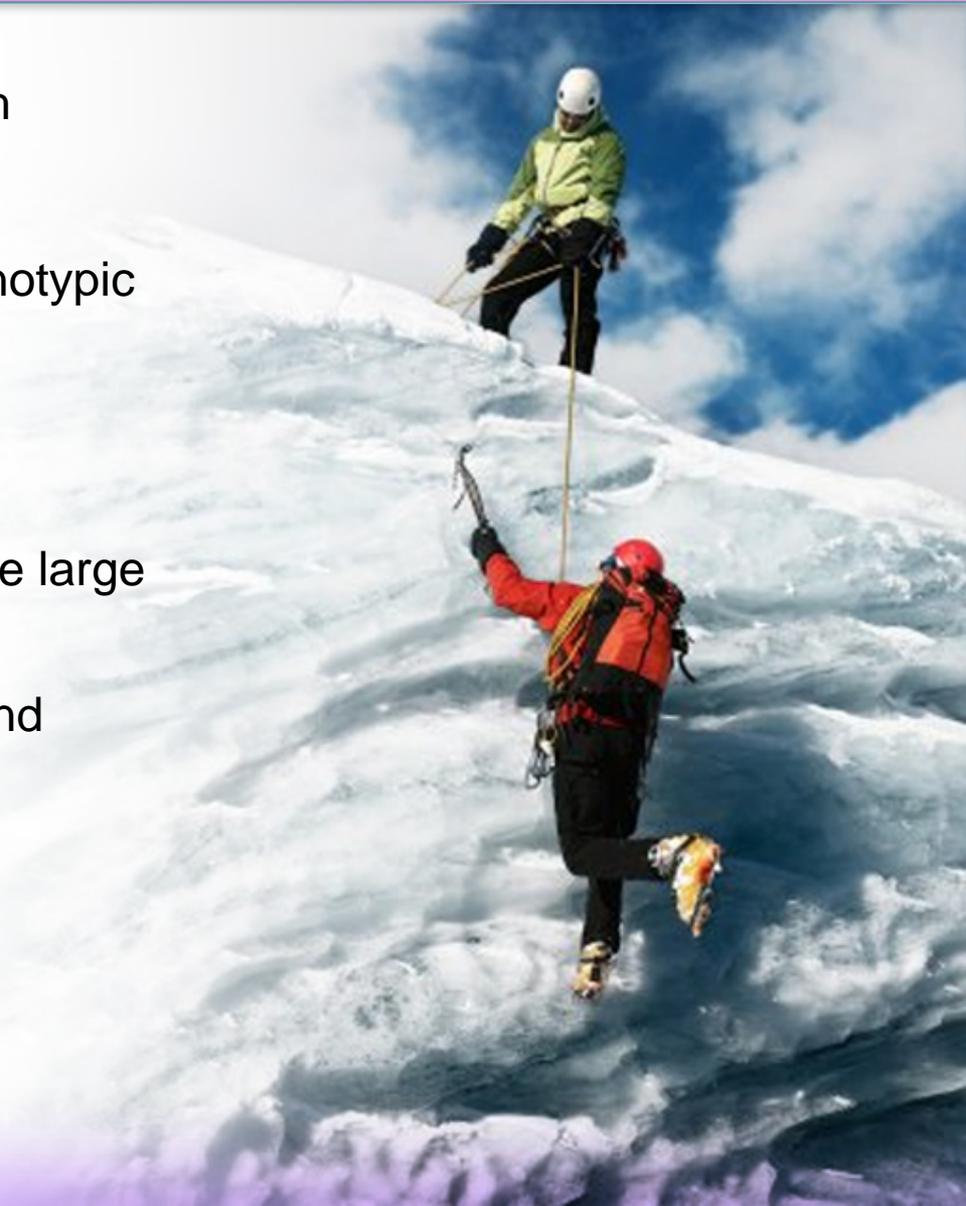
# Personalized Medicine: What We're Trying to Achieve



- **Predictive, Preemptive, Participatory.....**
- **Unifies** clinical research, clinical care, and discovery (bench-bedside-bed) into a seamless continuum
- **Results** in improved clinical outcomes
- **Accelerates** the time from discovery to patient benefit
- Enables a health care **system**, not a disparate “sector”
- **Empowers** consumers in managing their health over a lifetime

# But There's a Daunting "Mountain" of Prerequisites for that Vision

- Access to patients for clinical research
- Ability to conduct molecular profiling
- Ability to integrate genotypic and phenotypic information
- Ability to access and query clinically annotated biospecimens
- Ability to access, integrate and analyze large data sets
- Interoperability among the research and clinical care delivery information silos
- Research and clinical data sharing
- Standardization of terminologies



# Challenges: The Biomedical Landscape

- Isolated information “islands”
- Information dissemination uses models recognizable to Gutenberg
- Pioneered by British Royal Academy of Science in the 17th century
  - Write manuscripts
  - “Publish”
  - Exchange information at meetings



# Challenges: Information “Disconnects”



Basic Research	Clinical/Translational Research	Health Care Delivery
<b>Huge amounts of data from countless sources</b>	<b>Expiring patents, development and regulatory delays; post-marketing product recalls</b>	<b>Clinical data from disparate sources difficult to integrate; hard to track patients across sites and over time</b>
<b>Dramatically increasing costs and declining resources</b>	<b>Dramatically increasing costs of clinical development; slow/difficult recruitment process for clinical trials</b>	<b>Rising costs; inadequate reimbursement</b>
<b>Lack of data sharing leads to redundancy and lack of productivity</b>	<b>Countless biomarker targets, but difficult to validate clinically for drug development</b>	<b>Lack of data sharing leads to redundancy, lack of productivity; little ability to improve care based on previous trials</b>
Continued organizational and data “disconnects” slow the time to discovery	Continued organizational and data “disconnects” slow the time to translate research findings into safe and effective products	Continued organizational and data “disconnects” slow the time to translate clinical research findings into better clinical care

# Challenges: Information “Disconnects”



Basic Research	Clinical/Translational Research	Health Care Delivery
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**“We need to integrate our current fragmented and piecemeal system of addressing cancer. Front and center in our current system are the troubling divisions that separate research, prevention and treatment...”**

*-Senator Kennedy, June 2008*

Continued organizational and data “disconnects” slow the time to discovery

Continued organizational and data “disconnects” slow the time to translate research findings into safe and effective products

Continued organizational and data “disconnects” slow the time to translate clinical research findings into better clinical care

# BIG Health Consortium™

*“The world we have created today has problems which cannot be solved by thinking the way we thought when we created them.”\**

*\*Albert Einstein*

## Vision:

A biomedical system that synergizes the capabilities of the entire community to realize the promise of personalized medicine

## Mission:

The BIG Health Consortium™ is a collaboration among stakeholders in biomedicine, including ***government, academe, industry, non-profit, and consumers***, who come together in a novel organizational framework ***to demonstrate the feasibility and benefits of the personalized medicine paradigm.***

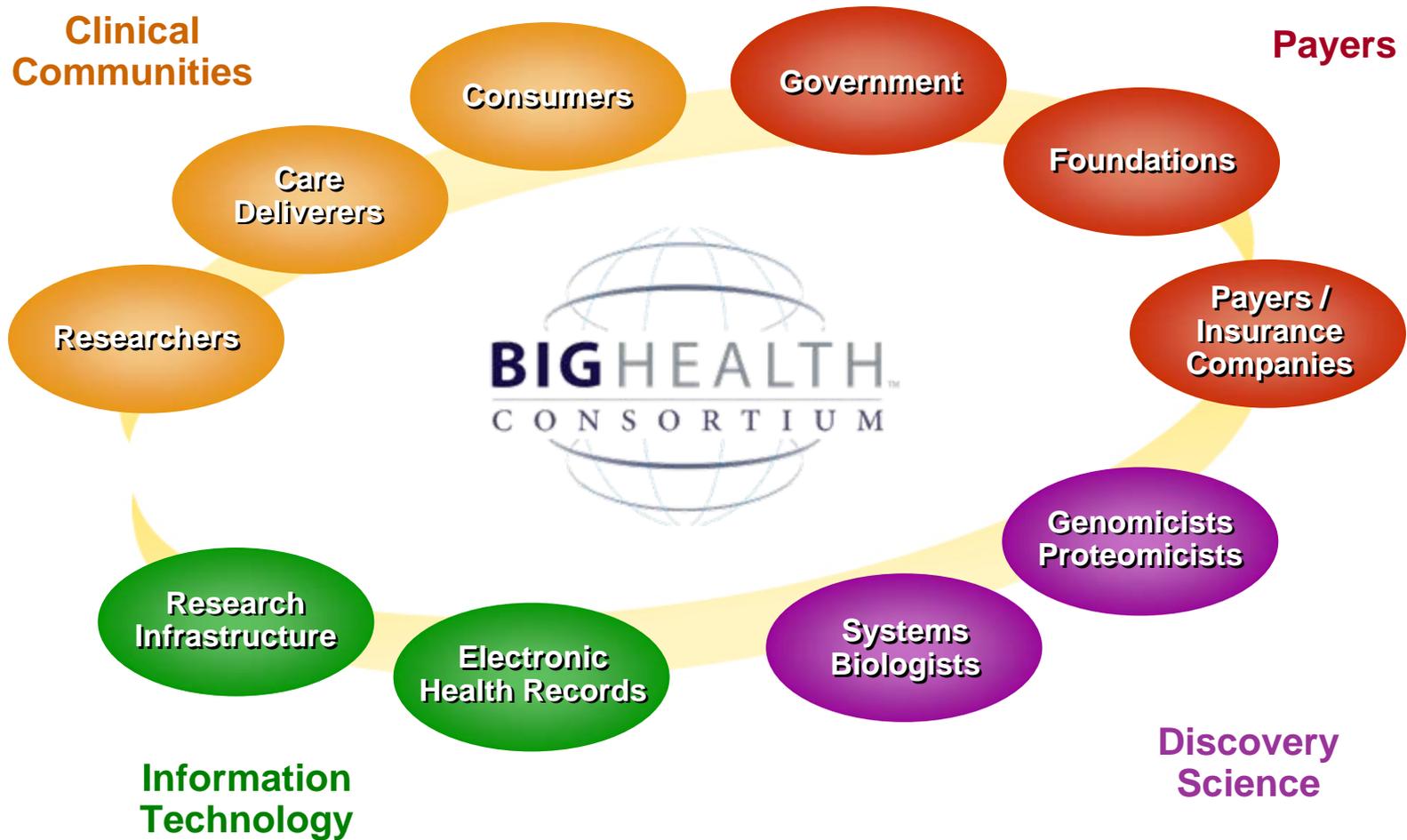
## Strategy:

Through a series of personalized medicine **demonstration projects**, with an expanding number of collaborators, BIG Health will **bootstrap** a new approach in which clinical care, clinical research, and scientific discovery are linked.

BIG Health will demonstrate that:

- Loosely-coupled sectors within life sciences and health care can come together in an ecosystem to implement personalized medicine real-world projects, in real time.
- The tools, infrastructure and standards of NCI's informatics infrastructure (caBIG<sup>®</sup>) can be applied to linking this ecosystem.
- Such an ecosystem can be financially self-sustaining.
- Clinical care, clinical research, and scientific discovery can be connected in a seamless continuum that speeds innovation and benefits patients.

# BIG Health Ecosystem



# **BIG Health In Action**

***“21st Century medicine requires new organizational approaches that embrace our capacity to work digitally...”***



## Research



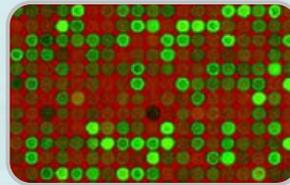
### Participants

Patients join research networks, grant consent, agree to be “sought” and to enroll – “on-demand” participants



### Biospecimen Collections

Researchers can access and query large collections of well-characterized, clinically annotated specimens



### Discovery of Correlations

Biomarkers are identified and validated; disease sub-groups emerge



### Individualization of Treatment

Patients are identified by sub-groups and treated appropriately



## Clinical Practice



### Electronic Health Records

EHRs can connect to clinical trials and hospital settings



### Outcomes Information

Large-scale databases of outcomes can be queried

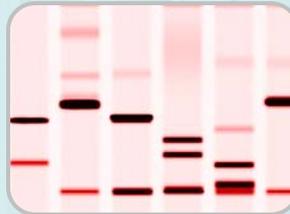


### Patient Participation

Patients can access clinical trials, educational materials, etc.



## Consumer



### My Genomic Profile

Consumers get their genetic and predisposition risk information



### My Prevention Strategies

Consumers work with genetic counselors; coordinate with health care provider



### My Clinical Record

Consumers link to their clinical histories with genetic profiles; access clinical research; participate in volunteer networks



**Standards**



**Interoperability**



**Data Sharing**



**Connectivity**

**caGRID**

# BIG Health Will Use 21<sup>st</sup>C Models of Collaboration



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Making Personalized Medicine a Reality.

About BigHealth

In The Community

Our Partnerships

News & Events

Resources



**The Need to do Something Different:** September 5, 2008  
by Ken Buetow

BLOG

One definition of insanity is doing the same thing over and over again and expecting different results. One may then fairly question the sanity of the biomedical enterprise...

[Read](#)

**BIG Health: A consortium to realize 21st Century Personalized Medicine**

WIKI

One place we have not seen this transformation is in how we as a community conduct biomedicine. We continue to apply existing organizational models.

[Participate](#)

**The End of a Beginning in Personalized Medicine:** Ken Buetow Presents 09.10.08

PODCAST

The BIG Health Consortium's 21st Century platform for discovery and translation provides one possible solution.

[Listen](#)

**Featured Profile:** Kenneth H. Buetow, Ph.D., Founder of BigHealth Consortium



[View Profile](#)

NEWS

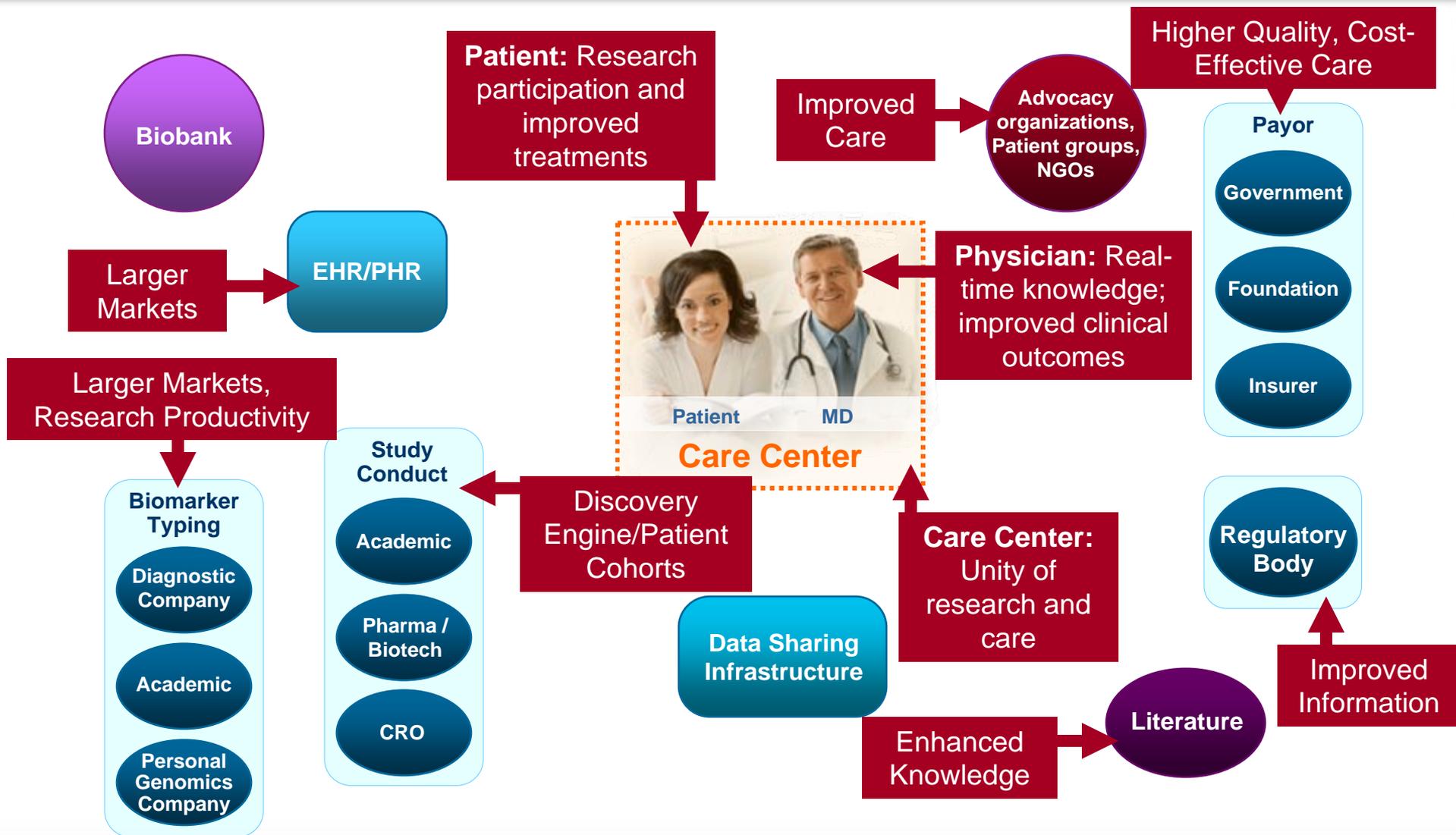
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**August 5, 2008:** In the August issue of the National Cancer Institute's Cancer Bulletin, Dr. Ken Buetow provided a guest update entitled, "Personalized Medicine – BIG Health" in which he announces the BIG Health Consortium. [Read](#)

**June 20, 2008:** Marking another positive step in the collaborative fight against cancer, GlaxoSmithKline announced the release of genomic profiling data for over 300 cancer cell lines via the National Cancer Institute's cancer Bioinformatics Grid™ (caBIG™). [Read](#)

# All Participants Bring Capabilities and Derive Benefit



# BIG Approaches to Big Challenges in Personalized Medicine



## Possibilities for Demonstration Projects

- **Virtual clinical research**
  - On-demand clinical trial
  - 21st century cohort study
- **Molecularly-based comparative effectiveness**
- **Sustainable biospecimens**
- **Learning health care system**
  - Monitor outcomes
  - Monitor incidence
  - Post marketing surveillance
  - Rapidly disseminate

# BIG Health Addresses Many of the Prerequisites of a New Biomedical Paradigm



Cost/inefficiency of screening

**Builds screening into clinical care**

Access to study populations

**Draws existing patient base into clinical research**

Acceptance in the community

**Provides a proactive role for the consumer**

Misaligned incentives

**Provide alternative business models and partners**

Data disconnects

**Provides the IT infrastructure to link entire process**

Lack of interoperability of research and clinical systems

**Provides a ready-made system of interoperability**

Requirements for systems-level effort that daunt an individual company

**Shares the “burden” of transformation**

Lack of knowledge among patients and physicians

**Provides a pathway for education**

# Framework for Action



**Think big...**  
**Start small...**  
**Act now!**



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