

TDWI

Dan Housman

Managing Director, Analytical Applications

July 26, 2010

Best of breed software/analytics company focused 100% on secondary uses of clinical and pre-clinical data

Core Competencies

- Healthcare data warehousing & integration services
- Translational research & quality reporting solutions
- Data strategy, governance & compliance consulting
- Open Source implementations & extensions

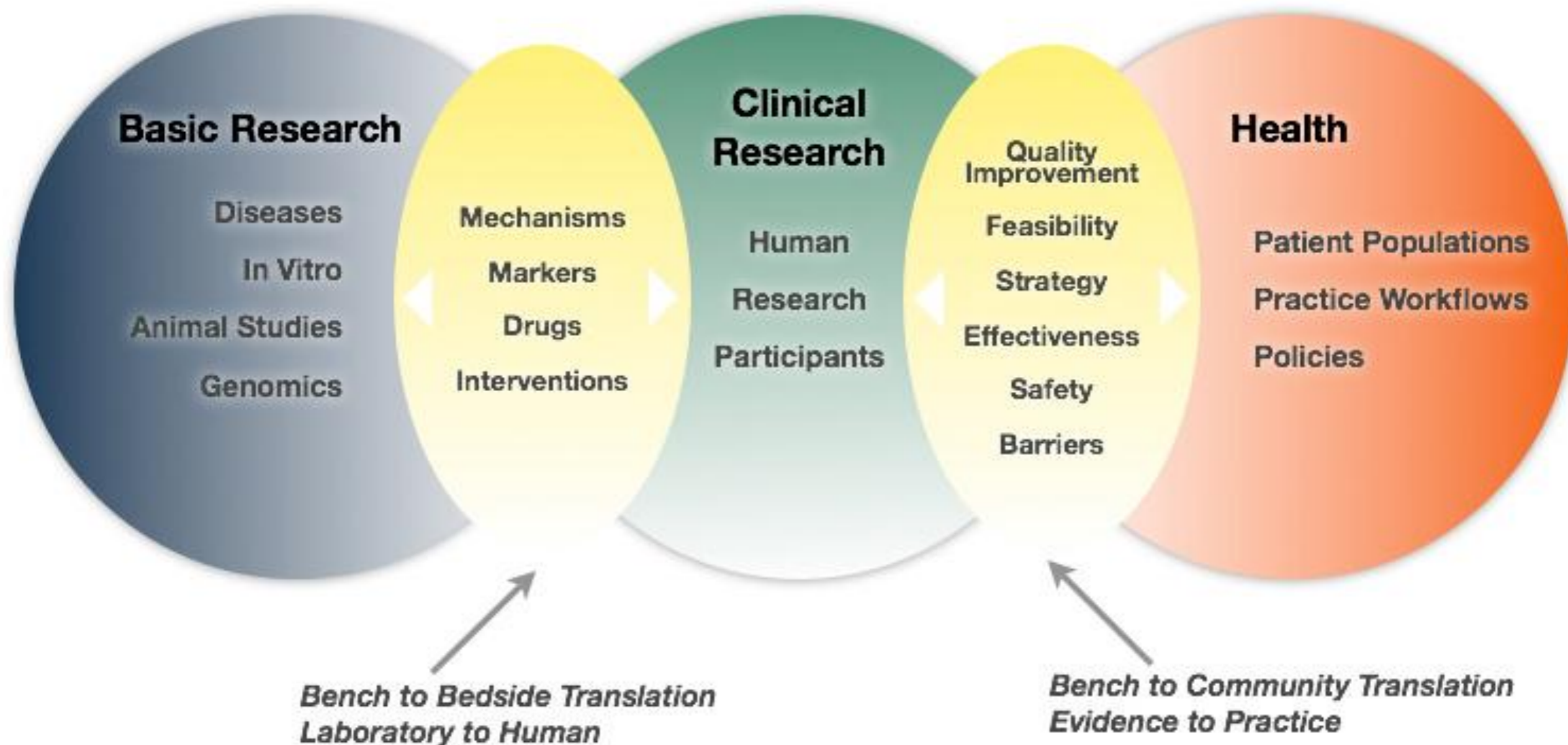
Core Values

- Pragmatism
- Effective Communication
- Trust

Non-profit research
Pharma R&D

Clinical
Trials

Adoption of
evidence based medicine

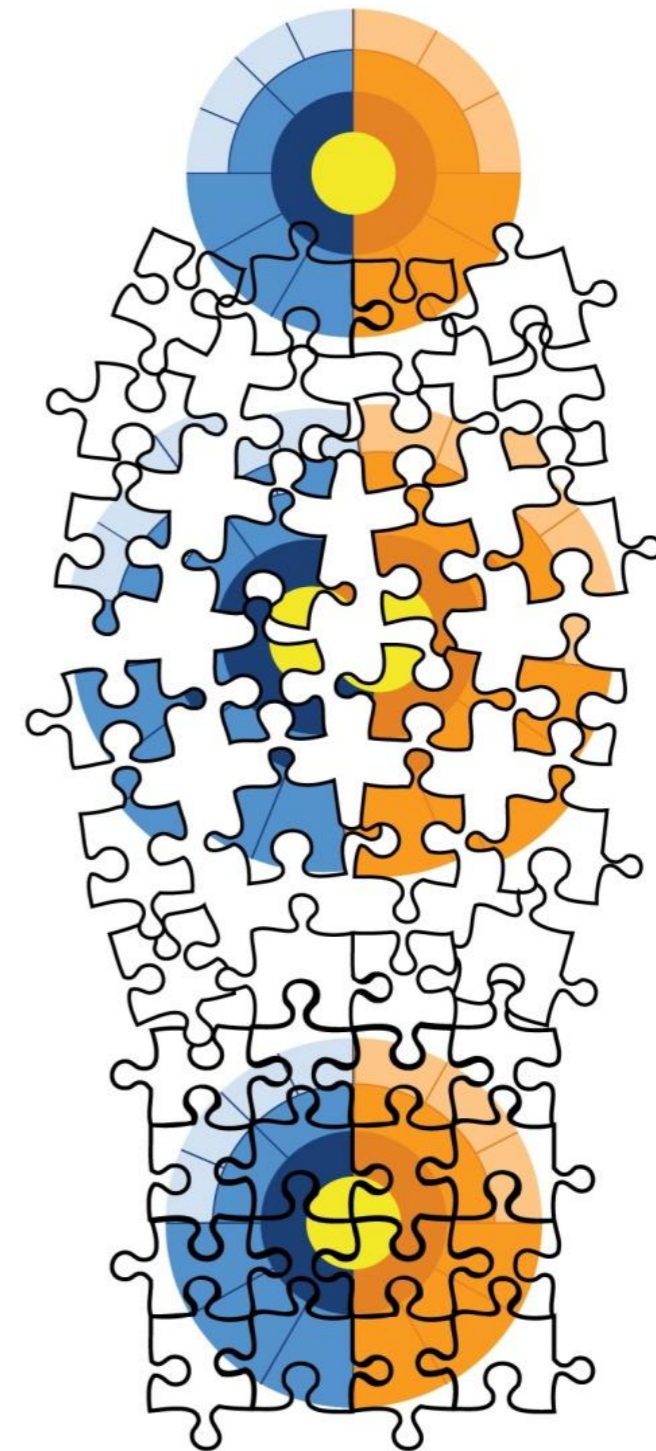
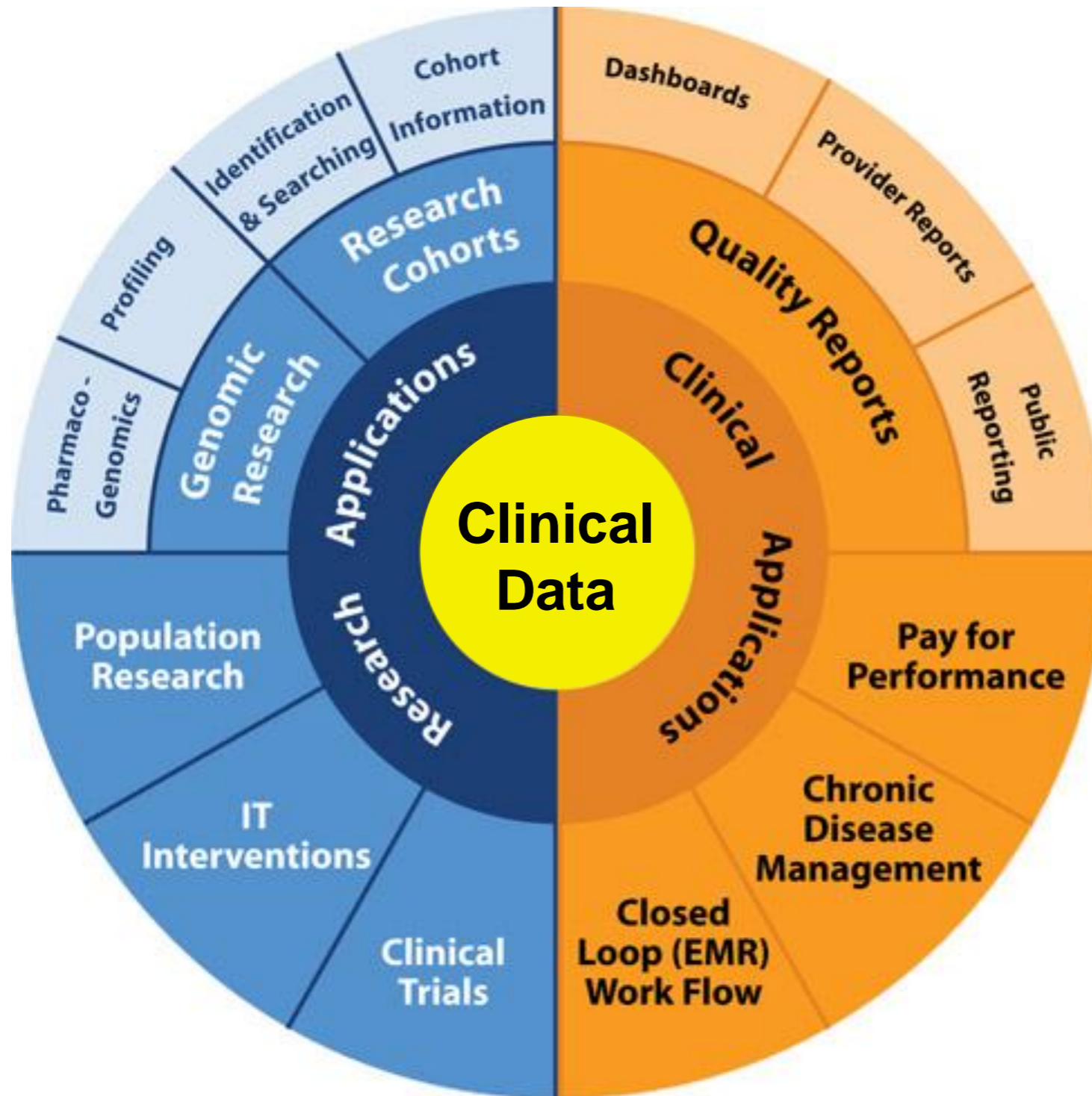


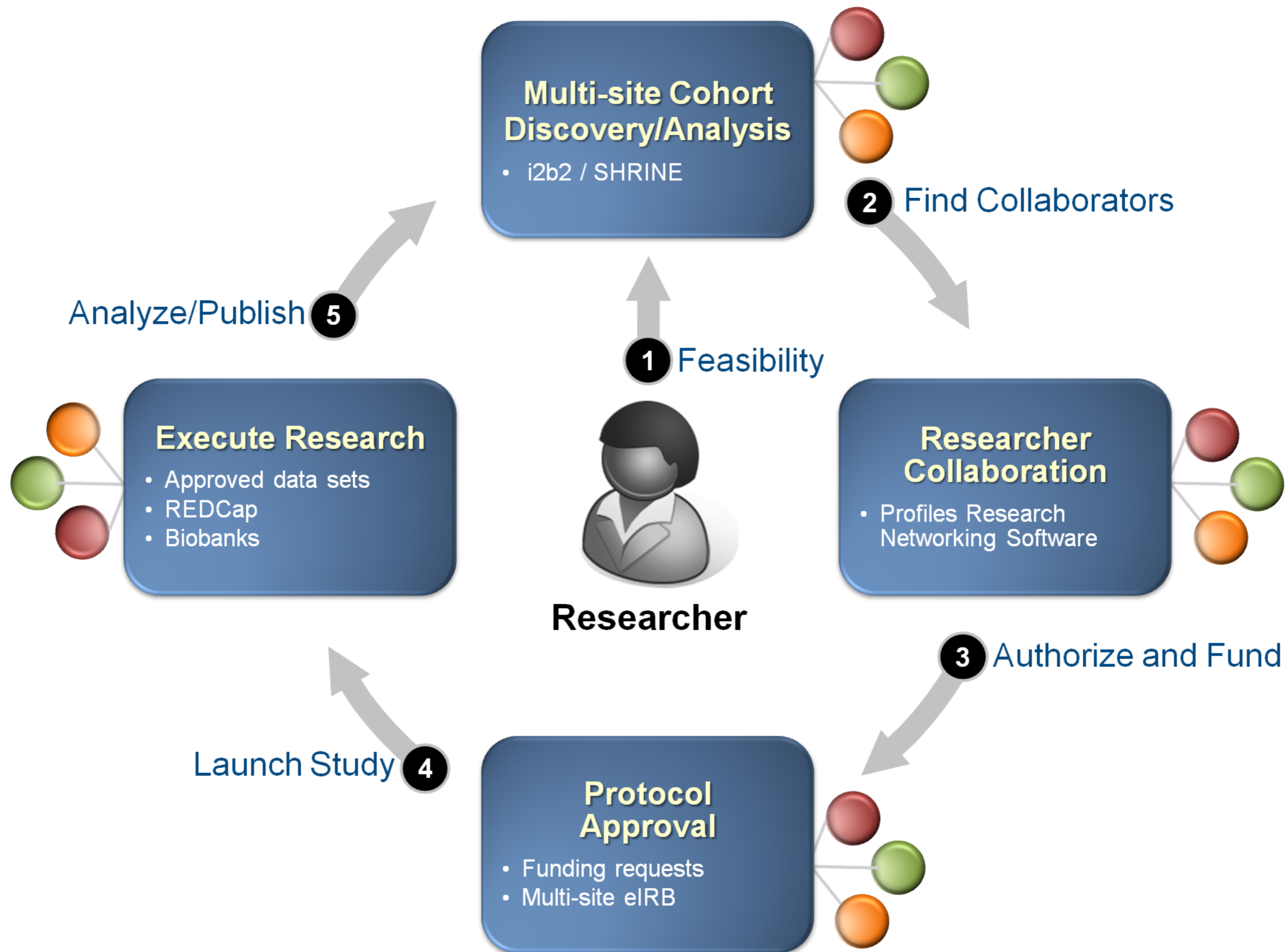
- **Recombinant Customers**
 - 11 – Year Ago
 - 27 – Today
- **Recombinant Employees**
 - 21 – Year Ago
 - 42 – Today
 - 50 projected by end of 2010
- **Healthcare requires expertise**
 - **Matvey Palchuk, MD, MS**
Director of Medical Informatics
 - **D. Doug Liu, PhD**
Chief Scientist
 - **David Fram, PhD**
Research Director

- **Research/Quality convergence**
 - Quality activities require research approaches
 - Cross-over of tools (e.g. GPP, i2b2 for quality)
 - Registries
- **Bio-banking / genomics**
 - Lower costs for genetic research drive clinical data
 - Big studies/big data sets
- **ARRA driving new data demands**
 - HIE, Interoperability, accountable care, shared decision making, permissions
- **Public data use**
 - Profiles, pre-competitive sharing, benchmarking

Target vision - incremental approach

Recombinant

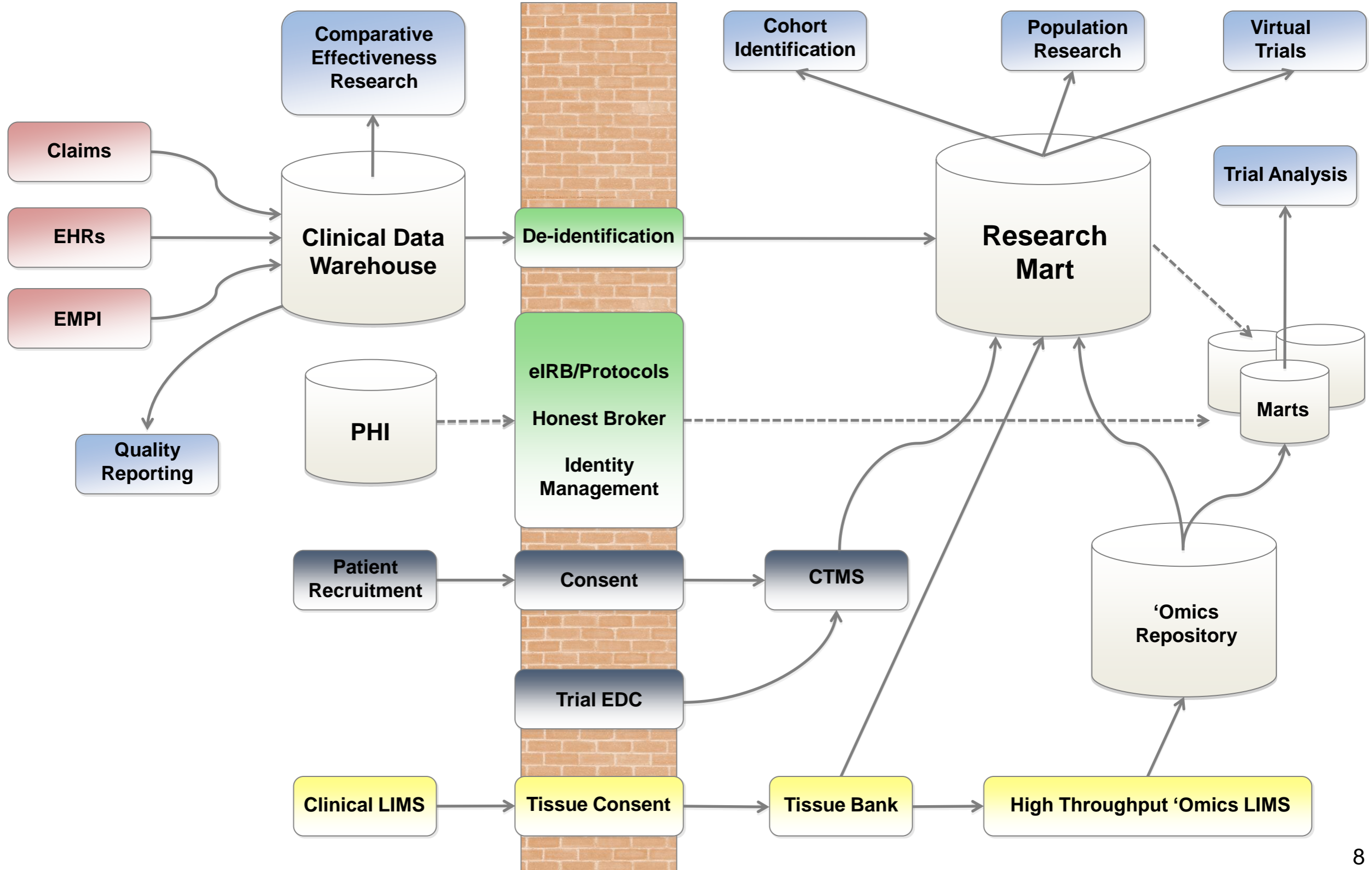


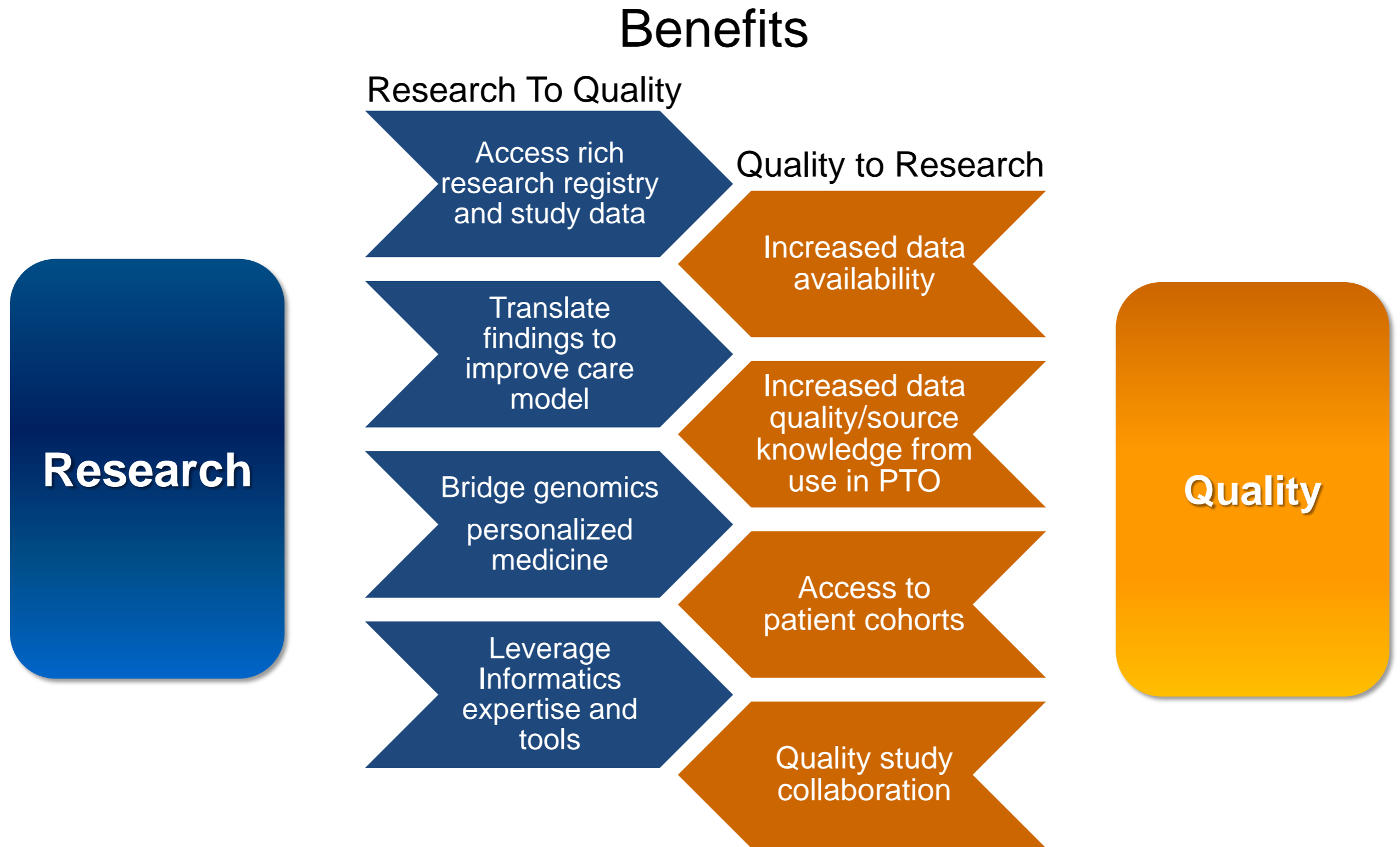


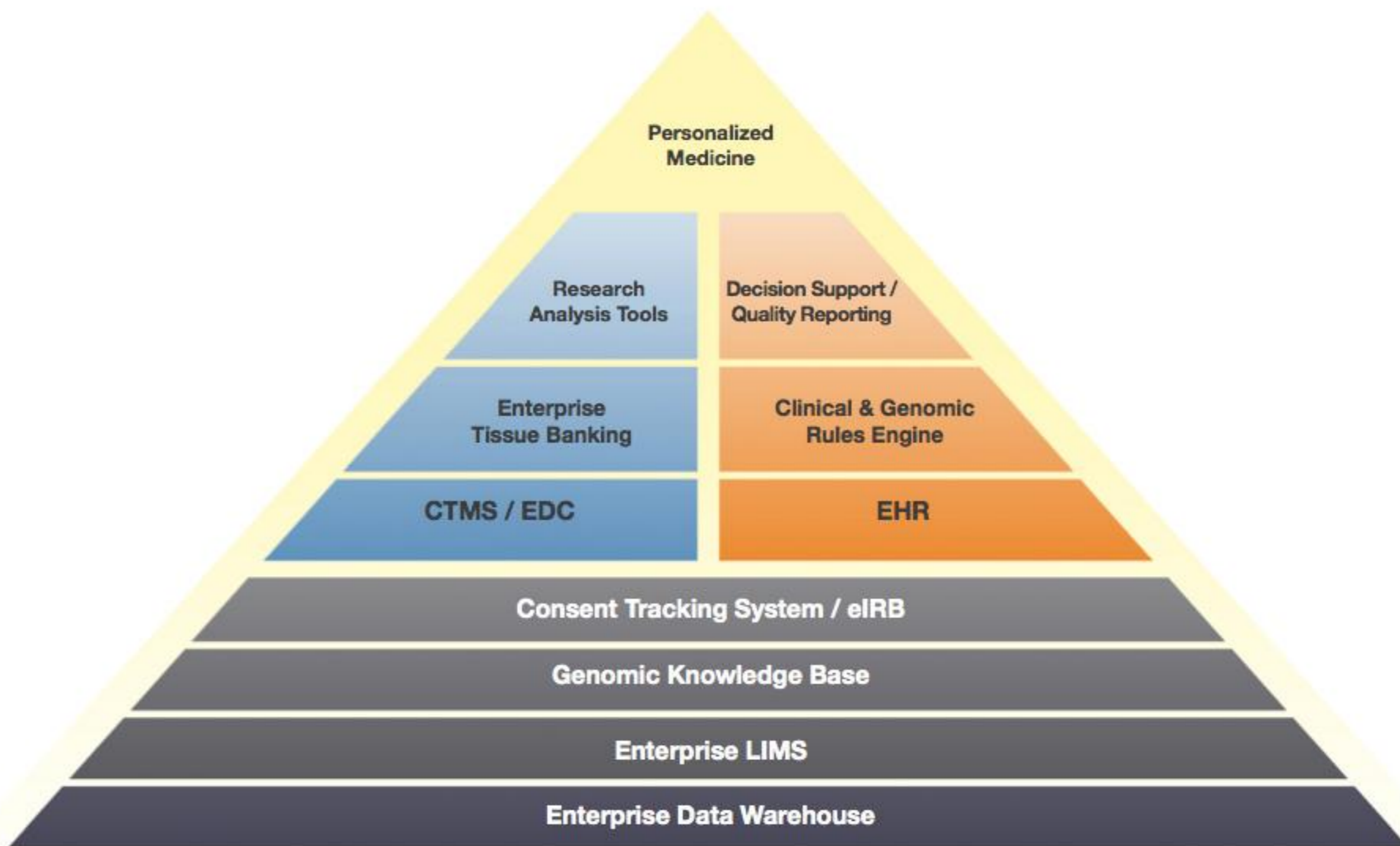
Patient Care

HIPAA/IRB Wall

Clinical Research



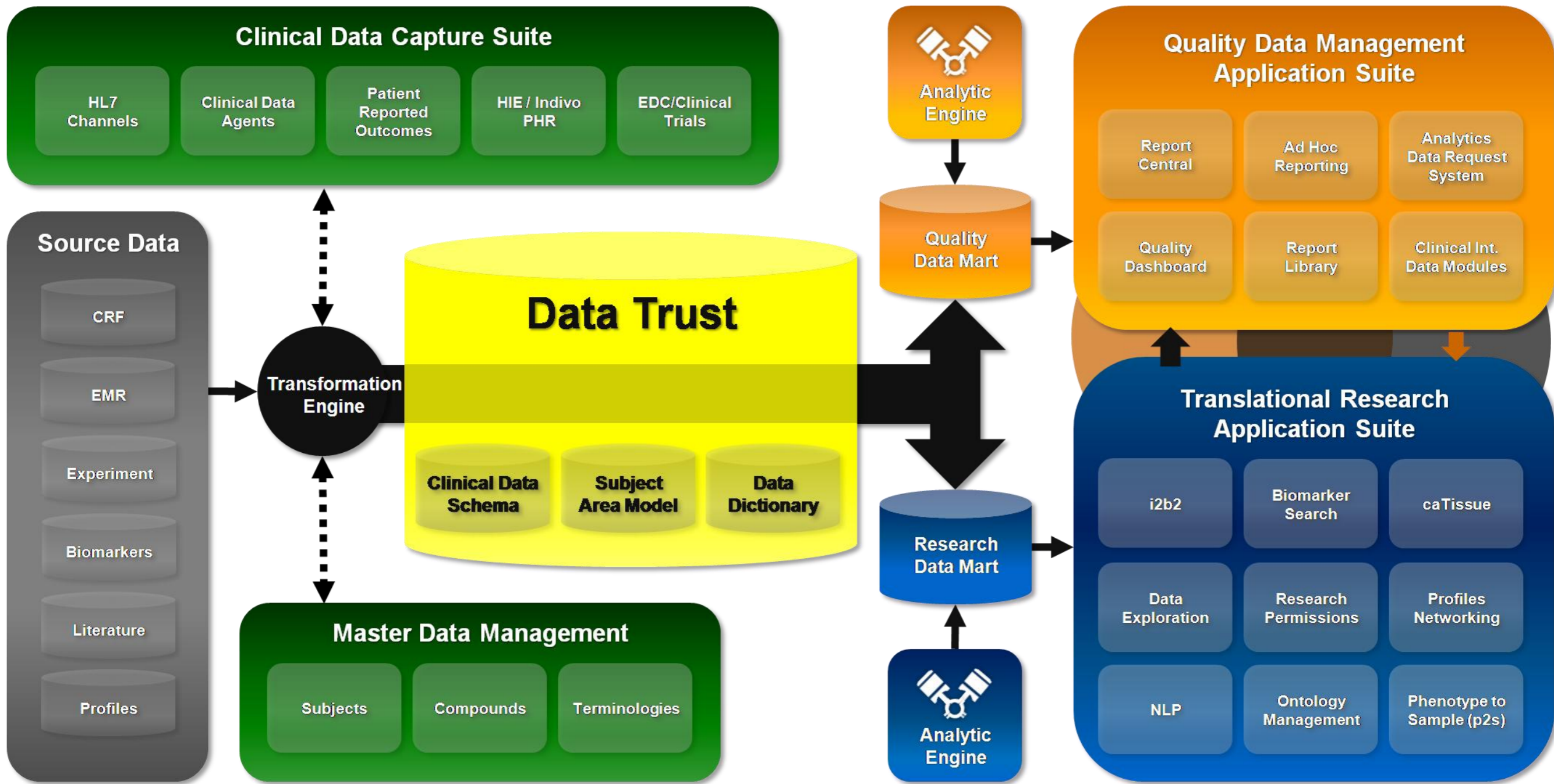






"On the Internet, nobody knows you're a dog."

Our solution Map



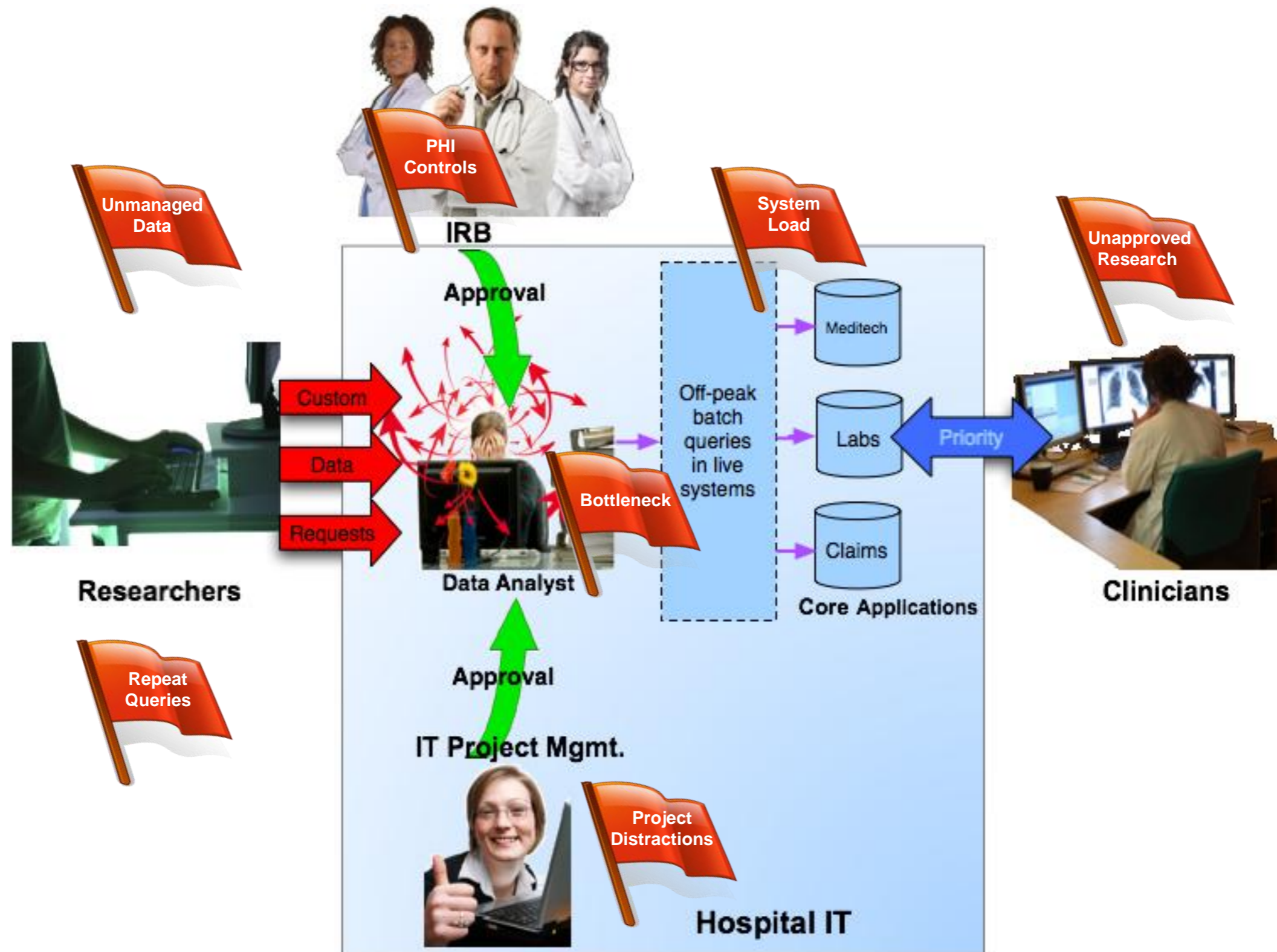
Open source initiatives

- i2b2
- Pentaho ETL/BI
- Hudson
- Indivo PHR
- REDCap Electronic Data Capture
- Gene Pattern
- caTissue
- Profiles Research Networking Software
- Lucene search

- Sometimes free
- Shared ideas
- Interoperability
- Science friendly (share)
- Evidence based directive
- Metrics/Benchmarks
- Anyone can contribute
- Grants
- Innovation
- Dissemination

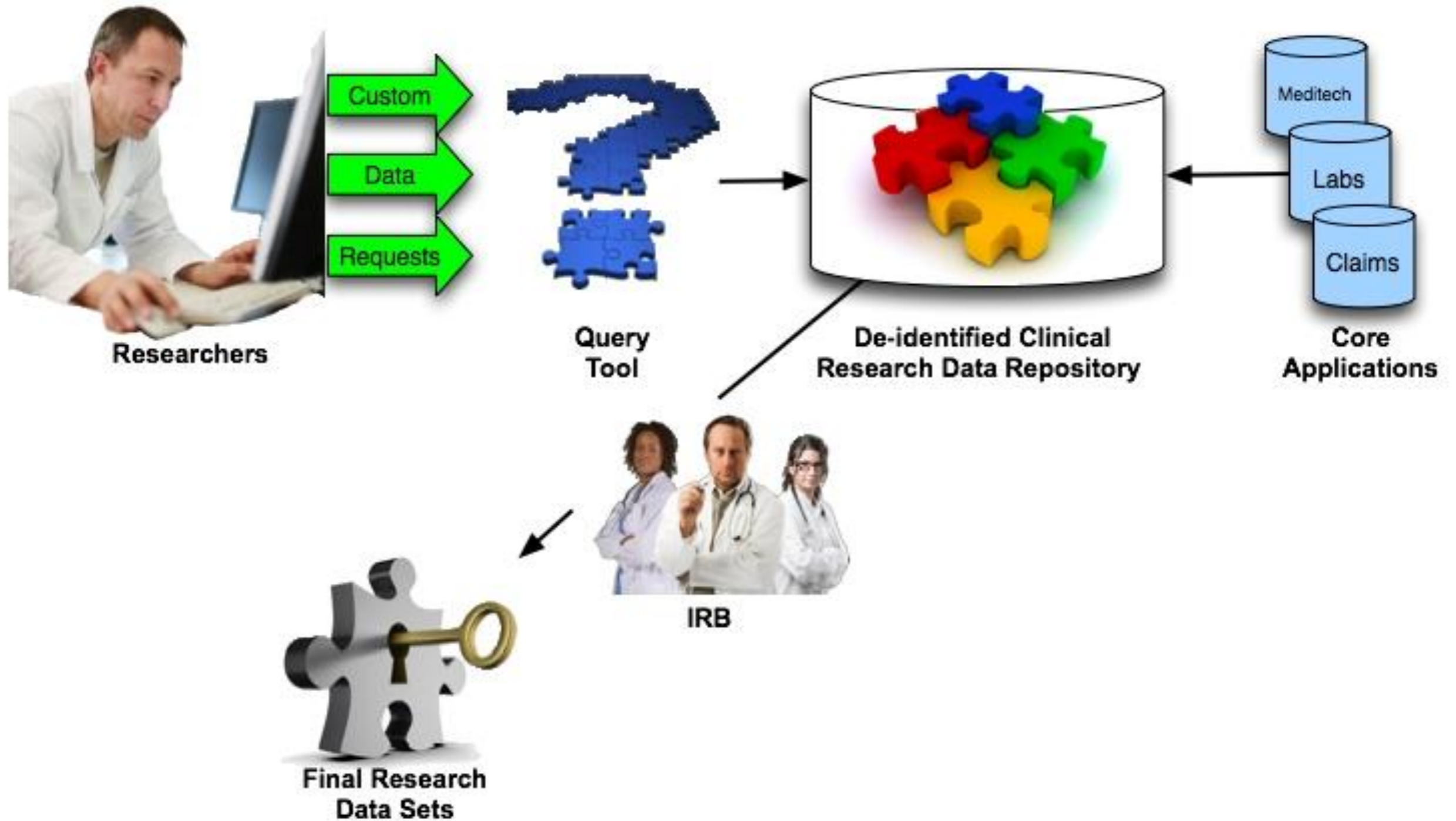
- Distrust by IT/CIOs
- Support model
- Marketing/sales
- Solution providers
- Commercial FUD
- Completeness
- Predictability
- Financial limits

What is in the best interest of patients?

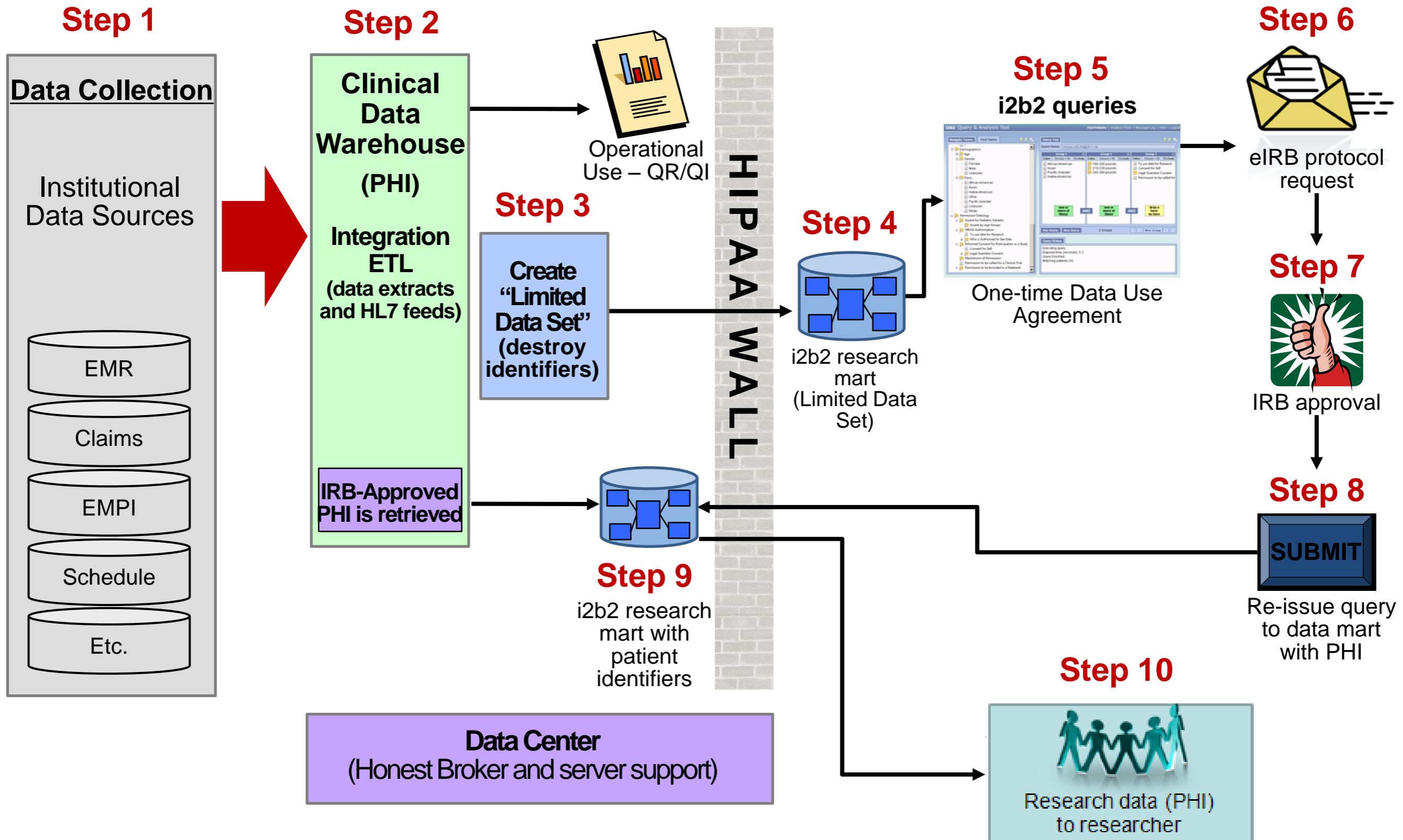


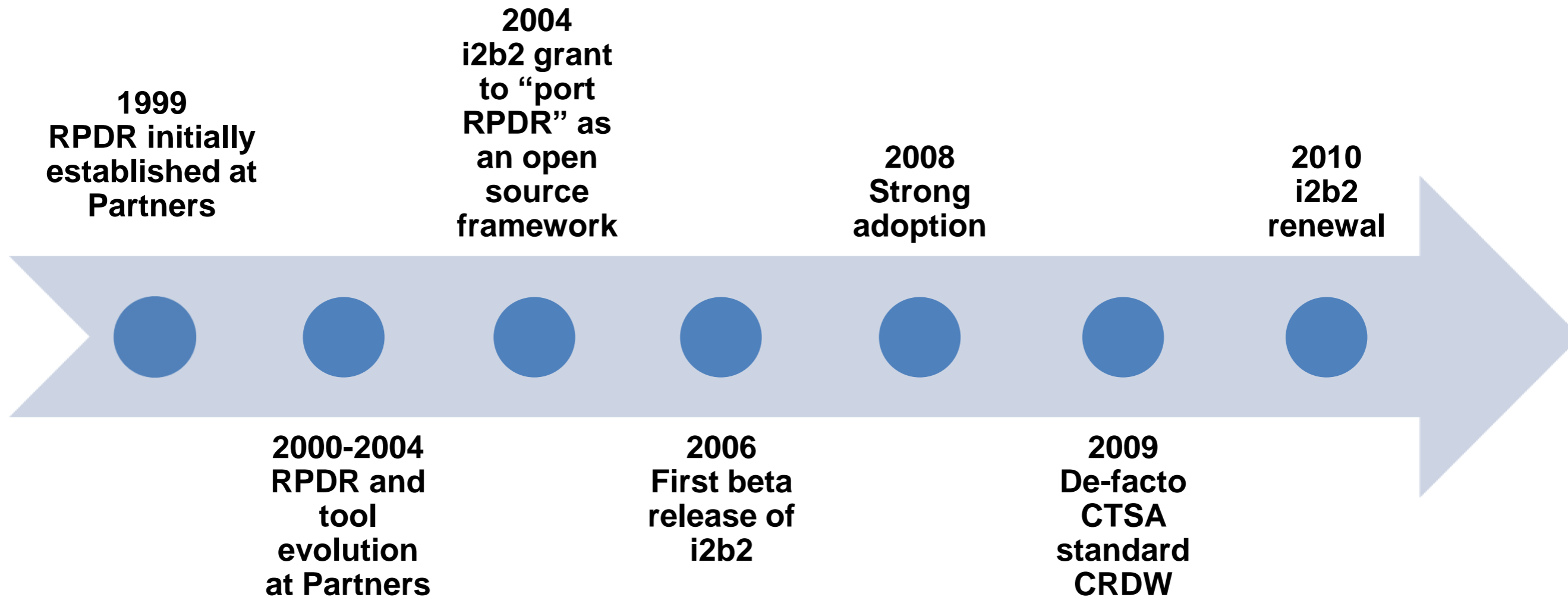
The Solution: Managed self-service

Recombinant



Full Research Workflow





*** RPDR (Research Patient Data Registry) was the precursor to i2b2**

United States

- Beth Israel Deaconess Hospital, Boston, MA
- Boston University School of Medicine, Boston, MA
- Brigham and Women's Hospital, Boston, MA
- Case Western Reserve Hospital
- Children's Hospital of Boston, MA
- Children's Hospital of Cincinnati, OH
- Children's Hospital of Denver, CO
- Children's Hospital of Philadelphia, PA
- Cleveland Clinic, Cleveland, OH
- Duke Medical College
- GE Research, Niskayuna, NY
- Group Health Cooperative
- Harvard Medical School, Boston, MA
- Kaiser Permanente, Oakland, CA
- Kimmel Cancer Center, Philadelphia, PA
- Maine Medical Center, Portland, ME
- Marshfield Clinic, Wisconsin
- Massachusetts General Hospital, Boston, MA
- Morehouse School of Medicine, Atlanta, GA
- Ohio State University Medical Center, Columbus, OH
- Oregon Health & Science University, Portland, OR
- Renaissance Computing Institute, Chapel Hill, NC
- Tufts New England Medical Center, Boston, MA
- University of California, Davis, CA
- University of California, Irvine, CA

United States (continued)

- University of California, San Francisco, CA
- University of Cincinnati, Cincinnati, OH
- University of Massachusetts Medical School, Worcester, MA
- University of Michigan Medical Center, Ann Arbor, MI
- University of Pennsylvania School of Medicine, Phila, PA
- University of Rochester Medical Center, Rochester, NY
- University of Texas Health Sciences Center SW, Dallas, TX
- University of Texas Health Sciences Center, Houston, TX
- University of Texas Health Sciences Center, San Antonio, TX
- University of Washington, Seattle, WA
- Utah Health Science Center, Salt Lake City, UT
- Veterans Administration Boston and Utah
- Weil Medical College of Cornell, NYC, NY






International

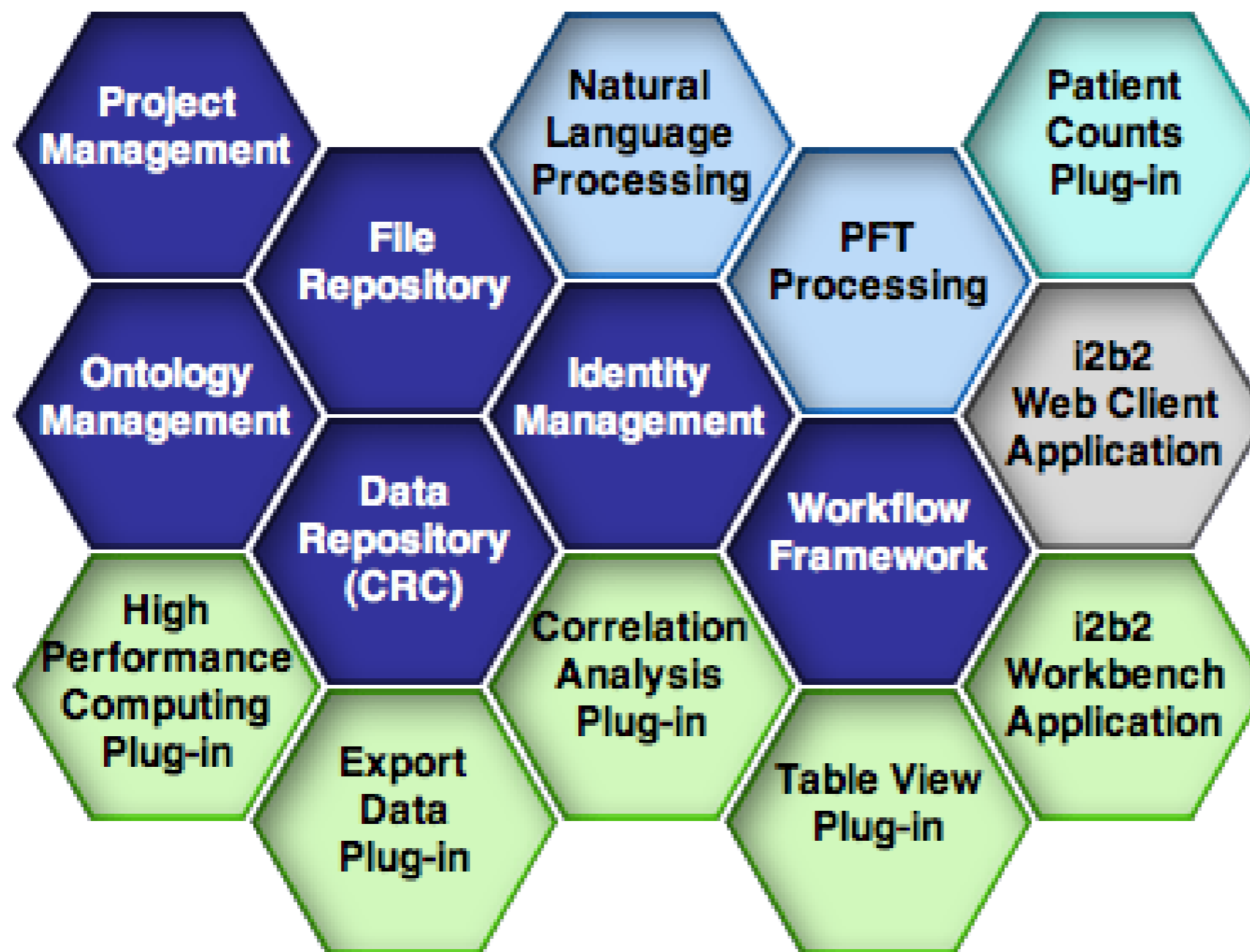
- Georges Pompidou Hospital, Paris, France
- University of Goettingen, Goettingen, Germany
- University of Pavia, Pavia, Italy
- University of Seoul, Seoul, Korea

Pharmaceutical

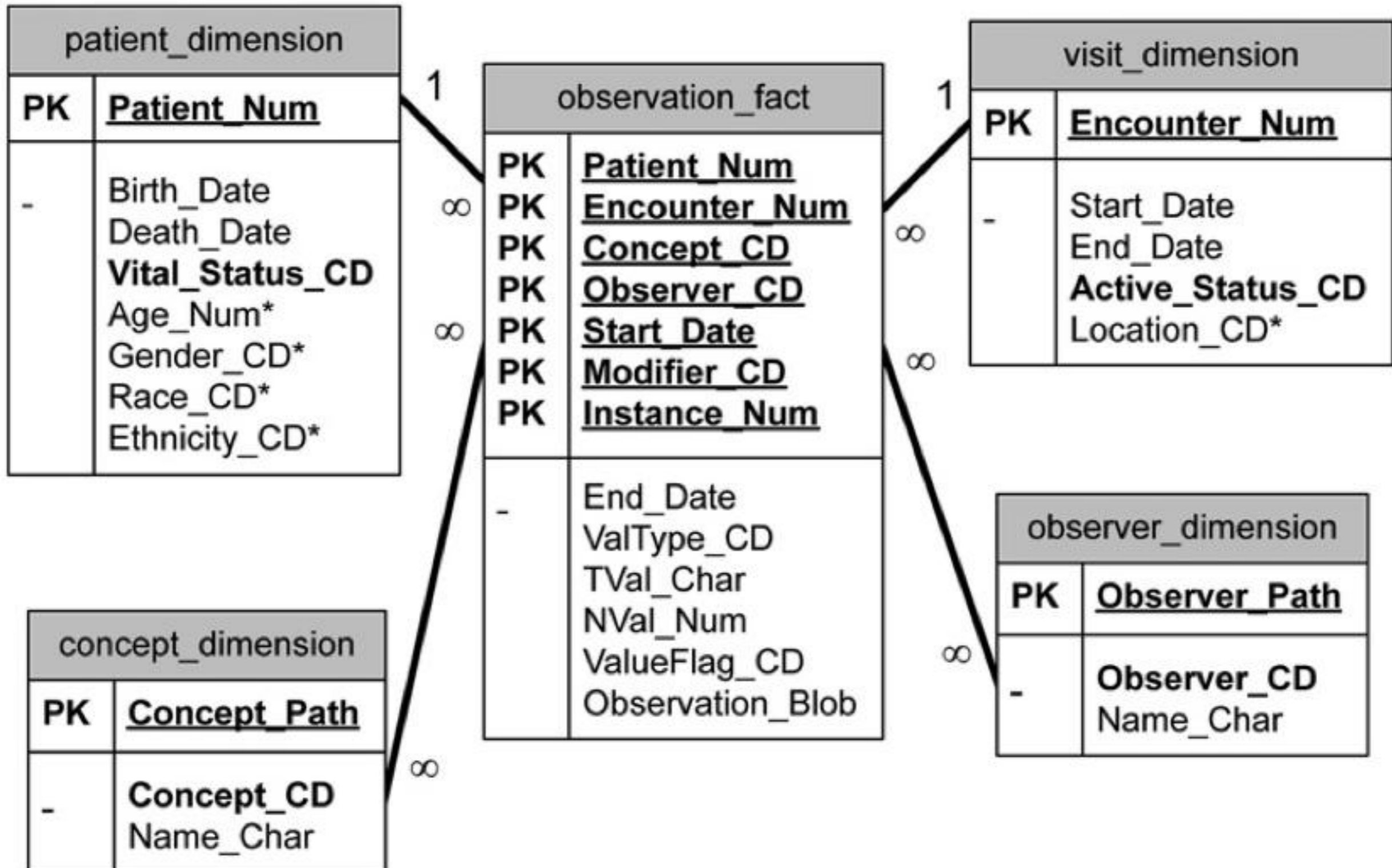
- Johnson and Johnson

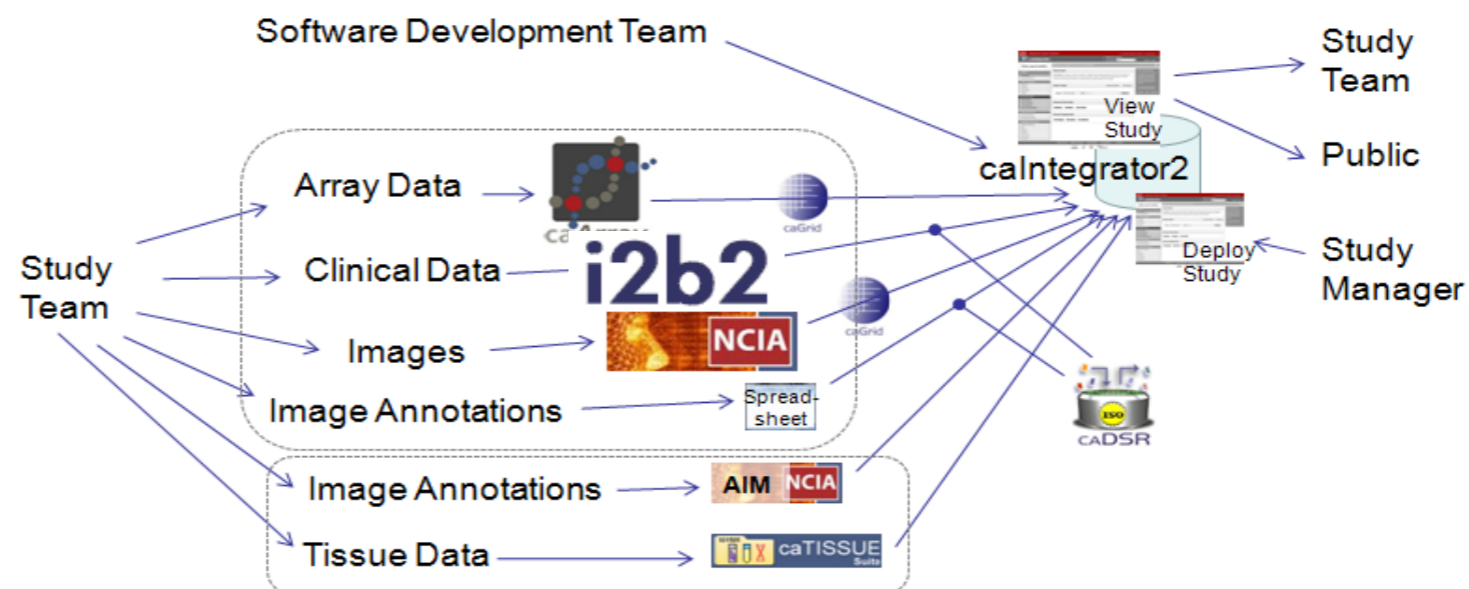
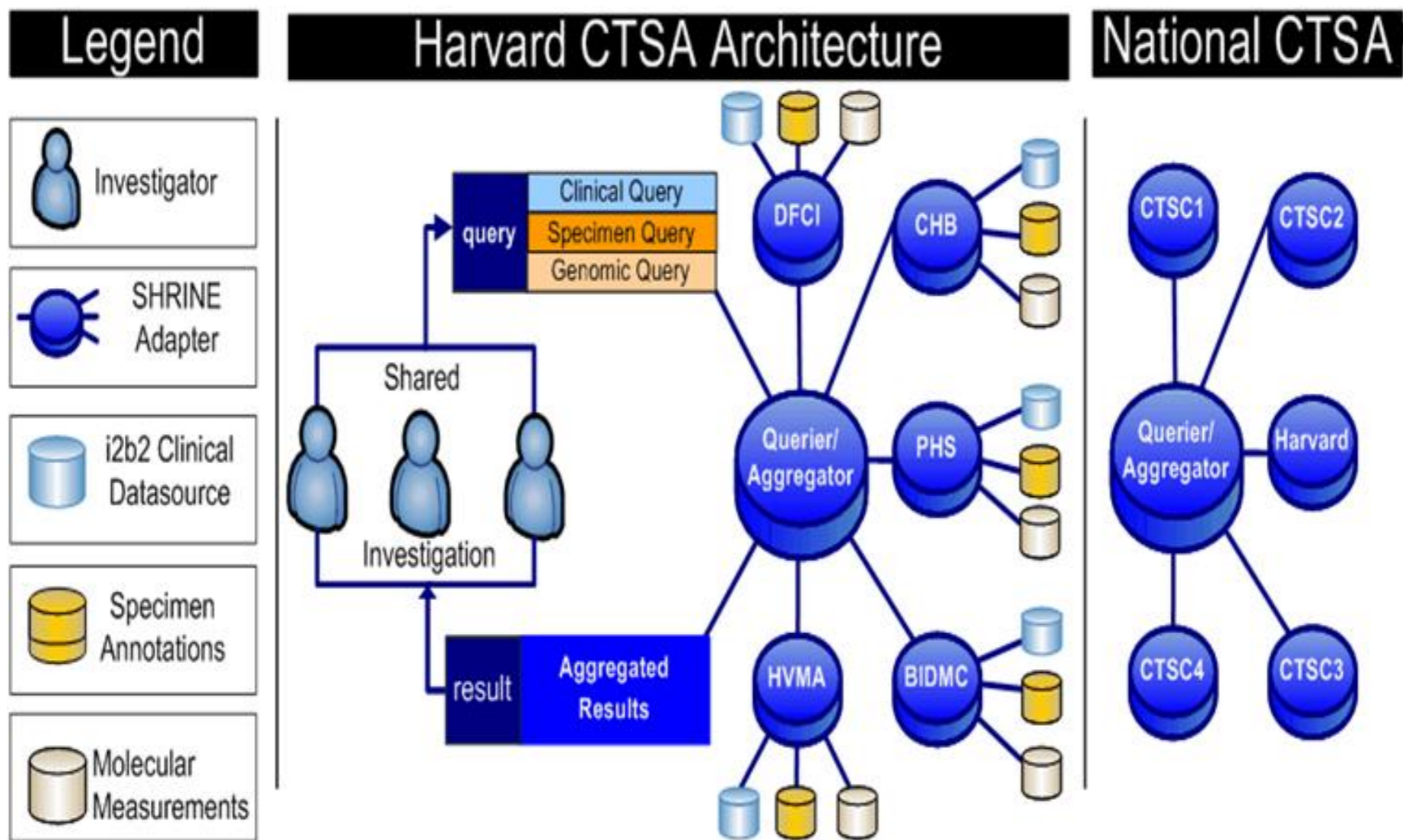
Key

 i2b2 Core Cell	 i2b2 Optional Cell	 Workbench/Plug-in
 Web Client	 CRC Plug-in	



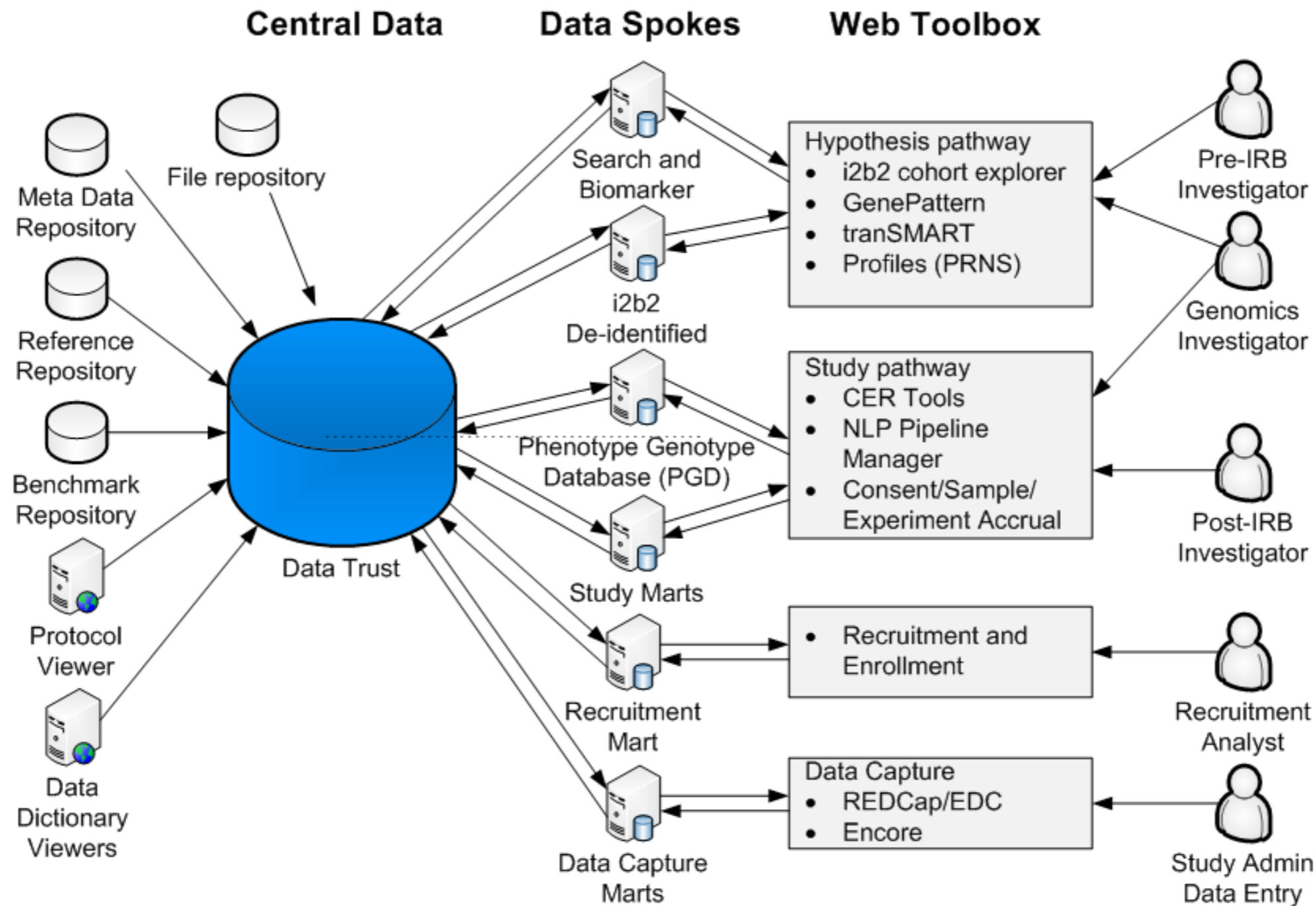
- Entity Attribute Value (EAV) Data Model





Research systems

Research Focused Interfaces



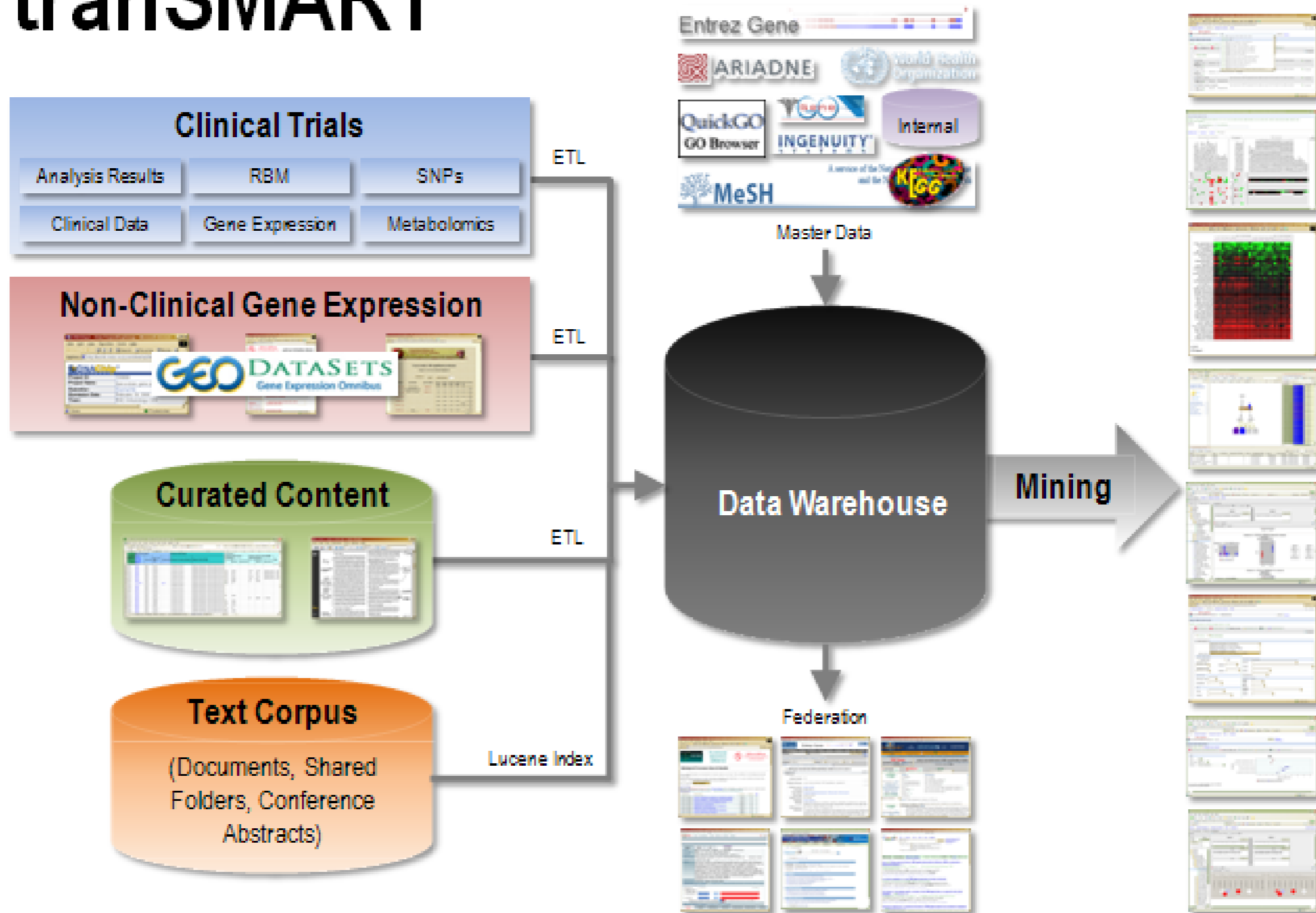
How Informatics Can Potentiate Precompetitive Open-Source Collaboration to Jump-Start Drug Discovery and Development

ED Perakslis¹, J Van Dam¹ and S Szalma¹

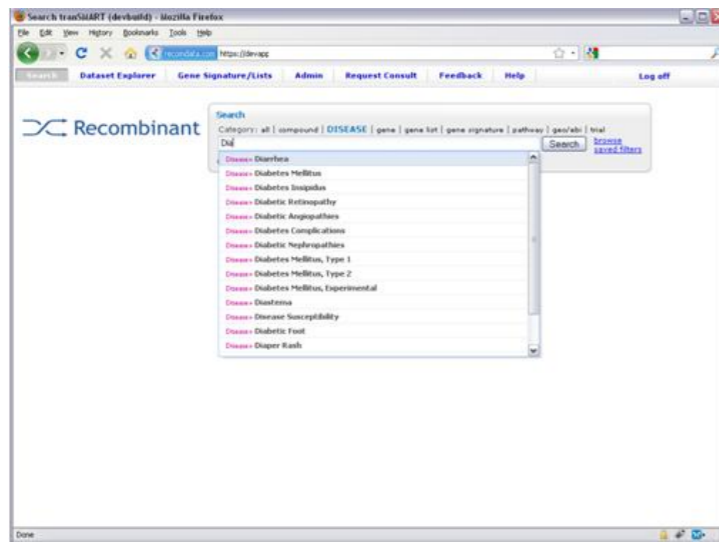
- Recombinant Solution Wins 2010 Bio-IT World Best Practices Award in Knowledge Management
- Implementation at Centocor R&D, Inc., a subsidiary of Johnson & Johnson
- tranSMART designed to share drug research and development data across Johnson & Johnson



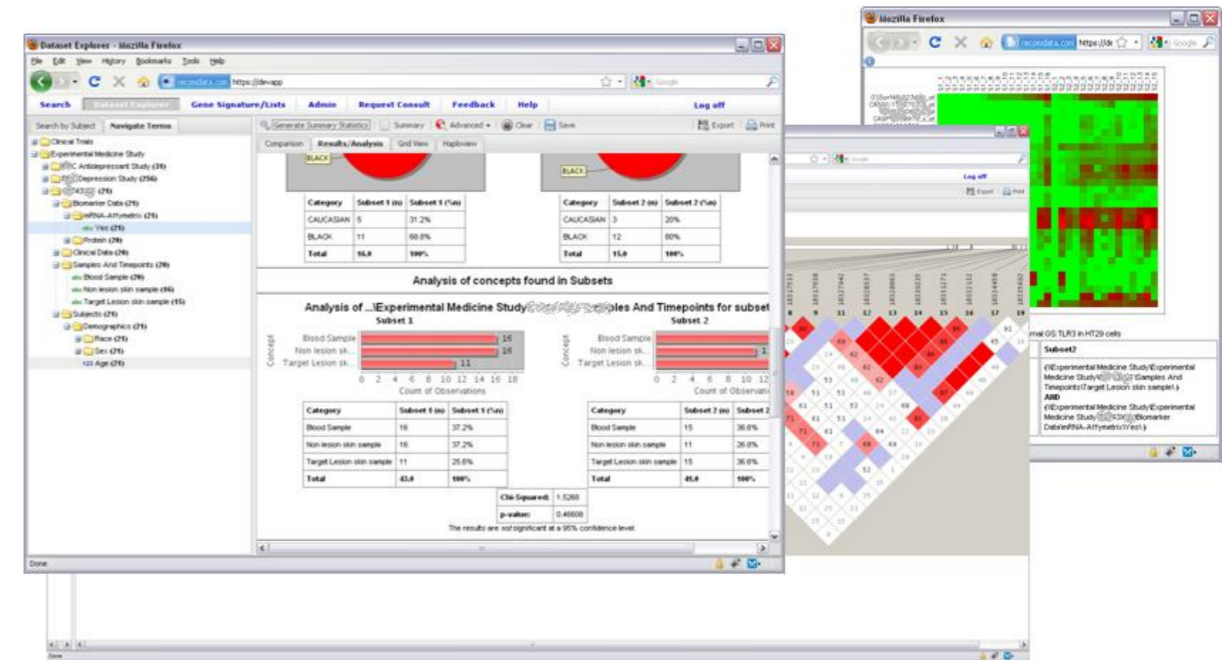
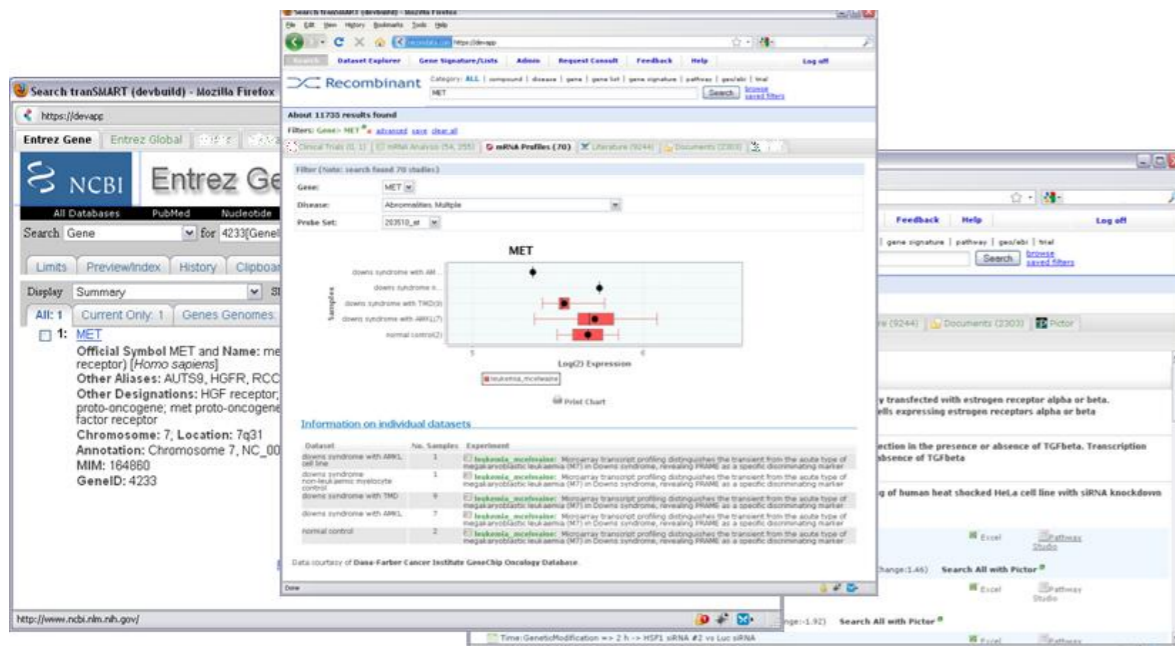
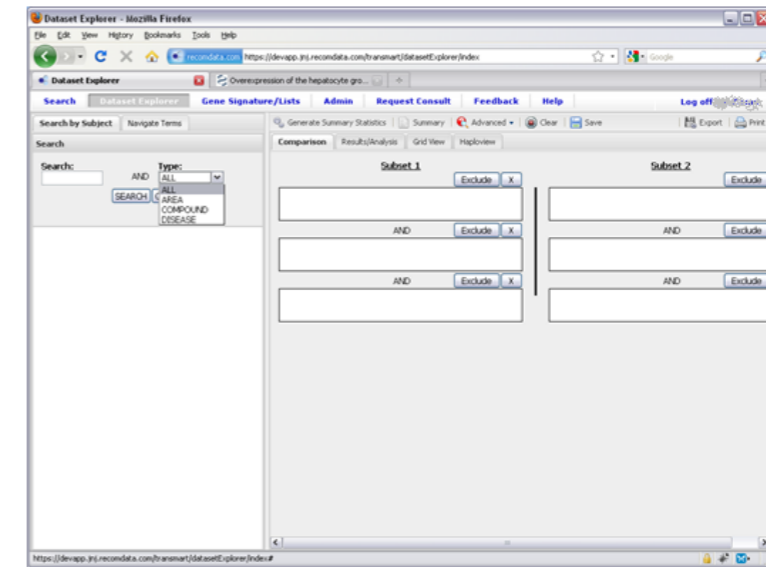
tranSMART



Search



Data Analysis



Search | **Dataset Explorer** | **Gene Signature/Lists** | **Request Consult** | **Feedback** | **Help** | **Log off Training Account**

Search by Subject | **Navigate Terms**

- Clinical Trials
- Experimental Medicine Study

Generate Summary Statistics | Summary | Advanced | Clear | Save | Export | Print

Comparison | Results/Analysis | Grid View | Haploview

Subset 1

Exclude X

...\Female\

AND Exclude X

...\FEF in L/Second (PFFEF) <1.5

AND Exclude X

...\Week 024\

AND Exclude X

Subset 2

Exclude X

...\Male\

AND Exclude X

...\FEF in L/Second (PFFEF) >=1.5

AND Exclude X

...\Week 024\

AND Exclude X

Set Value

Searches by value can be constrained by the high/low flag set by the performing laboratory or by the values themselves.

No Value

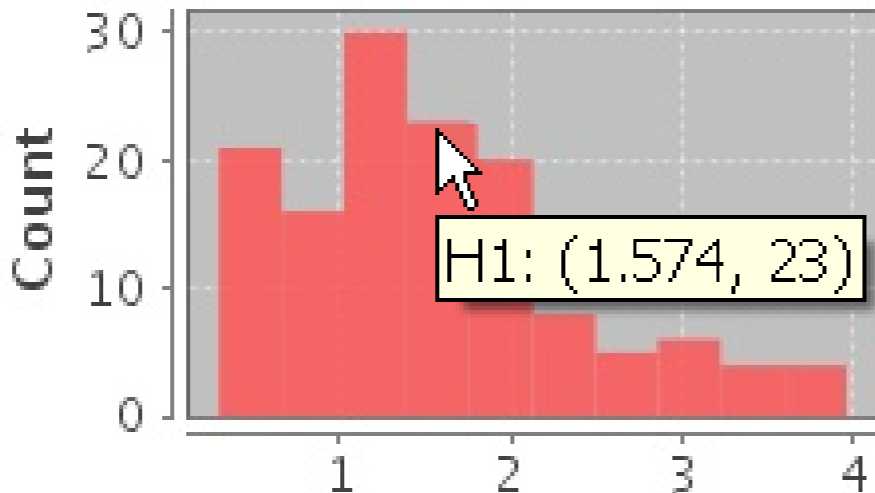
By high/low flag

By numeric value

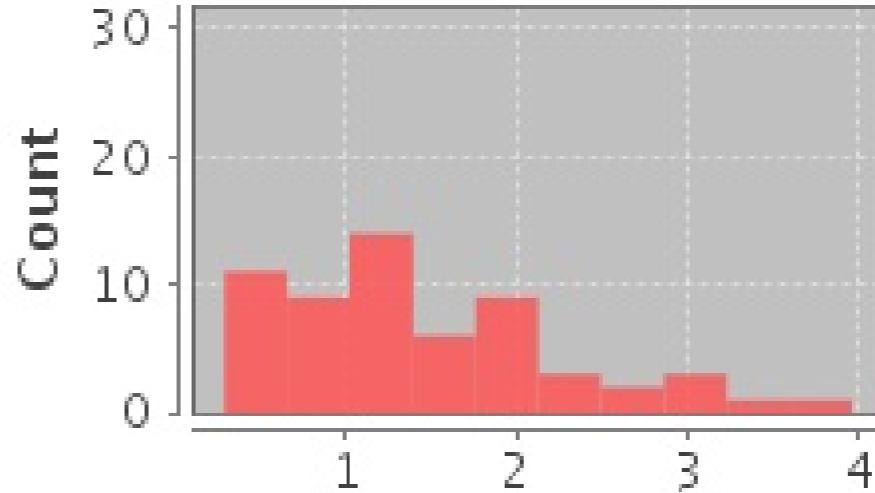
Please select operator:
LESS THAN(<)

Please enter value:
1.5

Histogram of ... \Medical History \Pulmonary Function Test \FEF in L/Second (PFEF) for all



Histogram of ... \Medical History \Pulmonary Function Test \FEF in L/Second (PFEF) for subset



Count

Count

1 2 3 4

1 2 3 4

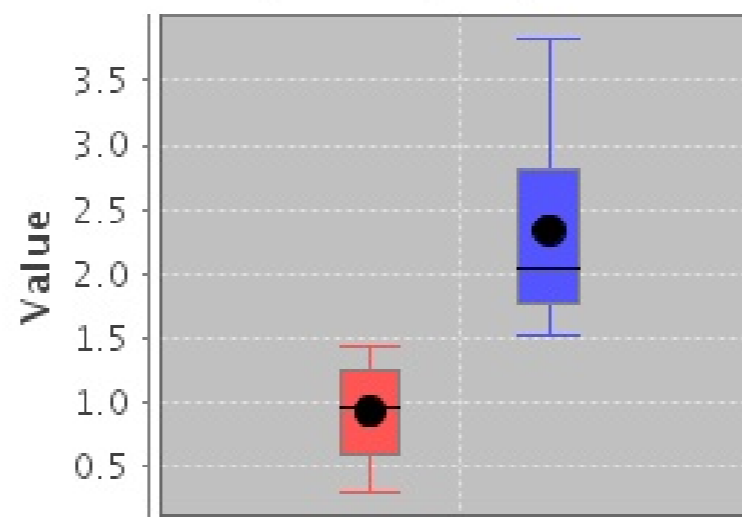
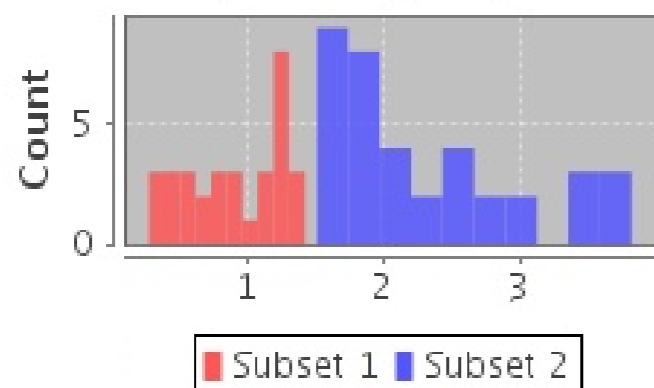
Show Histogram Show Histogram for subset OK Cancel

Analysis of concepts found in Subsets

Analysis of ... \Medical History \Pulmonary Function Test \FEF in L/Second (PFFEF) for subsets:

Comparison of ... \Medical History \Pulmonary Function Test \FEF in L/Second (PFFEF)

Histogram of ... \Medical History \Pulmonary Function Test \FEF in L/Second (PFFEF)



Subset 1

Trial55
Mean: 0.93
Median: 0.96
IQR: 0.65
SD: 0.35
Data Points: 32






Subset 2

Trial55
Mean: 2.34
Median: 2.05
IQR: 1.04
SD: 0.7
Data Points: 37

t statistic:	-10.801
p-value:	3.5527e-15

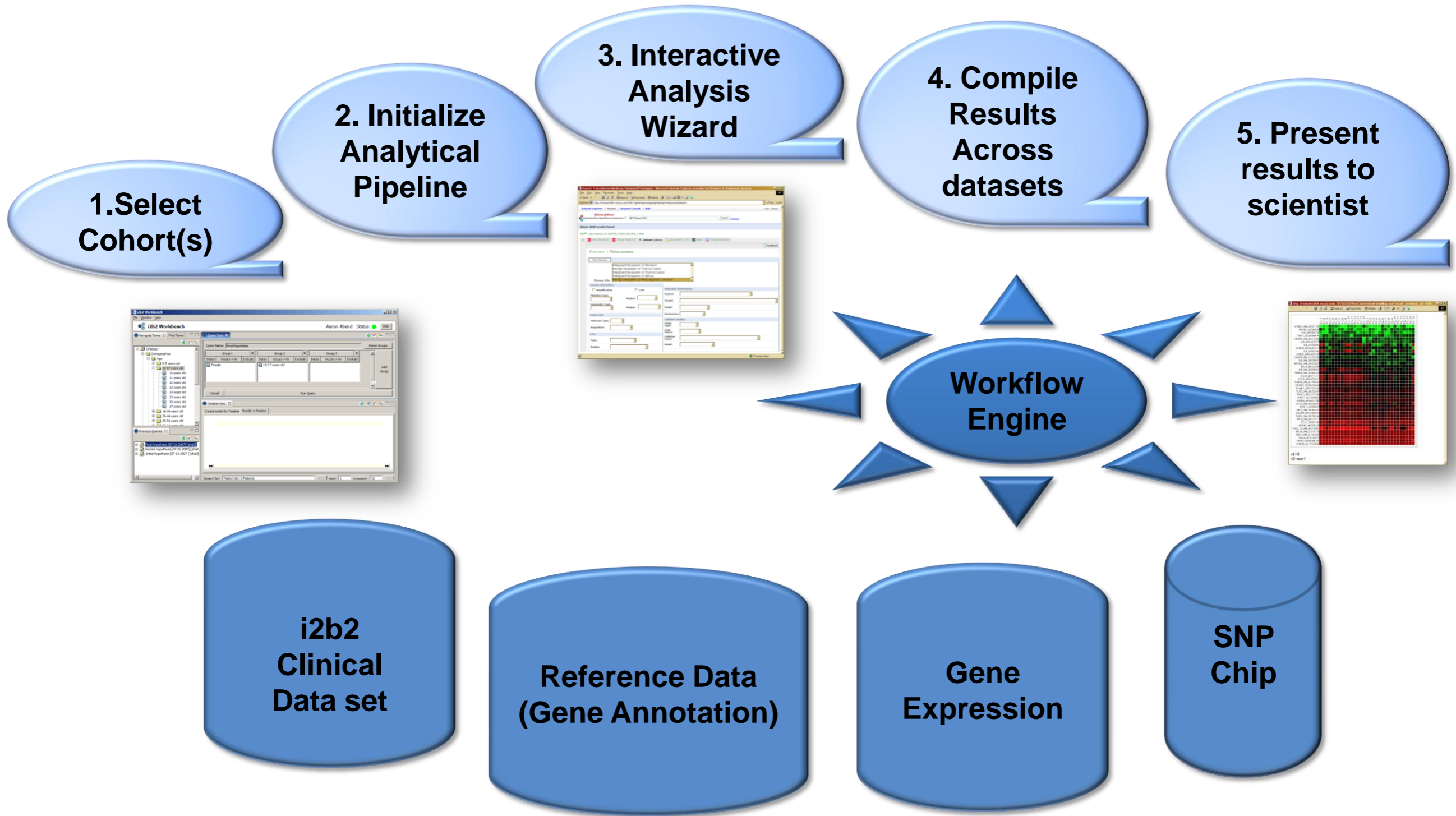
The results are significant at a 95% confidence level.

Subset 1 Subset 2

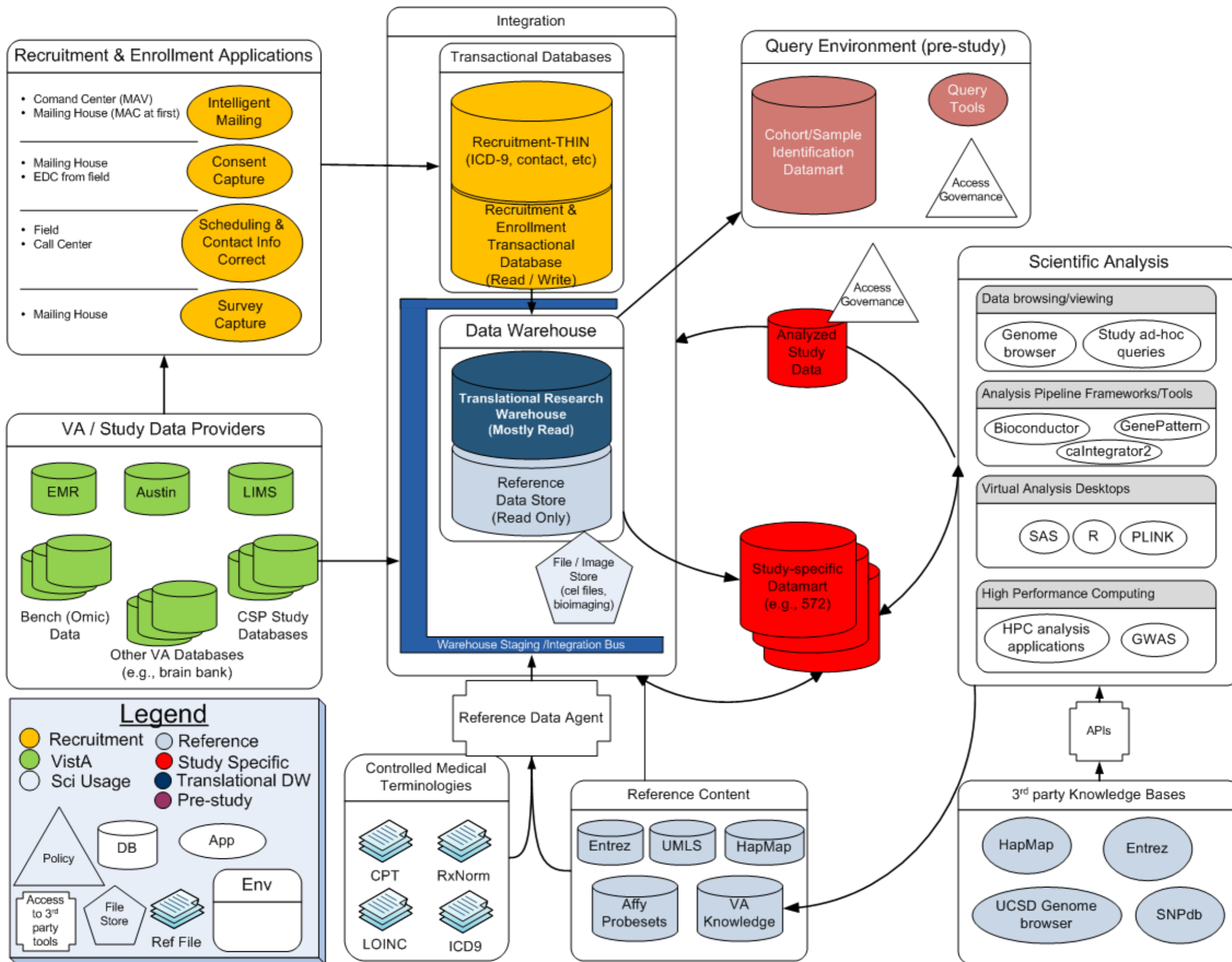
 Generate Summary Statistics |
  Summary |
  Advanced ▾ |
  Clear |
  Save

Comparison |
 Results/Analysis |
 Grid View |
 Haploview

Subject	Subset	Trial	Sex	Age	Race	FEF_in_L/Second_(PFPEF)	Female	Male
65476	subset1	Trial55	F	46	Caucasian	1.21	Female	N
65478	subset1	Trial55	F	57	Black or Afri...	1.4	Female	N
65479	subset1	Trial55	F	47	Other	1.43	Female	N
65482	subset1	Trial55	F	38	Black or Afri...	1.15	Female	N
65483	subset1	Trial55	F	39	Caucasian	0.93	Female	N
65492	subset1	Trial55	F	39	Caucasian	0.51	Female	N
65500	subset1	Trial55	F	40	Black or Afri...	0.77	Female	N
65506	subset1	Trial55	F	48	Caucasian	1.27	Female	N
65511	subset1	Trial55	F	34	Caucasian	0.62	Female	N
65514	subset1	Trial55	F	66	Caucasian	1.06	Female	N
65525	subset1	Trial55	F	58	Caucasian	0.82	Female	N
65533	subset1	Trial55	F	58	Caucasian	0.29	Female	N
65534	subset1	Trial55	F	47	Black or Afri...	1.24	Female	N
65536	subset1	Trial55	F	48	Black or Afri...	1.3	Female	N
65538	subset1	Trial55	F	66	Caucasian	0.72	Female	N
65541	subset1	Trial55	F	56	Black or Afri...	1.18	Female	N
65542	subset1	Trial55	F	47	Black or Afri...	0.95	Female	N



GenISIS Architecture: MVP



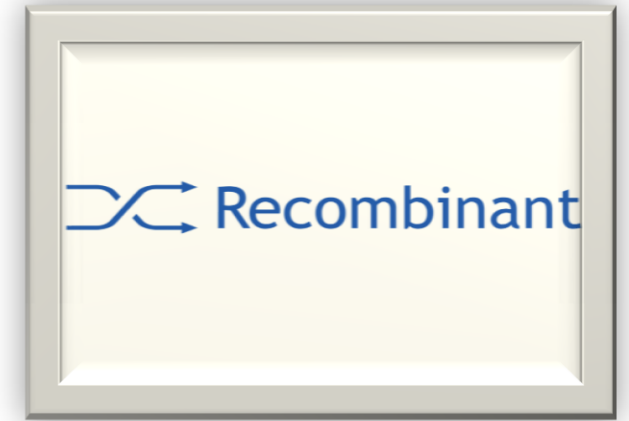
Profiles Research Networking Software

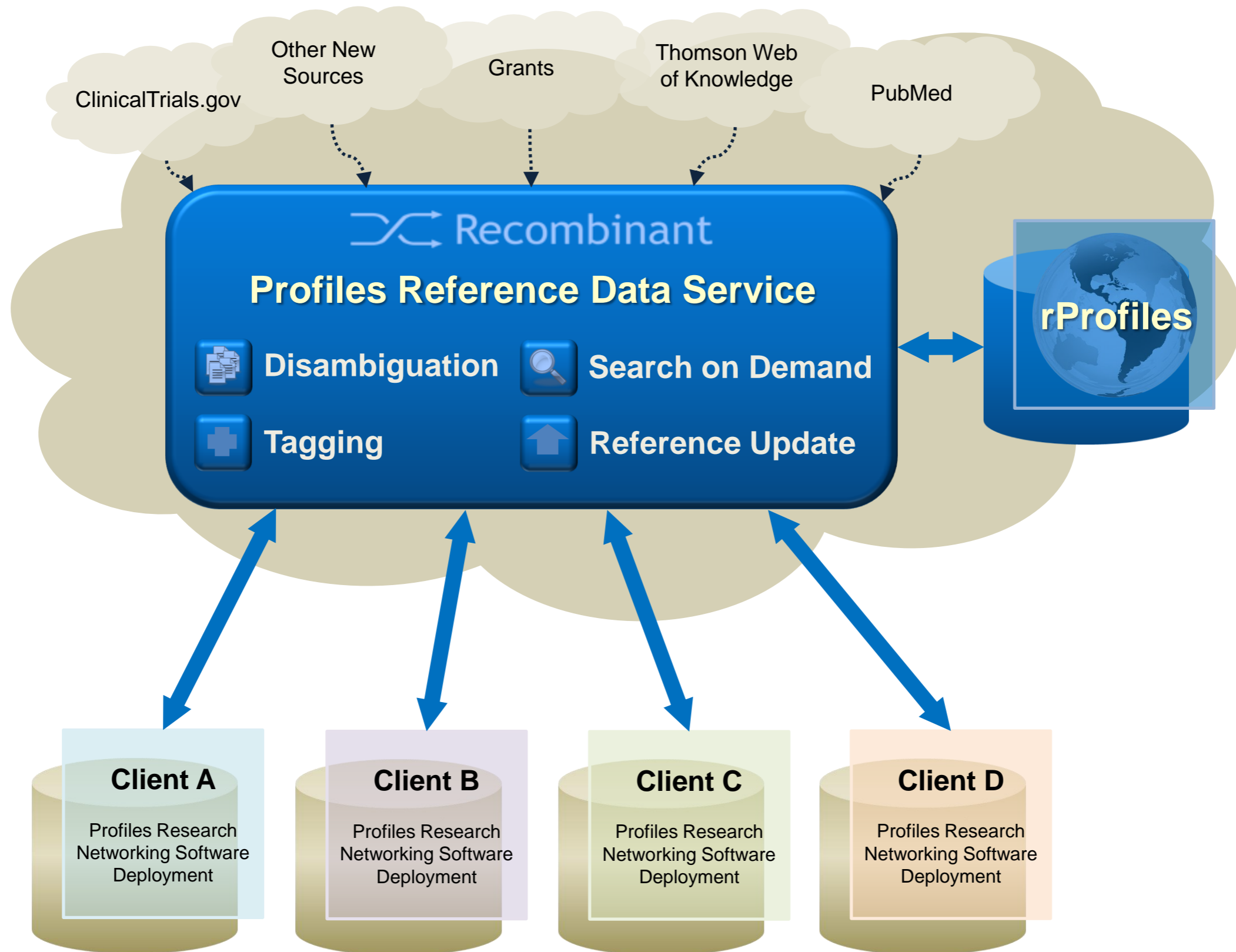
Open Source Initiative

- Research networking & expertise mining tool
- Developed as part of Harvard Catalyst, The Harvard Clinical and Translational Science Center
- Deployed at UCSF as an alpha site
- Now being released as open source software
- Recombinant is an authorized support provider for Profiles Research Networking Software
- Working with Griffin Weber to implement two beta sites



¹ Profiles Research Networking Software was developed under the supervision of Griffin M Weber, MD, PhD, with support from Grant Number 1 UL1 RR025758-01 to Harvard Catalyst, The Harvard Clinical and Translational Science Center from the National Center for Research Resources and support from Harvard University and its affiliated academic healthcare centers





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John David Halamka, M.D.

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Email	jhalamka@caregroup.harvard.edu



Other Positions

Title	Chief Information Officer
Institution	Harvard Medical School
Department	IT

Narrative

John D. Halamka, MD, MS, is Chief Information Officer of the CareGroup Health System, Chief Information Officer and Associate Dean for Educational Technology at Harvard Medical School, Chairman of the New England Health Electronic Data Interchange Network (NEHEN), CEO of MA-Share, Chair of the Healthcare Information Technology Standards Panel (HITSP), Chief Information Officer of the Harvard Clinical Research Institute and a practicing Emergency Physician.

Publications

1. Halamka J, Gray JW, Gledhill BL, Lake S, Wyrobek AJ. [Estimation of the frequency of malformed sperm by slit scan flow cytometry](#). Cytometry. 1984 Jul; 5(4):333-8.
2. Halamka JD, Safran C. [Virtual consolidation of Boston's Beth Israel and New England Deaconess Hospitals via the World Wide Web](#). Proc AMIA Annu Fall Symp. 1997; 349-53.
3. Halamka JD, Szolovits P, Rind D, Safran C. [A WWW implementation of national recommendations for protecting electronic health information](#). J Am Med Inform Assoc. 1997 Nov-Dec; 4(6):458-64.
4. Bourie PQ, Ferrenberg VA, McKay M, Halamka JD, Safran C. [Implementation of an on-line Emergency Unit nursing system](#). Proc AMIA Symp. 1998; 330-3.
5. Halamka JD, Hughes M, Mack J, Hurwitz M, Davis F, Wood D, Borten K, Saal AK. [Managing care in an integrated delivery system via an Intranet](#). Proc AMIA Symp. 1998; 401-5.
6. Halamka JD, Safran C. [CareWeb, a web-based medical record for an integrated healthcare delivery system](#). Stud Health Technol Inform. 1998; 52 Pt 1:36-9.
7. Halamka JD. [Web technology for emergency medicine and secure transmission of electronic patient records](#). MD Comput. 1998 Jul-Aug; 15(4):232-7.

Halamka's...

Keywords(MeSH)

[Patient Identification Systems](#)

[Radio](#)

[Medical Record Linkage](#)

[Regional Medical Programs](#)

[Computer Security](#)

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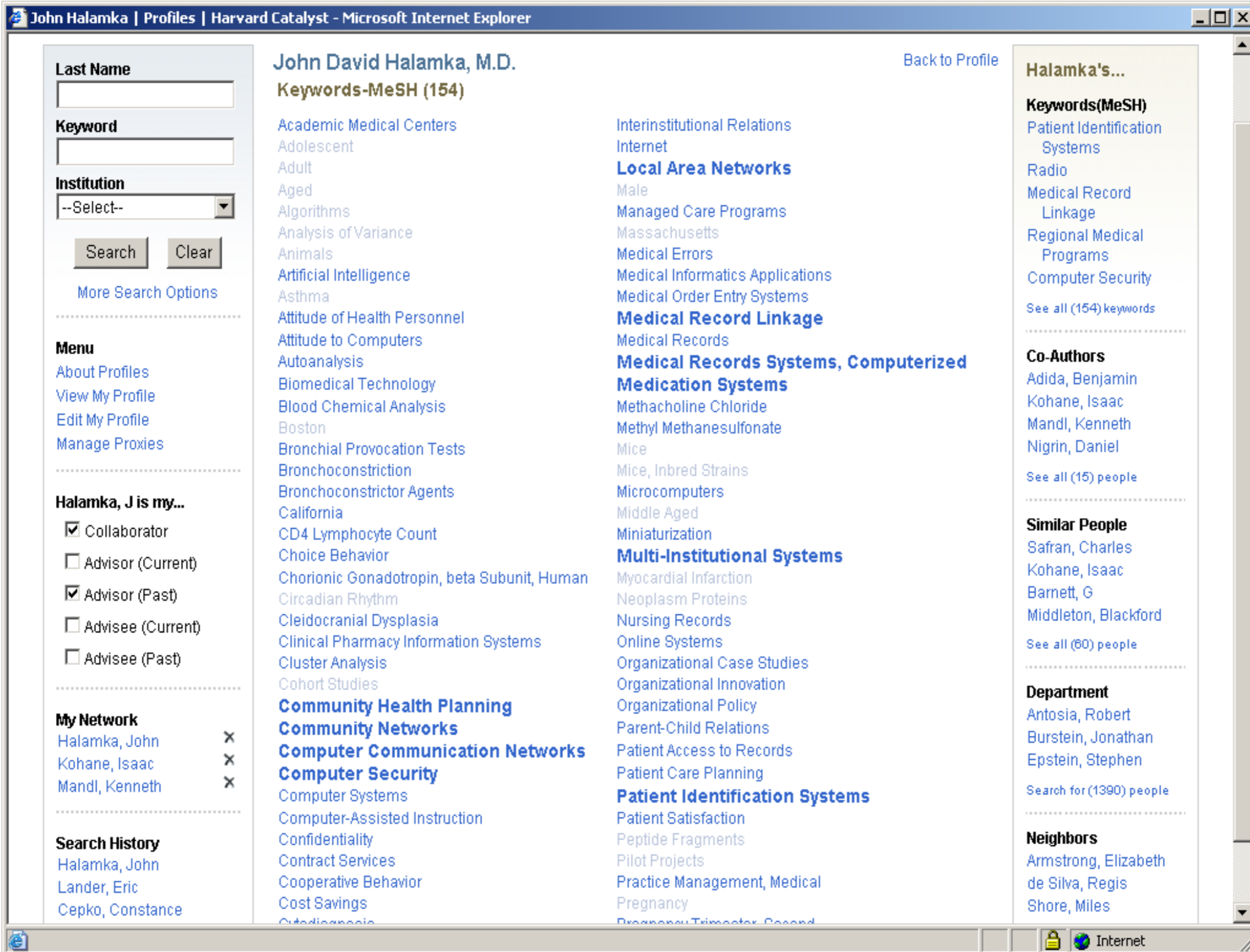
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Keywords-MeSH (154)

- Academic Medical Centers
- Adolescent
- Adult
- Aged
- Algorithms
- Analysis of Variance
- Animals
- Artificial Intelligence
- Asthma
- Attitude of Health Personnel
- Attitude to Computers
- Autoanalysis
- Biomedical Technology
- Blood Chemical Analysis
- Boston
- Bronchial Provocation Tests
- Bronchoconstriction
- Bronchoconstrictor Agents
- California
- CD4 Lymphocyte Count
- Choice Behavior
- Chorionic Gonadotropin, beta Subunit, Human
- Circadian Rhythm
- Cleidocranial Dysplasia
- Clinical Pharmacy Information Systems
- Cluster Analysis
- Cohort Studies
- Community Health Planning**
- Community Networks**
- Computer Communication Networks**
- Computer Security**
- Computer Systems
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- Confidentiality
- Contract Services
- Cooperative Behavior
- Cost Savings
- Cytodiagnosis
- Interinstitutional Relations
- Internet
- Local Area Networks**
- Male
- Managed Care Programs
- Massachusetts
- Medical Errors
- Medical Informatics Applications
- Medical Order Entry Systems
- Medical Record Linkage**
- Medical Records
- Medical Records Systems, Computerized**
- Medication Systems**
- Methacholine Chloride
- Methyl Methanesulfonate
- Mice
- Mice, Inbred Strains
- Microcomputers
- Middle Aged
- Miniaturization
- Multi-Institutional Systems**
- Myocardial Infarction
- Neoplasm Proteins
- Nursing Records
- Online Systems
- Organizational Case Studies
- Organizational Innovation
- Organizational Policy
- Parent-Child Relations
- Patient Access to Records
- Patient Care Planning
- Patient Identification Systems**
- Patient Satisfaction
- Peptide Fragments
- Pilot Projects
- Practice Management, Medical
- Pregnancy
- Pregnancy Trimester, Second

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- Regional Medical Programs
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2	Goroll, Allan	7	McClennen, Seth	12	Saal, A.
3	Ho, Kalon	8	Moy, Marilyn	13	Safran, Charles
4	Horowitz, Gary	9	Nigrin, Daniel	14	Stair, Thomas
5	Kohane, Isaac	10	Rind, David	15	Szolovits, Peter

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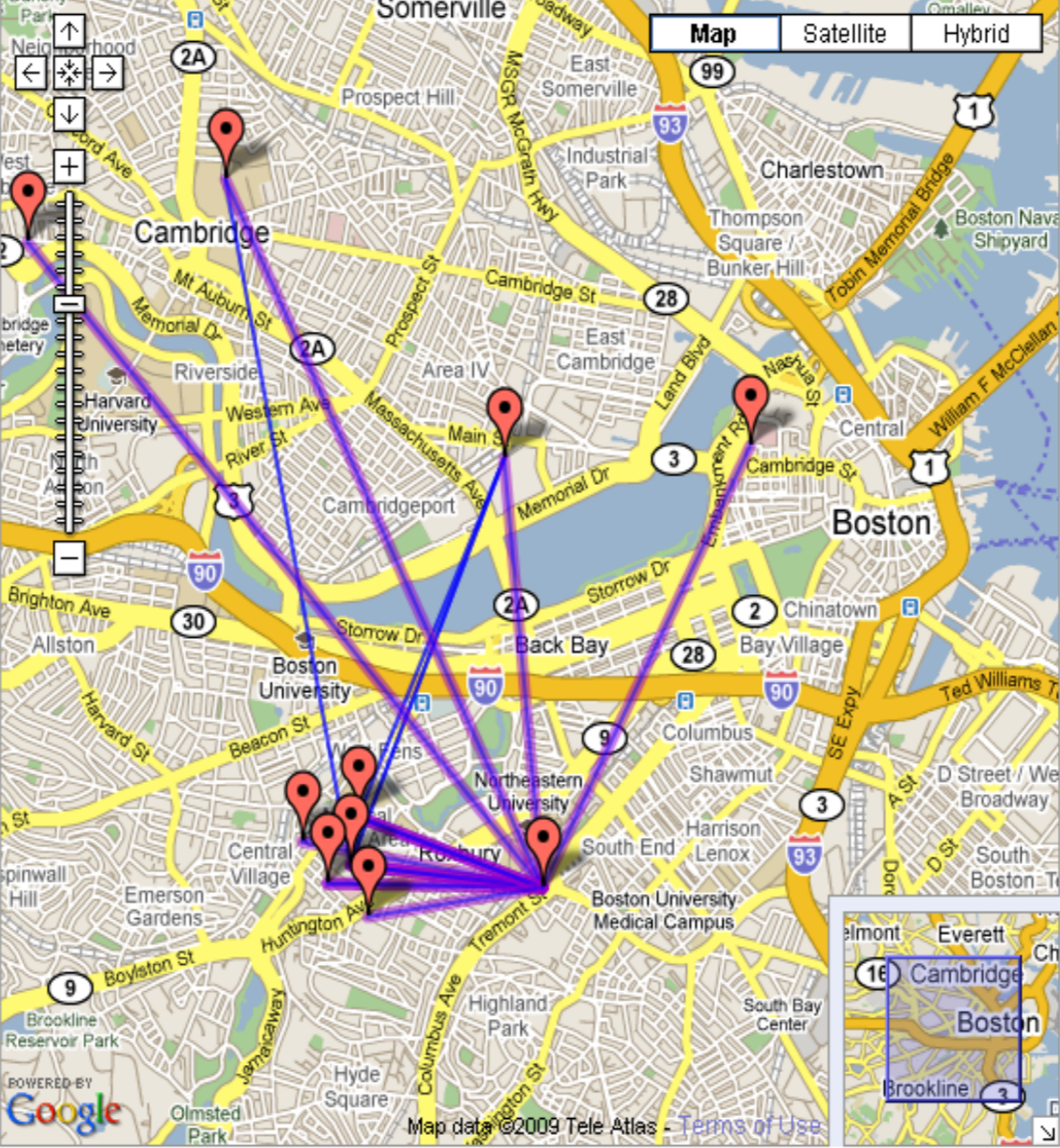
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- [Radio](#)
- [Medical Record Linkage](#)
- [Regional Medical Programs](#)
- [Computer Security](#)

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Quality Reporting Overview



Avoid Reinventing the Wheel



IDN / Hospital A

Data Warehouse A



Workflow A



Diabetes Reports A



IDN / Hospital B

Data Warehouse B



Workflow B



Diabetes Reports B



IDN / Hospital C

Data Warehouse C



Workflow C

None

Diabetes Reports C



IDN / Hospital A

Data Warehouse A



IDN / Hospital B

Data Warehouse B



IDN / Hospital C

Data Warehouse C



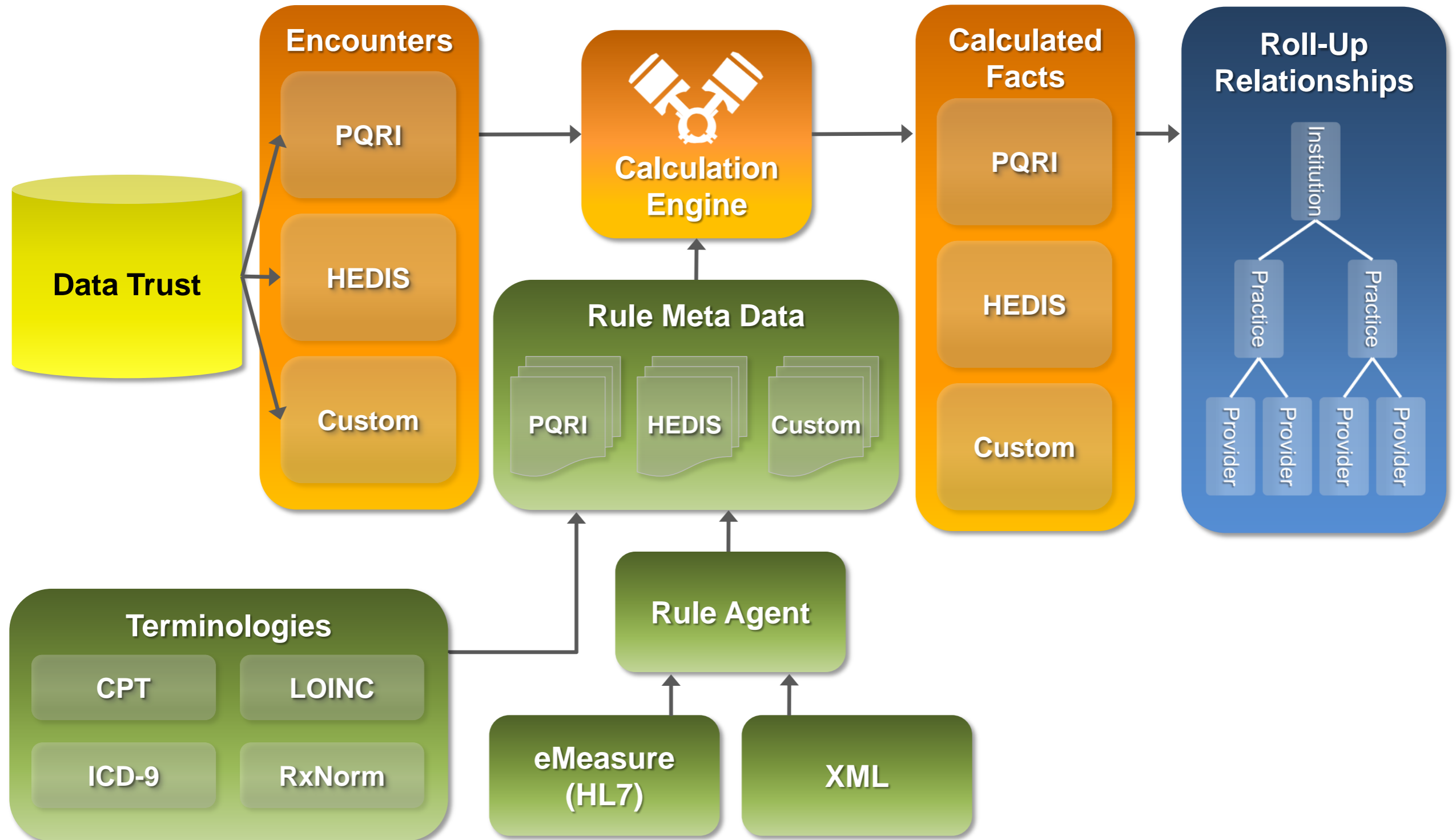
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Best Practice QI Workflows

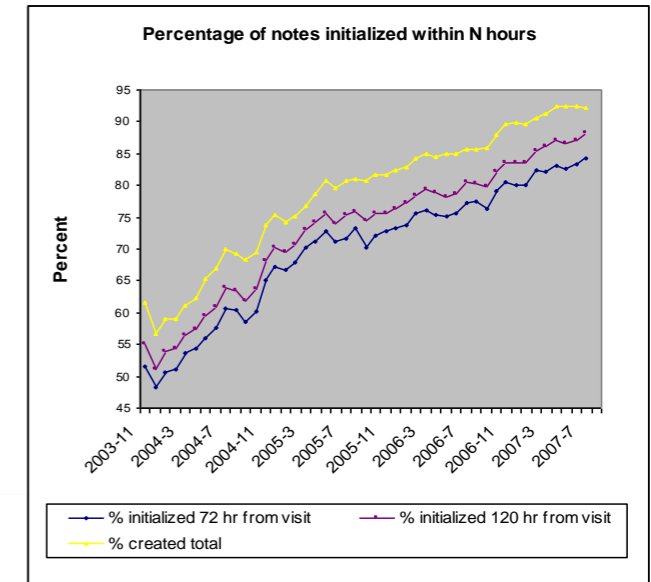
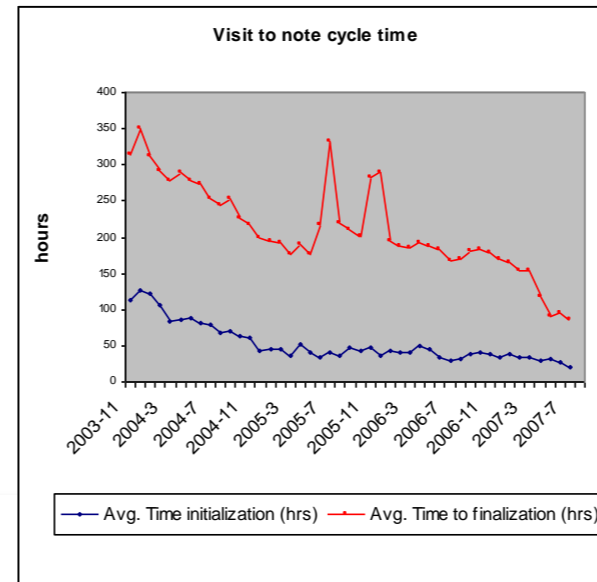


Standardized Reporting Library





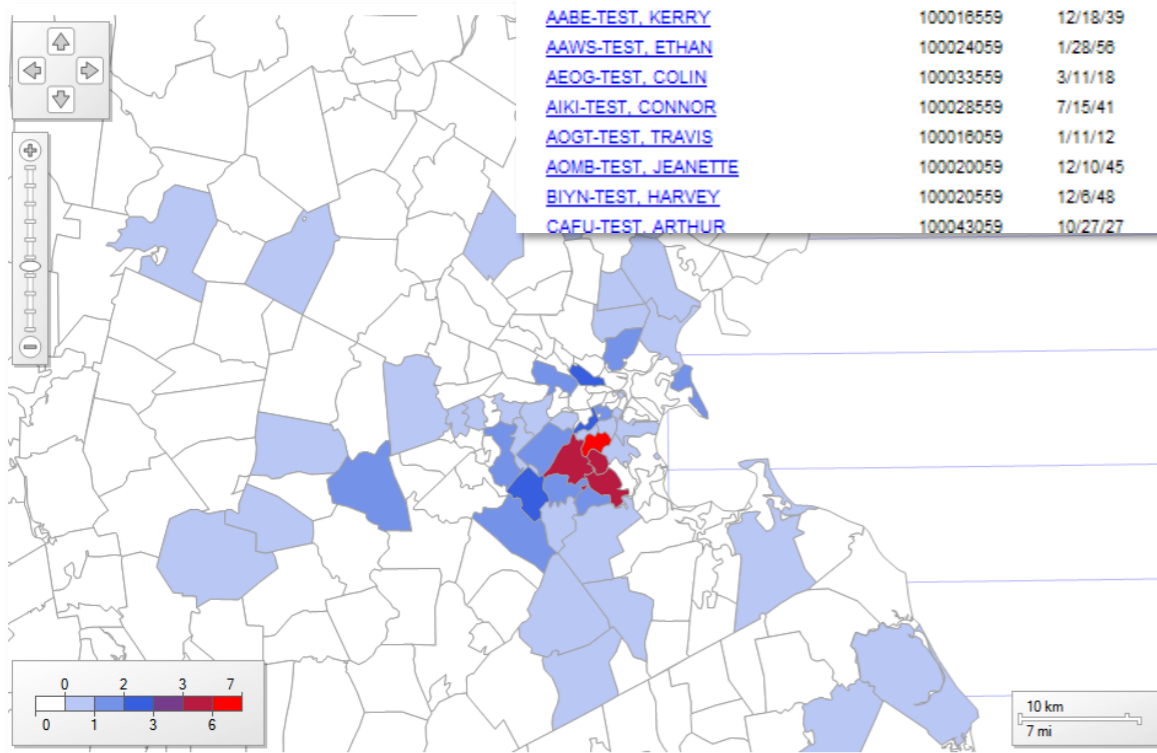
- Denominators (panels, locations)
- Practice snapshots
- EHR adoption
- Visits/utilization



Report: My panel (patient list)
 Institution: Institution Clinic: Clinic 10
 Provider/PCP: AARONSON, JEANETTE M.D.
 Today's Date: 3/5/2008
 Reporting Period: Thru 03/05/2008

Total Patients in Panel: 100

Patient	MRN	DOB	Age	Sex	#Visits	Next Visit
AABE-TEST, KERRY	100016559	12/18/39	25	F	2	7/27/12
AAWS-TEST, ETHAN	100024059	1/28/58	25	M	3	8/18/14
AEOG-TEST, COLIN	100033559	3/11/18	25	M	4	3/23/17
AIKI-TEST, CONNOR	100028559	7/15/41	25	M	3	11/9/15
AOGT-TEST, TRAVIS	100018059	1/11/12	25	M	2	6/7/12
AOMB-TEST, JEANETTE	100020059	12/10/45	25	F	3	7/12/13
BIYN-TEST, HARVEY	100020559	12/6/48	25	M	3	8/31/11
CAFU-TEST, ARTHUR	100043059	10/27/27	25	M	5	10/29/11



Operations

Chronic Disease Mgmt.

Preventative Medicine

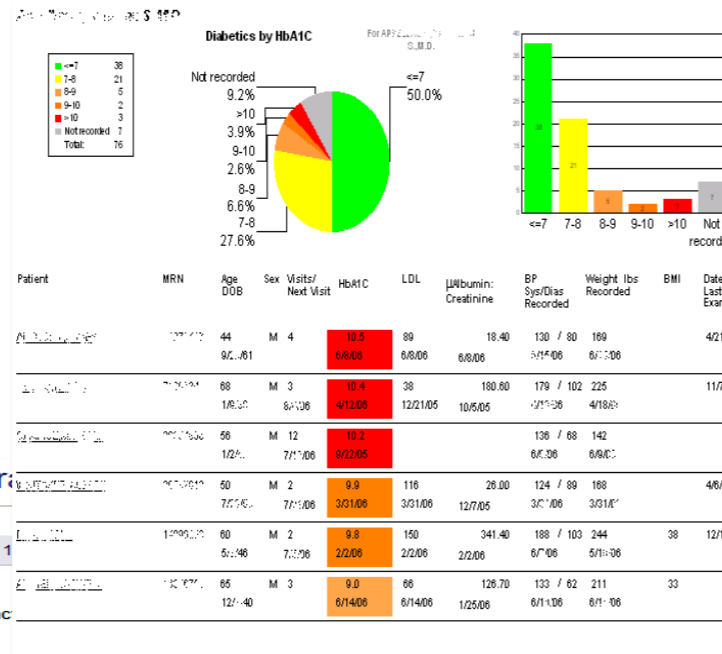
Patient Satisfaction

In Patient/Hospital

Ad-hoc queries

Report Library

- Diabetes
- Asthma
- CAD
- CHF



Diabetes stats - My practice

Report Definitions
120 / 1

LMR Report Central
- Diabetes stats - My practice

PRACTICE SUMMARY

N: 2,338
A1C tests in calendar year: 2,475
Diabetes ed. notes past 12 mos: 25

Avg A1C: 7.80
Avg. LDL: 91.63

% A1C past 12 mos: 87.94% (2056)
% 2 or more A1C past 12 mos: 62.02 (1450)
% Flu past 12 mos: 49.40% (1155)
% EKG ever: 58.98% (1379)
% Pneumovax ever: 74.21% (1735)
% Foot exam past 12 mos: 6.54% (153)
% Eye exam past 12 mos: 32.93% (770)
% Microalbumin past 12 mos: 64.80% (1515)
% LDL past 12 mos: (78.61%) 1838
% LDL >100: 28.61 (669)

% A1C Not Recorded: 1.50% (35)
% A1C >10: 9.41% (220)
% A1C 9-10: 5.73% (134)
% A1C 8-9: 12.02% (281)
% A1C 7-8: 23.01% (538)
% A1C ≤7: 37.47% (876)



Measure	My Value (N)	Clinic Average (N)	Target
Anti-platelet Management: % of patients on anti-platelet	95% (20/21)	93% (1586)	> 95%
Beta-blocker Management: % of MI patients on beta-blocker	100% (2/2)	20% (345)	> 80%
Blood Pressure Management: % of patients with BP at or below goal	67% (14/21)	65% (1110)	> 68%
Lipid Management: % of patient with LDL < 100	71% (15/21)	53% (913)	> 62%
ACE Inhibitor/ARB Management: % of DM or CHF patients on ACE/ARB	100% (4/4)	51% (870)	> 89%
BMI Documentation: % of patients with BMI documented	76% (16/21)	58% (999)	> 76%
Smoking Status Documentation: % of patients with smoking status documented	100% (21/21)	93% (1596)	> 87%
Zero Defect Care: % of patients with zero deficiencies	24% (5/21)	4% (62)	> 83%
Total # of CAD Patients:	21		

Chronic Disease Mgmt.

Preventative Medicine

Patient Satisfaction

In Patient/Hospital

Ad-hoc queries

Report Library

Data Needed for Typical Report



1. Thru date: Displaying the period allows the user to understand how up to date the data is and how the group is being measured

2. Patient, MRN, Age: Data from EMPI or other central patient data sets

3. Next Visit: Scheduling system (e.g. IDX)

4. HbA1C, Ualbumin, Lab data sets

5. Data collected from EHR or claims

6. Definitions: Definitions provide details into what the data means and how numerators or denominators were calculated. For example – What are my patients? Who is considered to be diabetic? What is considered on time?

7. Graphs: Summary performance for the provider across all patients based on with color highlights against categories of patients based on current outcomes. Potentially includes comparisons with peers.

8. Diabetes patients identified by claims, problem lists, constrained by provider's panel of patients based on enrollment (payors) and visits (non-payors).


Recombinant **Clinical Integration Trust**

[Dashboard](#)
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Provider: Dr. Sample

Practice: MyPractice

Institution:

Dashboard

System Risk - Current Risk Total 2.5% ●

[Target Summary](#) 

Patient Satisfaction – Avg. overall Press Ganey standard care provider score

Goal (%ile)	Current (%ile)	# Cases	Date Thru	Current System Risk	Details
79th	78th	890	3/12/10	● 1.0 %	My Score -
79th	77th	30	3/12/10		

PQRI - % of Clinic Physicians submitting claims with CPT II codes attached

Goal	Current	Reporting Physicians	Date Thru	Current System Risk	Details
>75%	65%	550 of 890	3/12/10	● 0.5%	My Practice

Core Measures - # Hospitals at core measure composite target

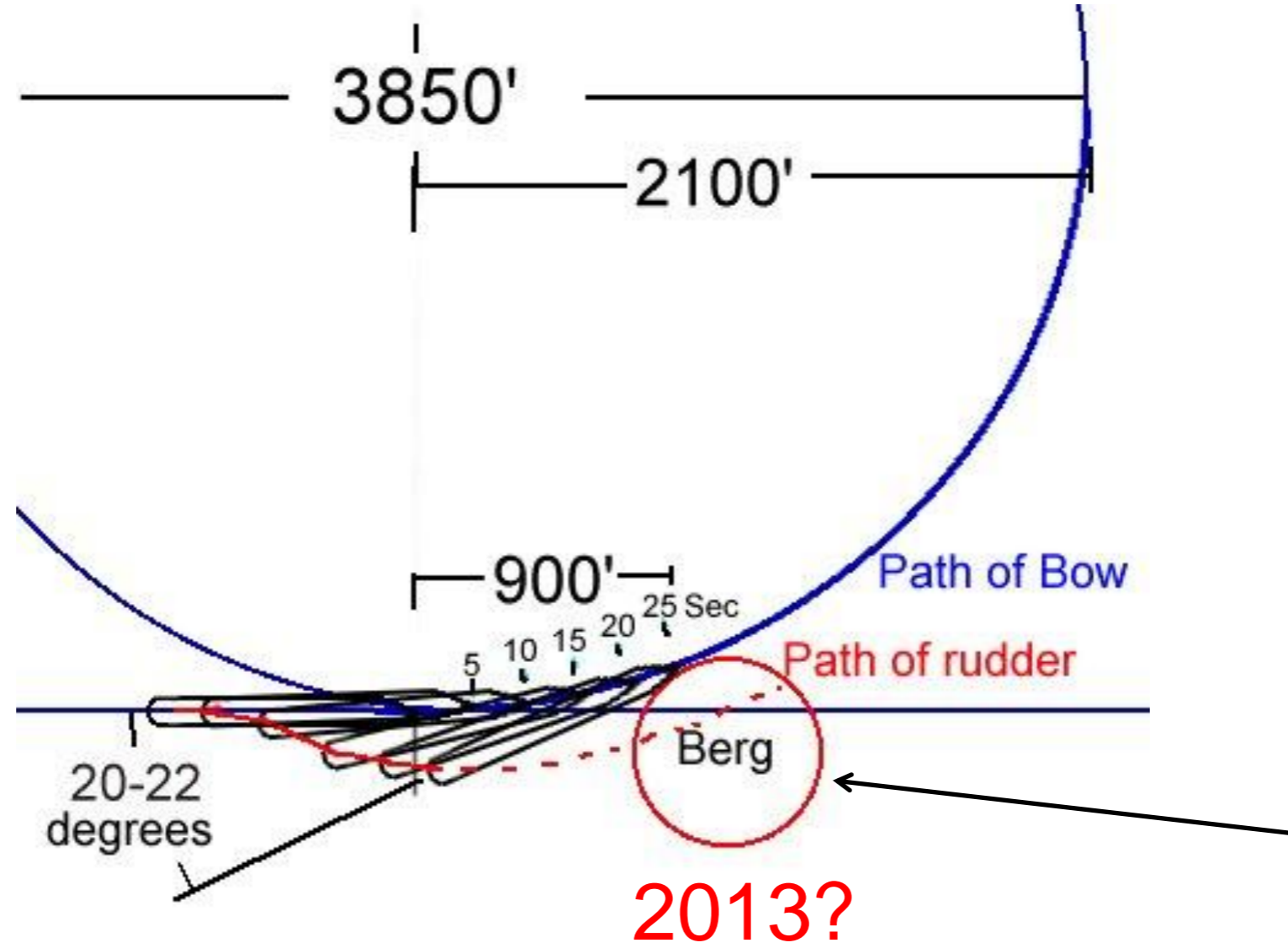
Hospital	Goal	At Target	Composite Score	Period	Current System Risk	Details by Hospital
Total +	4/4	2/4	N/A	Q4-09	● 1.0%	

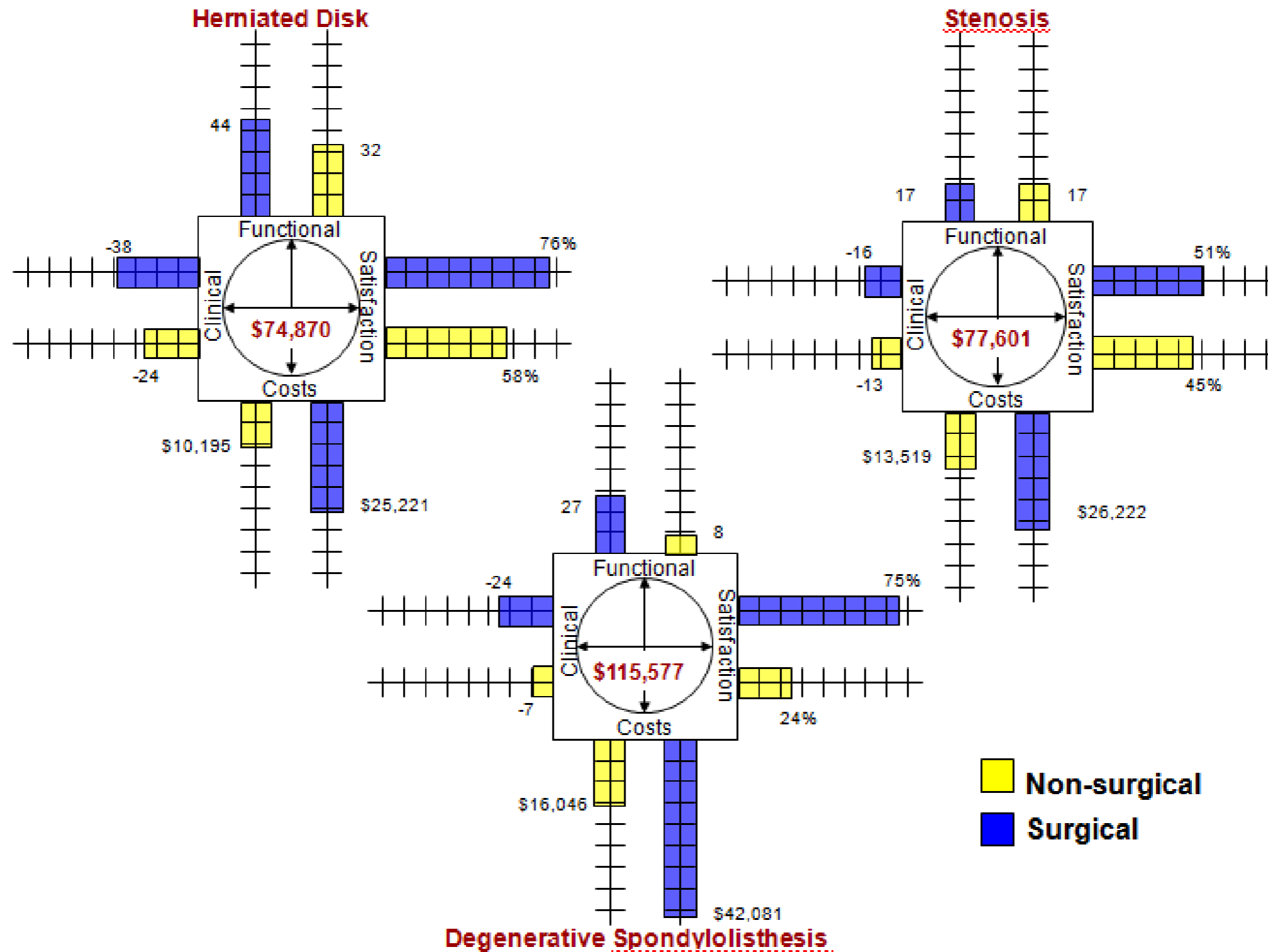
PQRI Measure

	Current Period Value (10/01/2010 thru 02/12/2010)				Quality Information Available?
	% Participation		% Performance		
	Visits	Unique Patients	Visits	Unique Patients	
HbA1c Poor Control in Diabetes Mellitus	90% (n=20)	90% (n=10)	90% (n=20)	90% (n=10)	more
(LDL-C) Control in Diabetes Mellitus	85% (n=20)	85% (n=10)	85% (n=20)	85% (n=10)	more
Asthma Assessment	85% (n=20)	85% (n=10)	85% (n=20)	85% (n=10)	N/A
Inquiry Regarding Tobacco Use	66% (n=240)	66% (n=165)	66% (n=240)	66% (n=165)	more

Bending the curve?

2010





SPORT trial – Jim Weinstein et. al

Thank You



Patient	MRN	Age (DOB)	Sex	Visit/Visit Date	HbA1c	LDL	Glucose	HDL	Triglycerides	Weight	BP	Cholesterol
TEST, CHLOE	100018001	59 (1/31/55)	F	2 5/15/10	12.0 (01/07)	127 (01/06)	147 (01/06)	12 (01/06)	117 (01/06)	154 (01/06)	110/70 (01/06)	175 (01/06)
TEST, GIOVANNI	100001001	31 (10/2/77)	M	1 1/1/09	10.2 (01/07)	97 (01/07)	123 (01/07)	41 (01/07)	110 (01/07)	152 (01/07)	110/70 (01/07)	150 (01/07)
TEST, VLADIMIR	100000501	38 (11/18/68)	M	1 11/29/08	8.2 (10/23/08)	58 (10/23/08)	65 (01/09)	13 (10/23/08)	137 (01/09)	162 (01/09)	110/70 (01/09)	150 (01/09)
TEST, SHANE	100008501	68 (8/27/42)	M	1 10/6/09	8.3 (02/20/07)	102 (02/20/07)	67 (01/09)	11 (01/09)	117 (01/09)	152 (01/09)	110/70 (01/09)	150 (01/09)
	100018501	54 (11/28/53)	F	2 3/17/10	8.8 (01/21/09)	141 (01/21/09)	14 (01/21/09)	14 (01/21/09)	147 (01/21/09)	152 (01/21/09)	110/70 (01/21/09)	150 (01/21/09)
			M	2 10/24/09	8.2 (5/7/09)	124 (5/7/09)	14 (5/7/09)	14 (5/7/09)	147 (01/21/09)	152 (01/21/09)	110/70 (01/21/09)	150 (01/21/09)

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