



ASSOLOMBARDA  
Confindustria Milano Monza e Brianza

# BIOMERIS

## Big Data in sanità: problema o opportunità

Speaker

Ing. Nicola Barbarini, PhD

30 Novembre 2015



# Lab. for Biomedical Informatics

since 1982



Dipartimento di Ingegneria  
Industriale e dell'Informazione

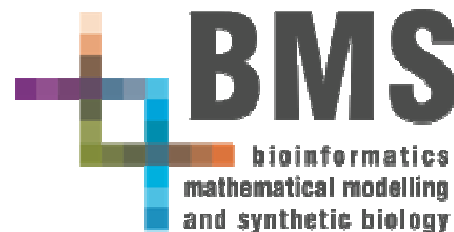
[labmedinfo.org](http://labmedinfo.org)

- Data Mining
- Decision Support Systems
- Telemedicine
- IT for Biomedical Research



**BMI director:**  
**Prof. Riccardo Bellazzi**

[lab-bioinfo.unipv.it](http://lab-bioinfo.unipv.it)



- Bioinformatics
- Synthetic Biology
- Mathematical Modelling of biological systems

**BMS director:**  
**Prof. Paolo Magni**



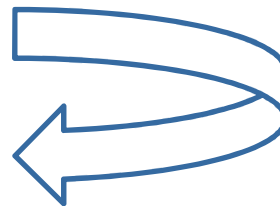
# BIOMEdical Research Informatics Solutions



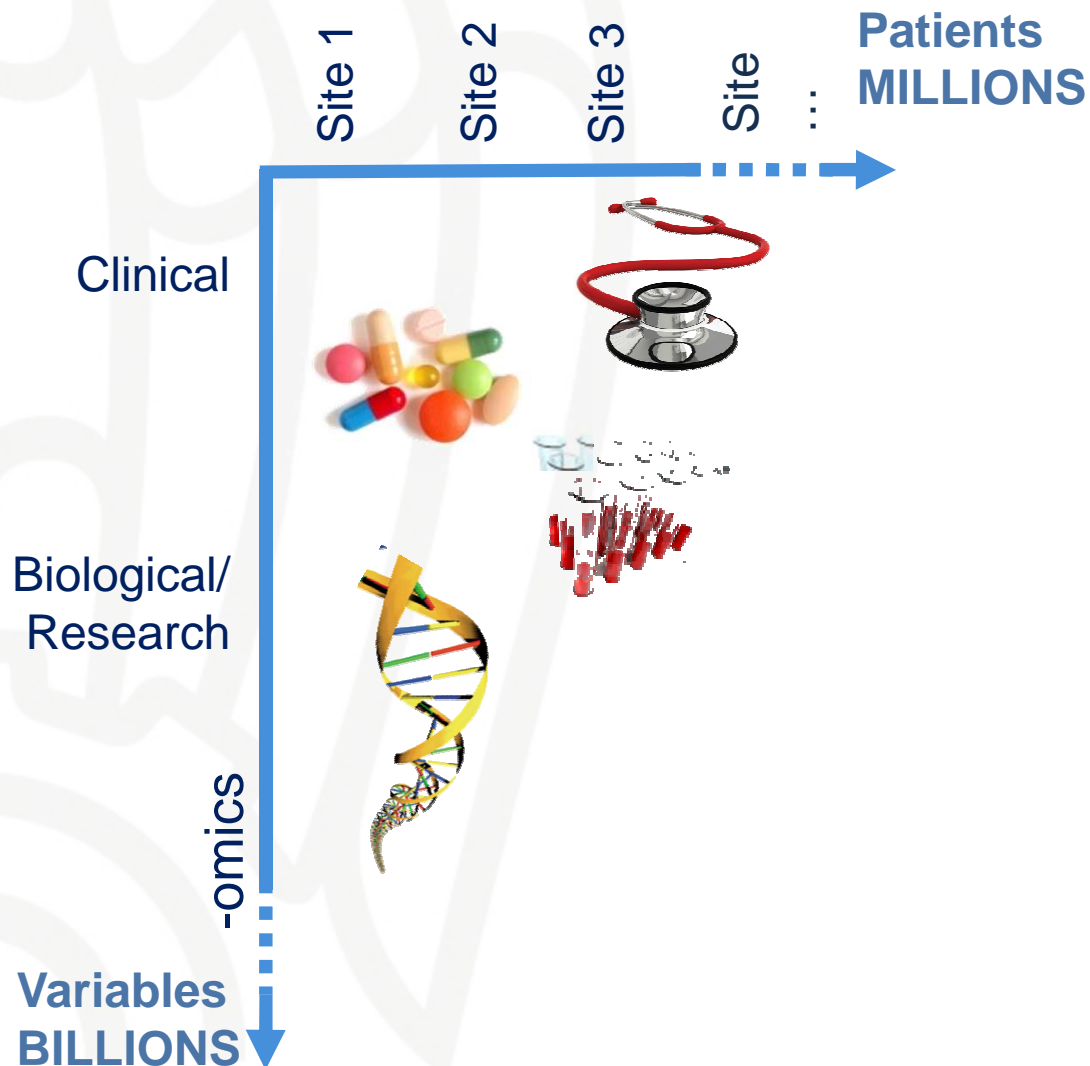
## Mission

Bridging the gap between

- the available **biomedical Big Data**
- the ability to exploit them to discover new knowledge



# Problem (opportunity?) in Clinical research



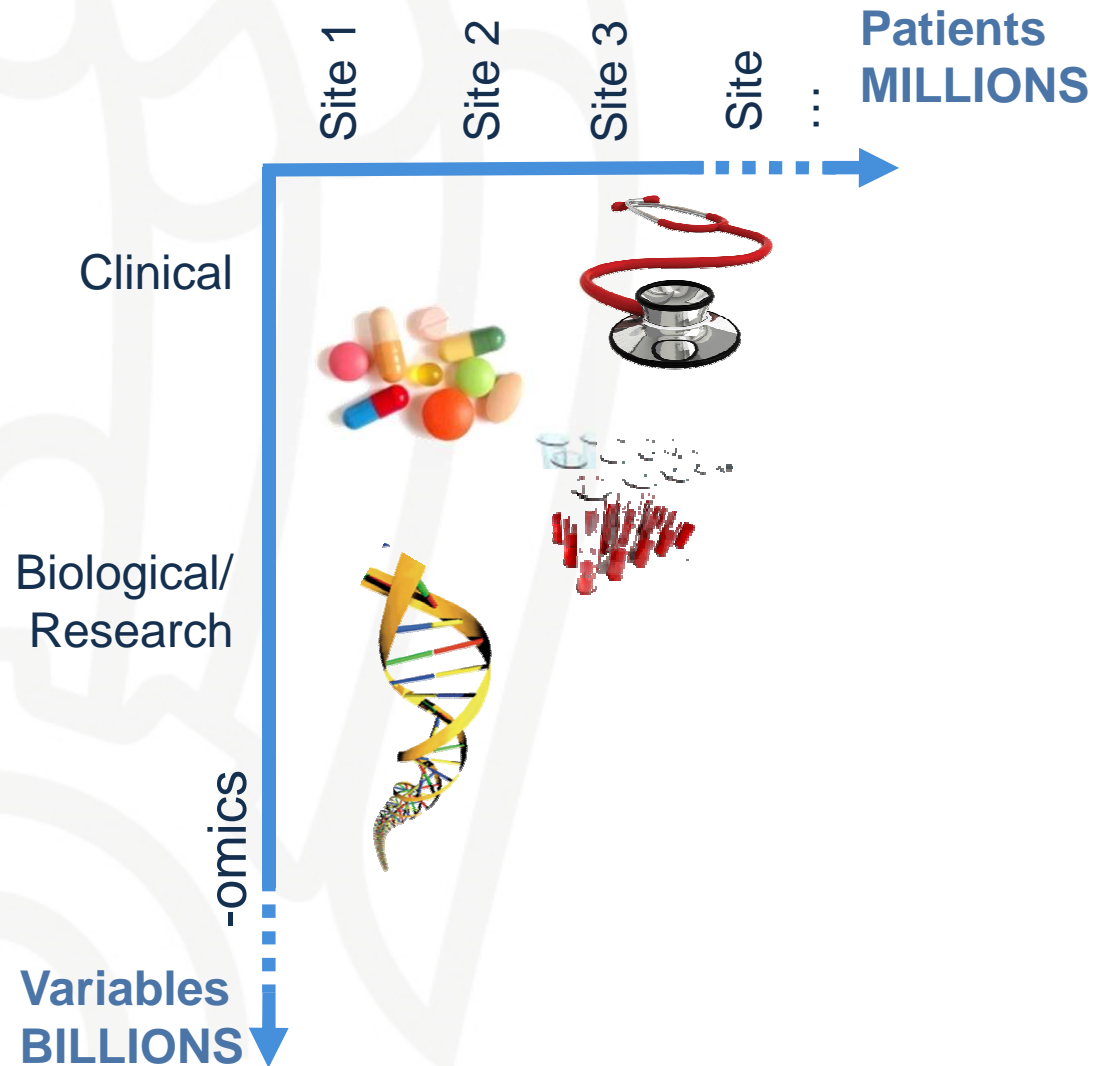
## Patients

- Several sites

## Variables

- Clinical data
- Biological/ Research data

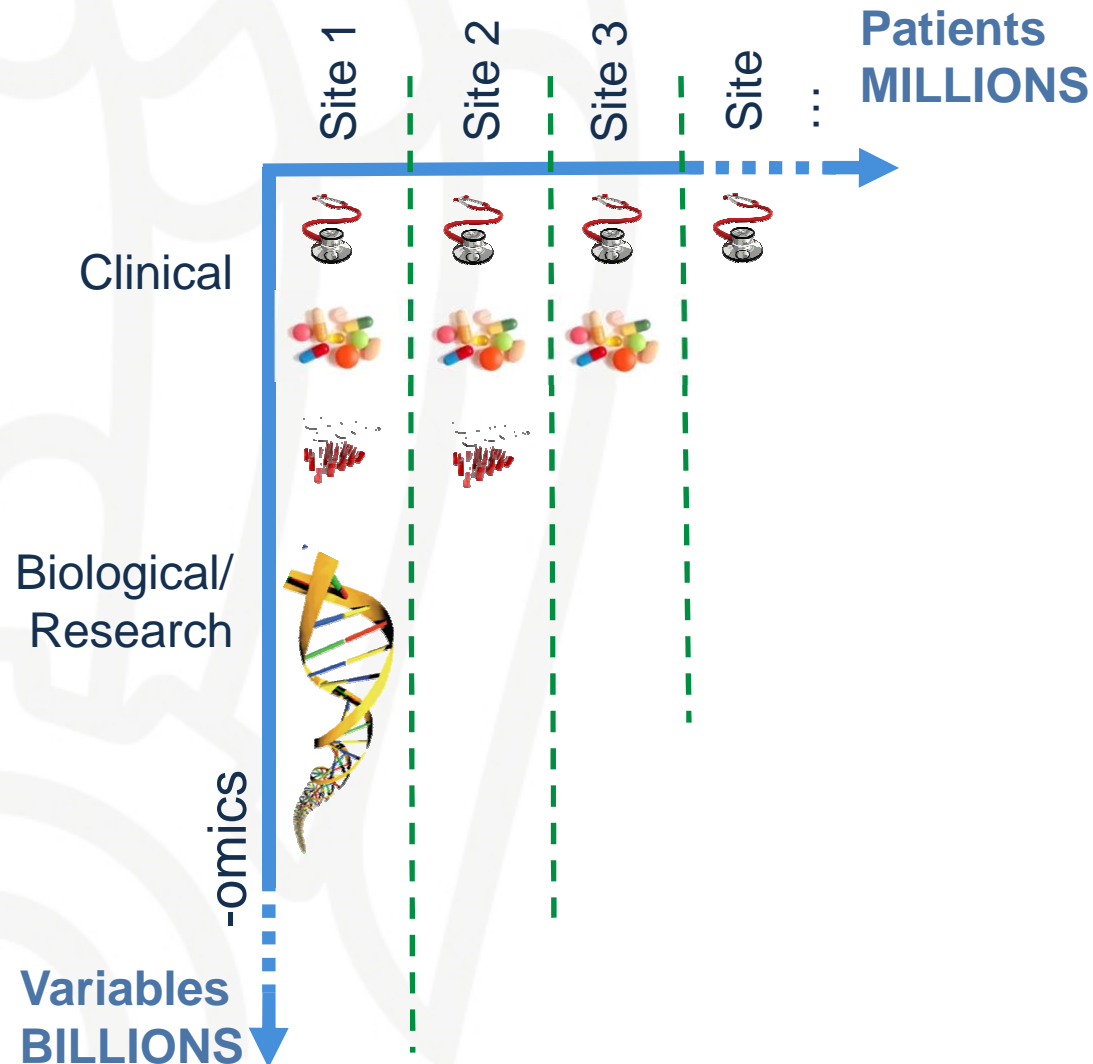
# Problem (opportunity?) in Clinical research



Available?



# Problem (opportunity?) in Clinical research

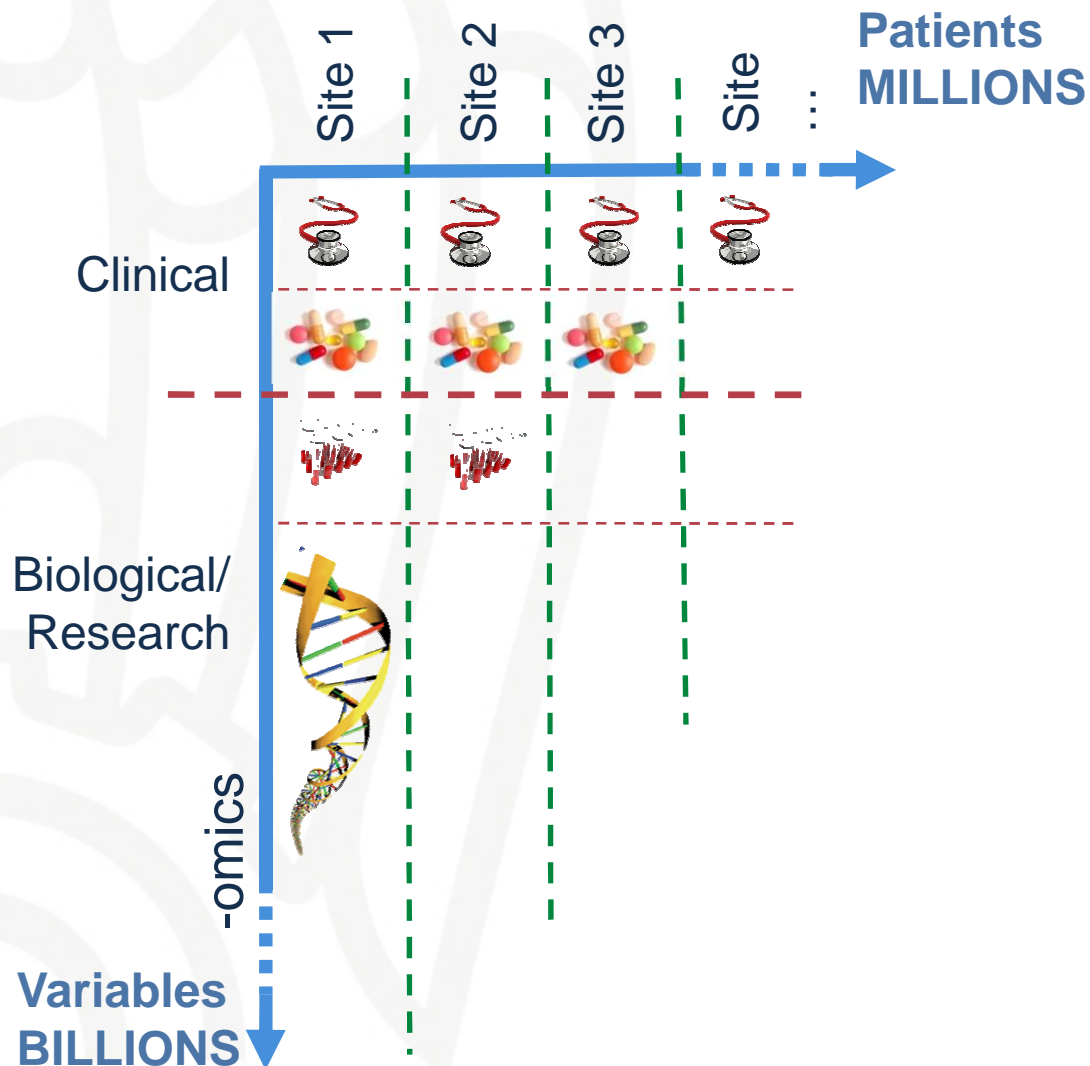


## Barriers

- Vertical : geo, buro, will



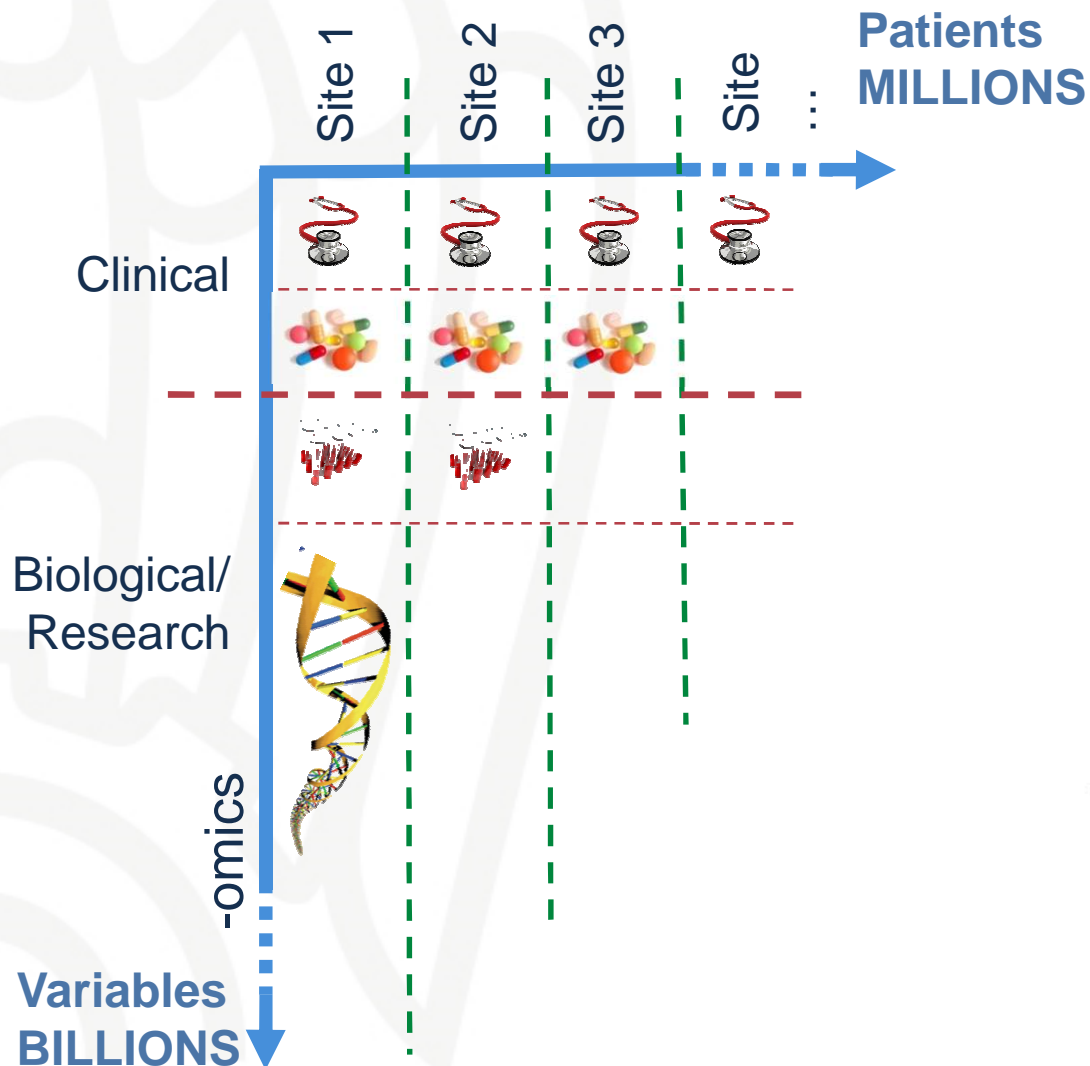
# Problem (opportunity?) in Clinical research



## Barriers

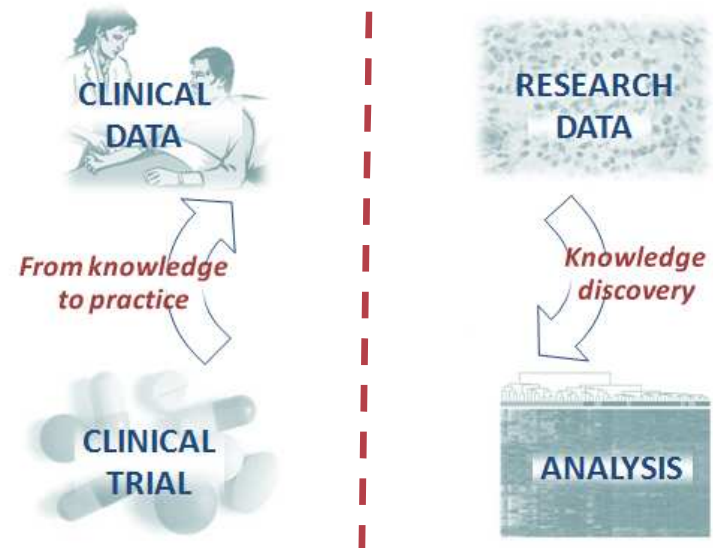
- Vertical : geo, buro, will
- Horiz: heterogeneity, tech

# Problem (opportunity?) in Clinical research



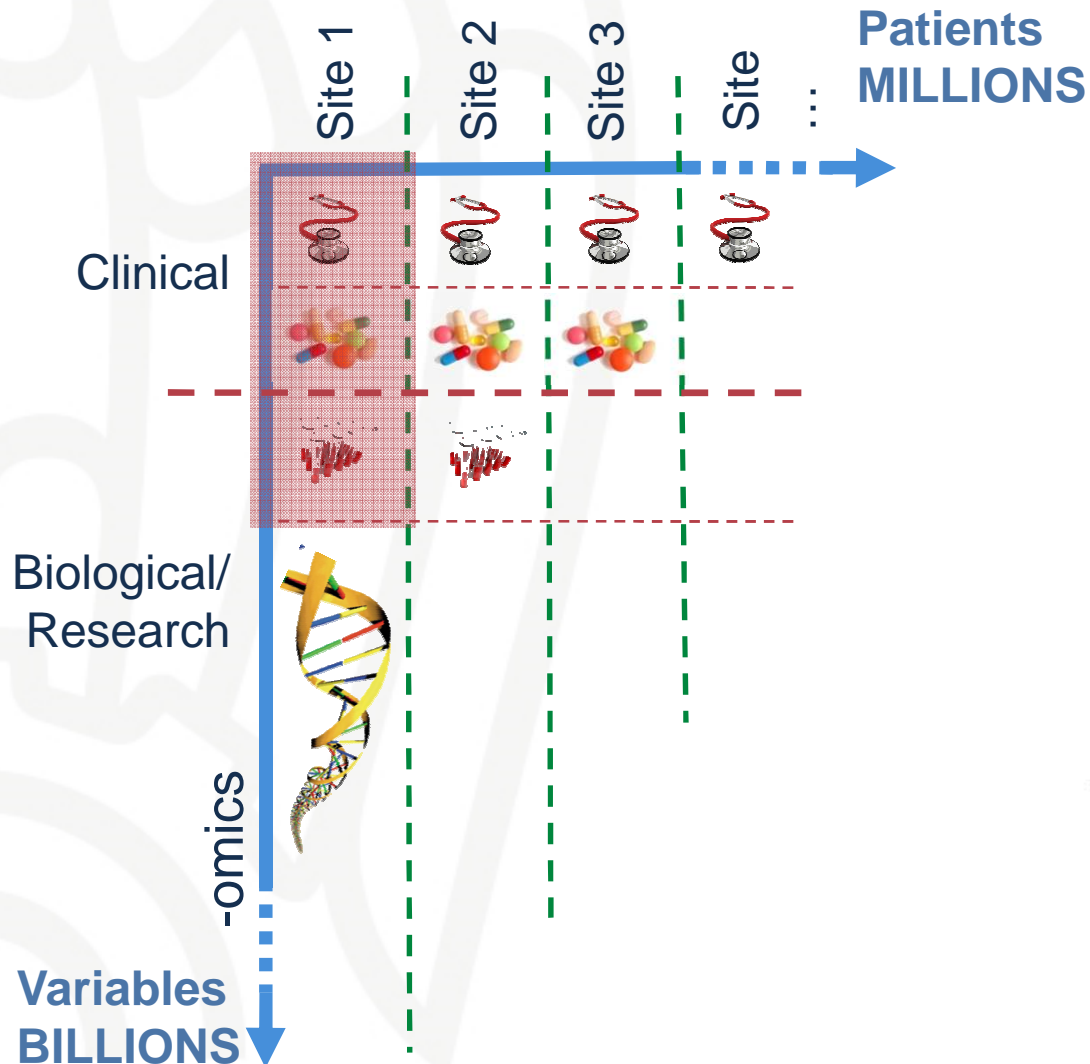
## Barriers

- Vertical : geo, buro, will
- Horiz: heterogeneity, tech

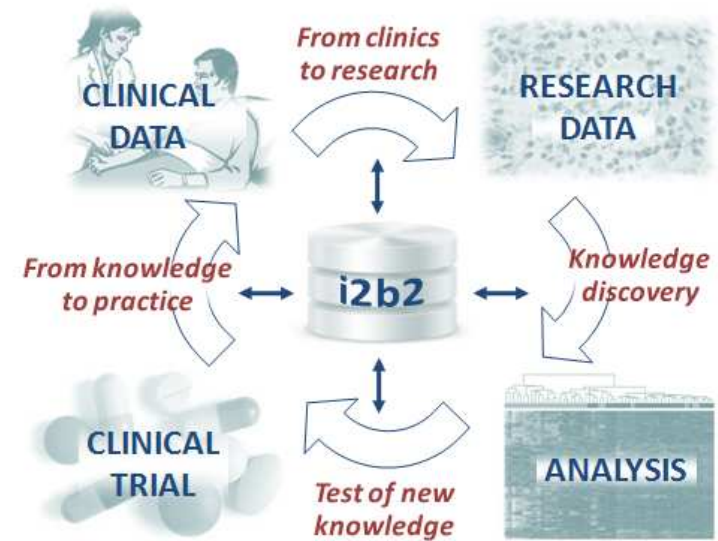




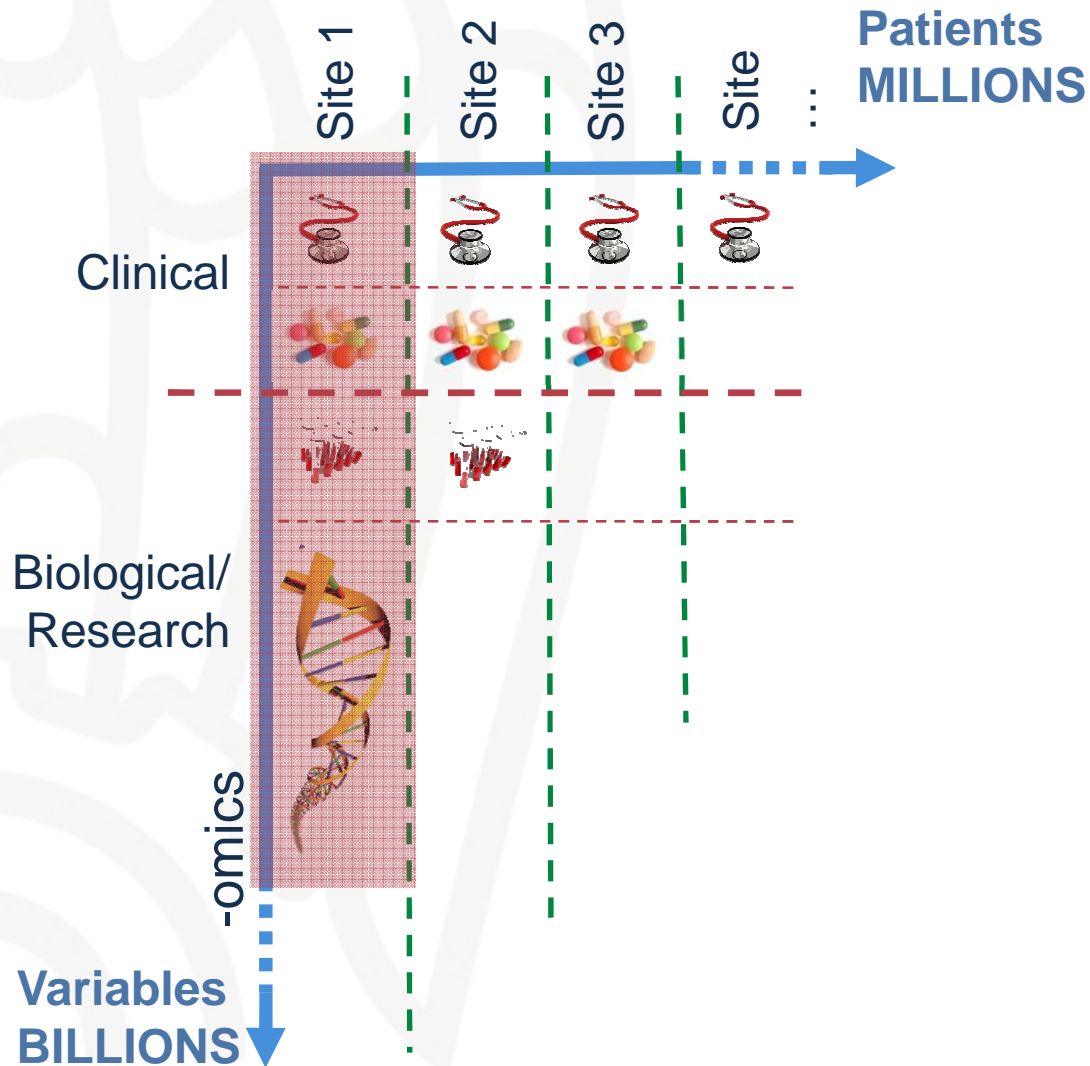
# Our Solutions



Informatics for Integrating  
Biology and the Bedside



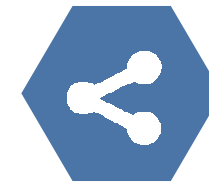
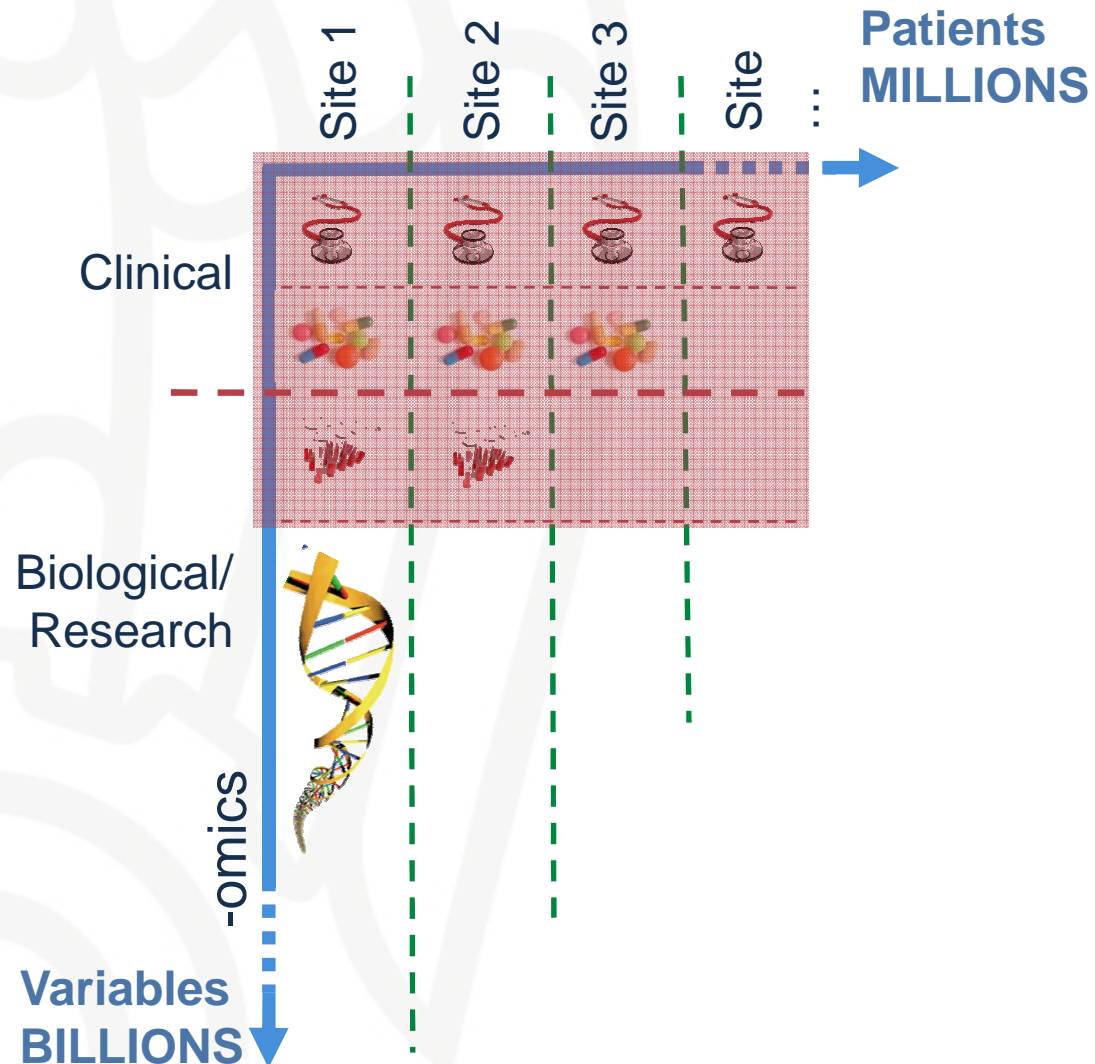
# Our Solutions



BigQ

i2b2 extension  
for Very Large  
Scale Database

# Our Solutions



Shrine

i2b2 extension :  
Shared Health Research  
Information NEtwork

# i2b2

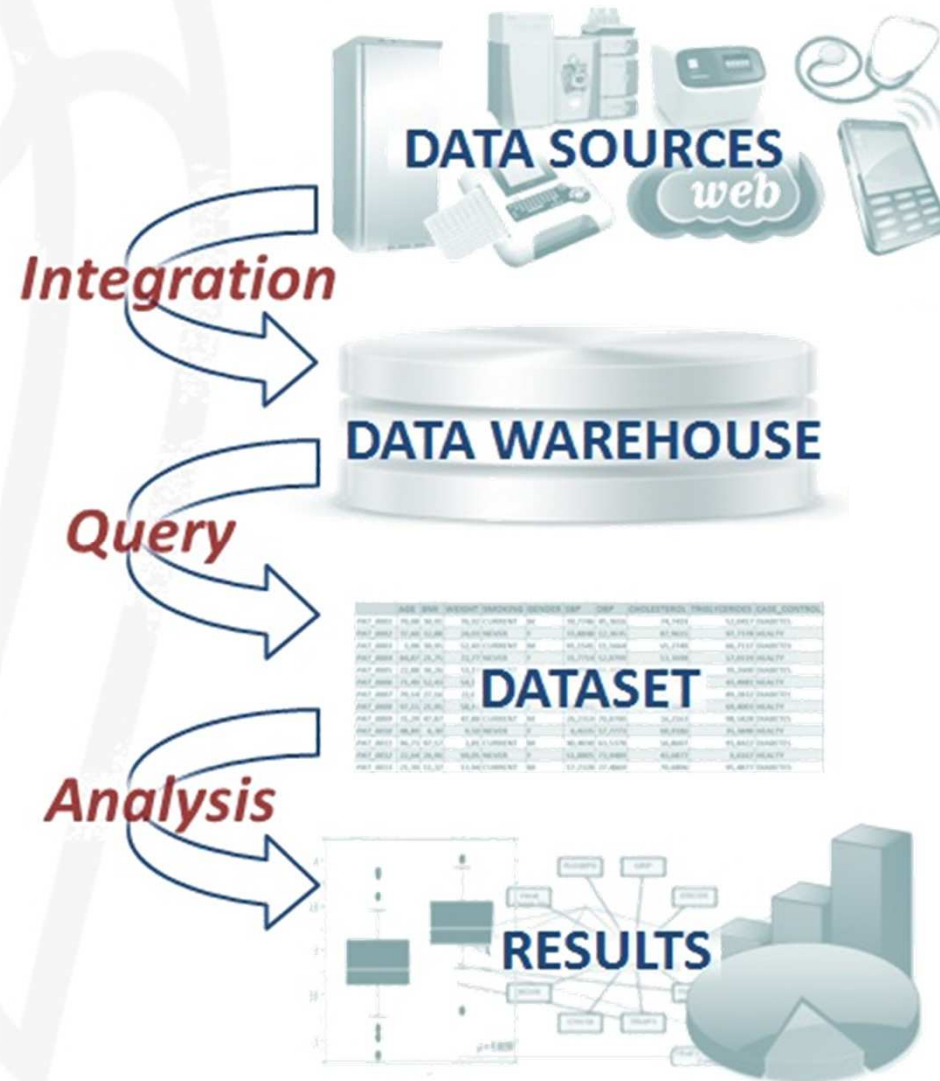
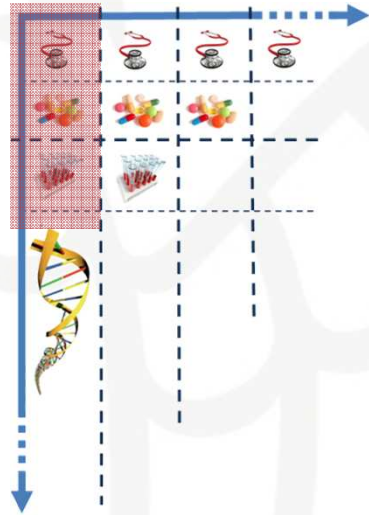
- Hundreds of i2b2 projects for **cohort management** and **population-based studies**



**More than 100 million patients**

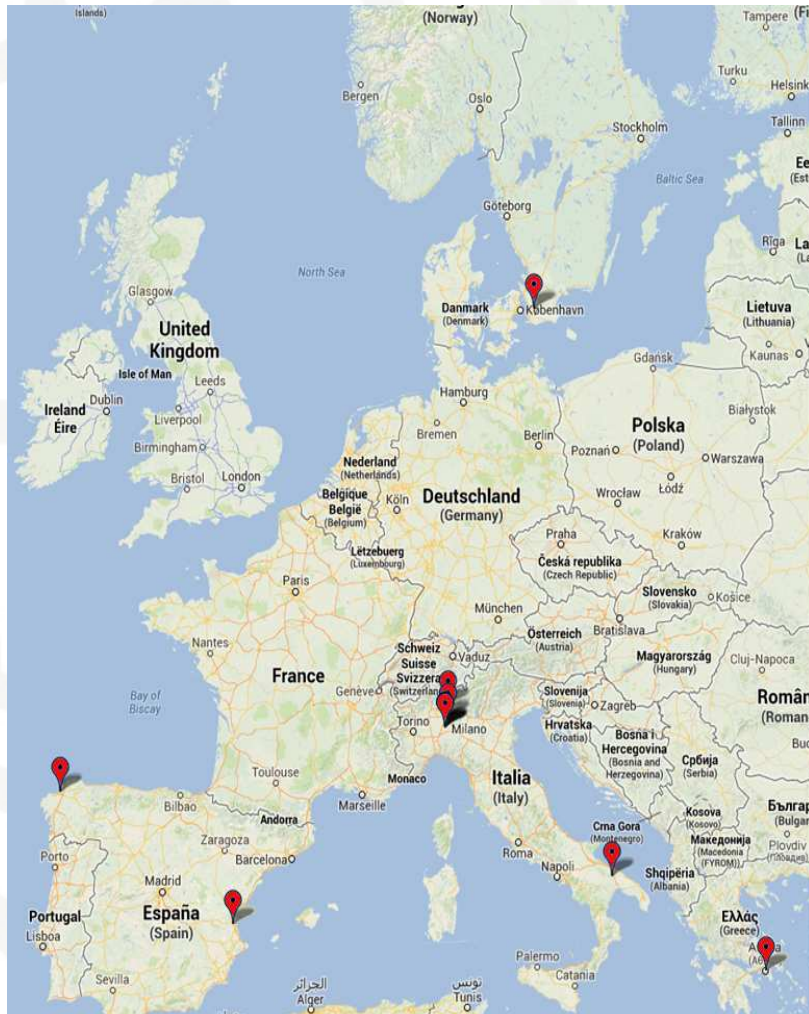
- CTSA (Centers for Translation Science Awards) or components thereof:
- Albert Einstein College of Medicine
- Boston University
- Case Western Reserve University (including Cleveland Clinic)
- University of Kentucky Research Foundation
- University of Massachusetts Medical School, Worcester
- University of Michigan
- University of Minnesota Twin Cities
- University of New Mexico Health Sciences Center
- University of Maryland Medical Center
- University of Missouri School of Medicine
- University of Tennessee Health Sciences Center
- University of Texas San Antonio
- University of California, Los Angeles
- University of California, San Diego
- University of California San Francisco
- University of Chicago
- University of Cincinnati (including Cincinnati Children's Hospital Medical Center)
- University of Colorado Denver (including Children's Hospital Colorado)
- University of Florida
- University of Kansas Medical Center
- Massachusetts Veterans Epidemiology Research and Information Center (MAVERICK), Boston
- Nemours Biomedical Research (DuPont Hospital for Children)
- Phoenix Children's Hospital
- RENCI
- Rush University Medical Center
- Thomas Jefferson University (including Kimmel Cancer Center)
- University of Connecticut Health Center
- University of Delaware
- University of Leicester and Hospitals, England (Biomed. Res. Informatics Ctr. for Clin. Sci)
- University of Leipzig, Germany
- University of Pavia, Pavia, Italy
- University of Seoul, Seoul, Korea
- Virgen del Rocio University Hospital, Spain
- Companies:
- Johnson and Johnson
- GE Healthcare Clinical Data Services

# i2b2





# Our i2b2 projects

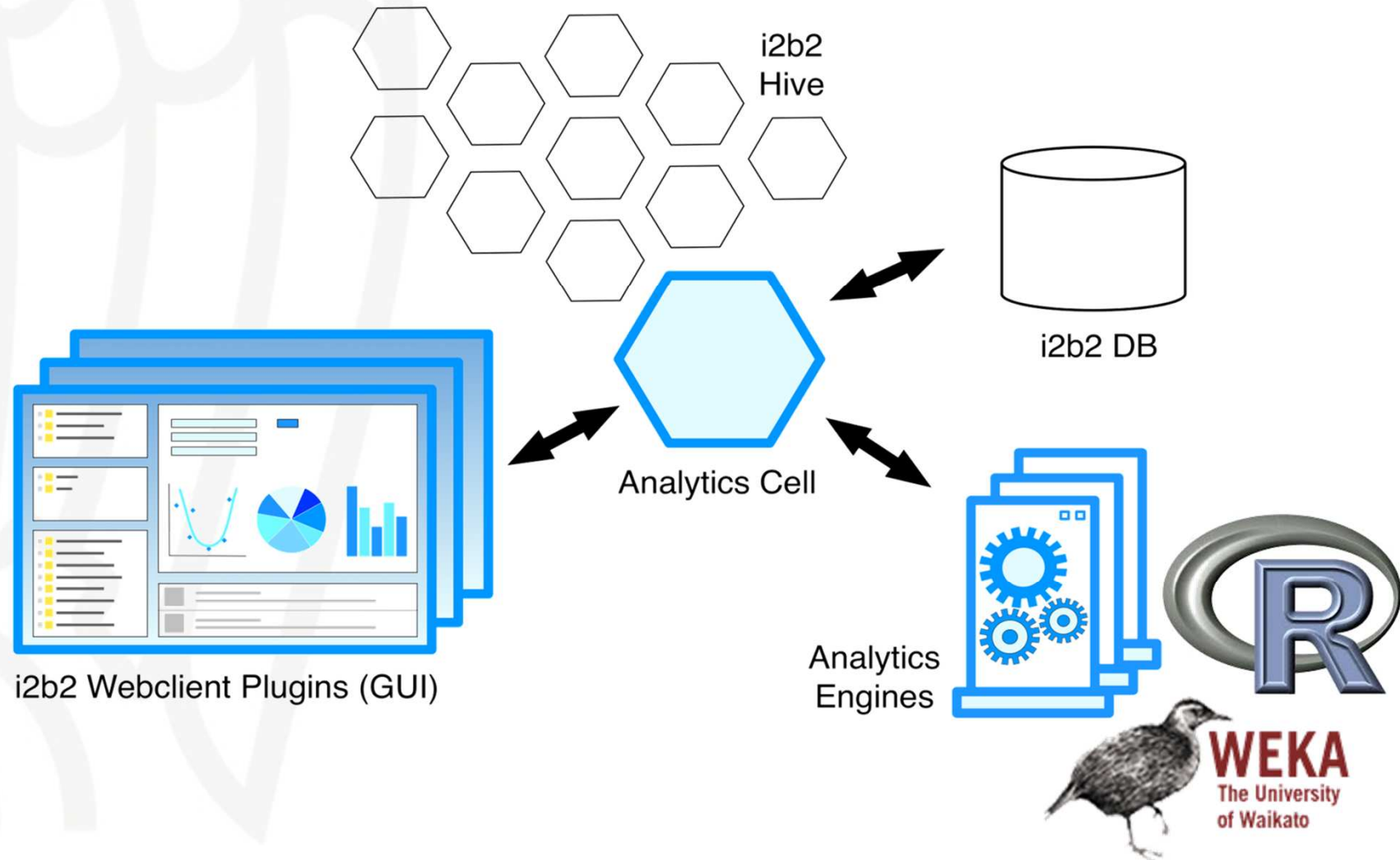


- **IRCCS Mondino (Pavia - IT)**
  - Headache
- **IRCCS San Matteo (Pavia - IT)**
  - HLA
  - Hematology
  - CTC
- **IRCCS Monzino (Milano - IT)**
  - Intensive Care Unit
- **FP7-INHERITANCE: La Coruña - ES**
  - Cardiomyopathies
- **IMI-SUMMIT (Lund - SE)**
  - Cardiovascular complications
- **FP7-MOSAIC (ASL, Maugeri Pavia - IT, Valencia -ES, Athens- GR)**
  - Diabetes
- **IRCCS Maugeri (Pavia - IT)**
  - Arrhythmias
  - Administrative data
  - Oncology
- **IRCCS Fondazione Policlinico (Milano – IT)**
  - Clinical data





# Analytics extension





# Biobank integration

Hospital  
Information  
System



Biobank  
Database



i2b2



**Genomic  
Analysis**



Medical  
Report



Pathology Unit  
Database

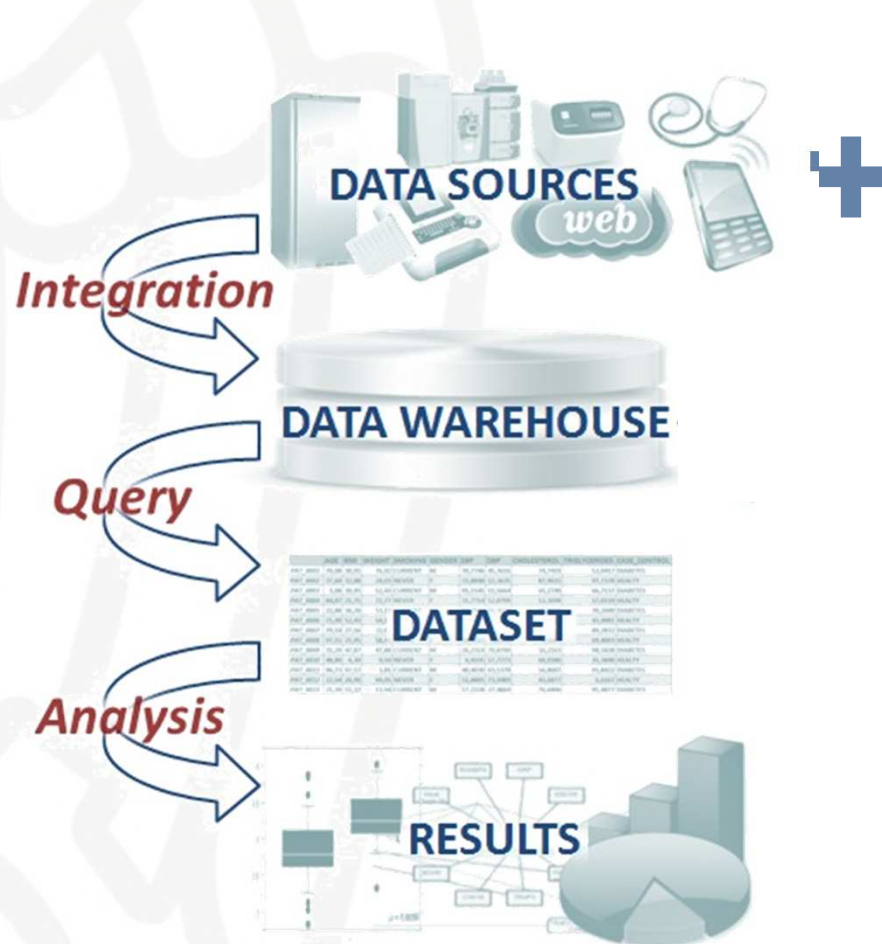


**NLP  
Engine**





# BigQ-NGS extension



- Next Generation Sequencing
- NoSQL database
- Fast query of variants (and associated data)
- 1 M variants => 1 sec



# Shrine extension

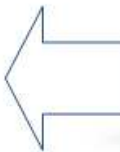
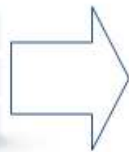
SITE 1



*Integration*



**i2b2**



SITE 2



*Integration*



**i2b2**

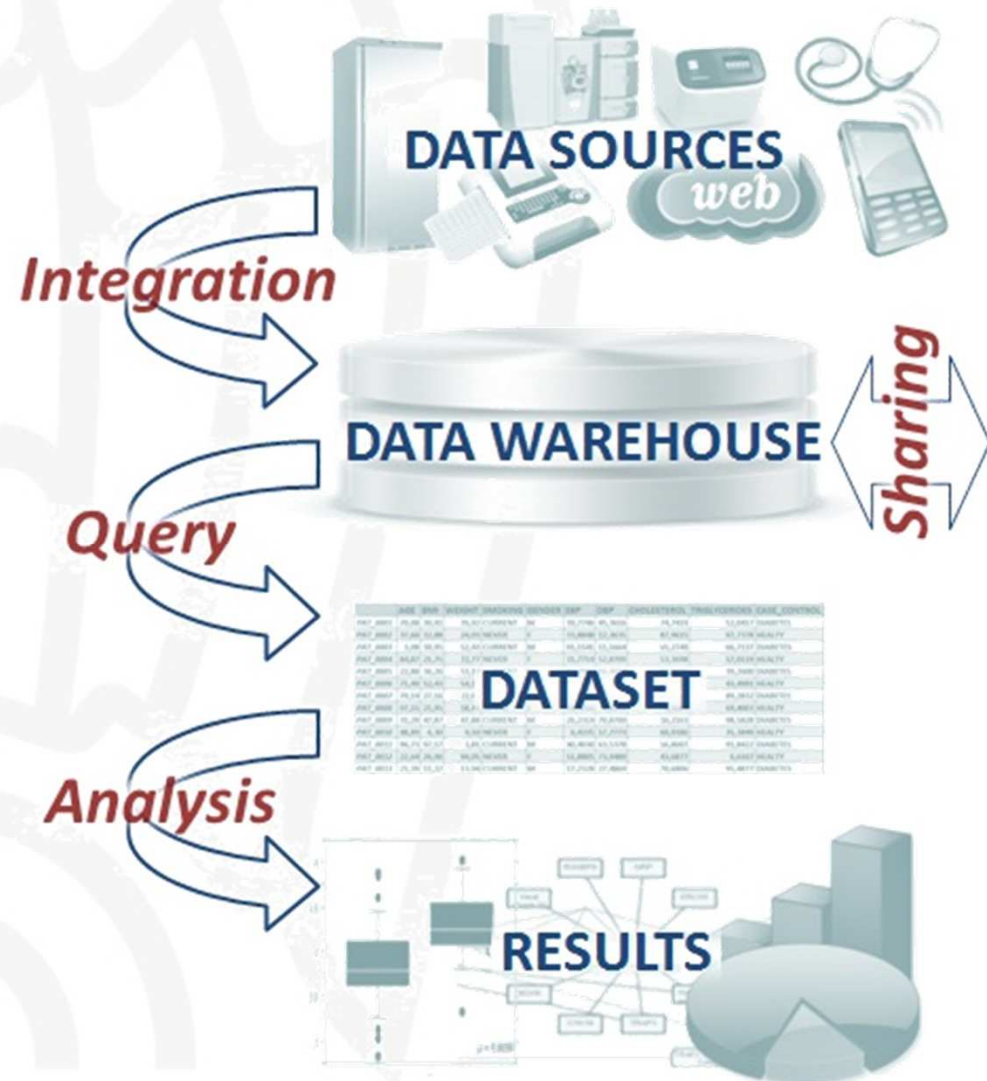
*Query*



PATIENTS									
1000000001	1000000002	1000000003	1000000004	1000000005	1000000006	1000000007	1000000008	1000000009	1000000010
1000000011	1000000012	1000000013	1000000014	1000000015	1000000016	1000000017	1000000018	1000000019	1000000020
1000000021	1000000022	1000000023	1000000024	1000000025	1000000026	1000000027	1000000028	1000000029	1000000030
1000000031	1000000032	1000000033	1000000034	1000000035	1000000036	1000000037	1000000038	1000000039	1000000040
1000000041	1000000042	1000000043	1000000044	1000000045	1000000046	1000000047	1000000048	1000000049	1000000050
1000000051	1000000052	1000000053	1000000054	1000000055	1000000056	1000000057	1000000058	1000000059	1000000060
1000000061	1000000062	1000000063	1000000064	1000000065	1000000066	1000000067	1000000068	1000000069	1000000070
1000000071	1000000072	1000000073	1000000074	1000000075	1000000076	1000000077	1000000078	1000000079	1000000080
1000000081	1000000082	1000000083	1000000084	1000000085	1000000086	1000000087	1000000088	1000000089	1000000090
1000000091	1000000092	1000000093	1000000094	1000000095	1000000096	1000000097	1000000098	1000000099	1000000100

1. Collaborative research networks
2. Pharma for Clinical Trials (patient recruitment)

# Partnership



- **Software** per gestione di dati clinici
- Strumentazione per **biobanche**
- Aziende farmaceutiche/ strumentazione per reclutamento dei pazienti per **clinical trial**

# THANK YOU !!!

For more information:

**Ing. Nicola Barbarini, PhD**  
*Co-Founder - COO*  
***nicola.barbarini@biomeris.com***

***www.biomeris.com***

***info@biomeris.com***