Bioinformatics-Guided Biomarker Discovery Program

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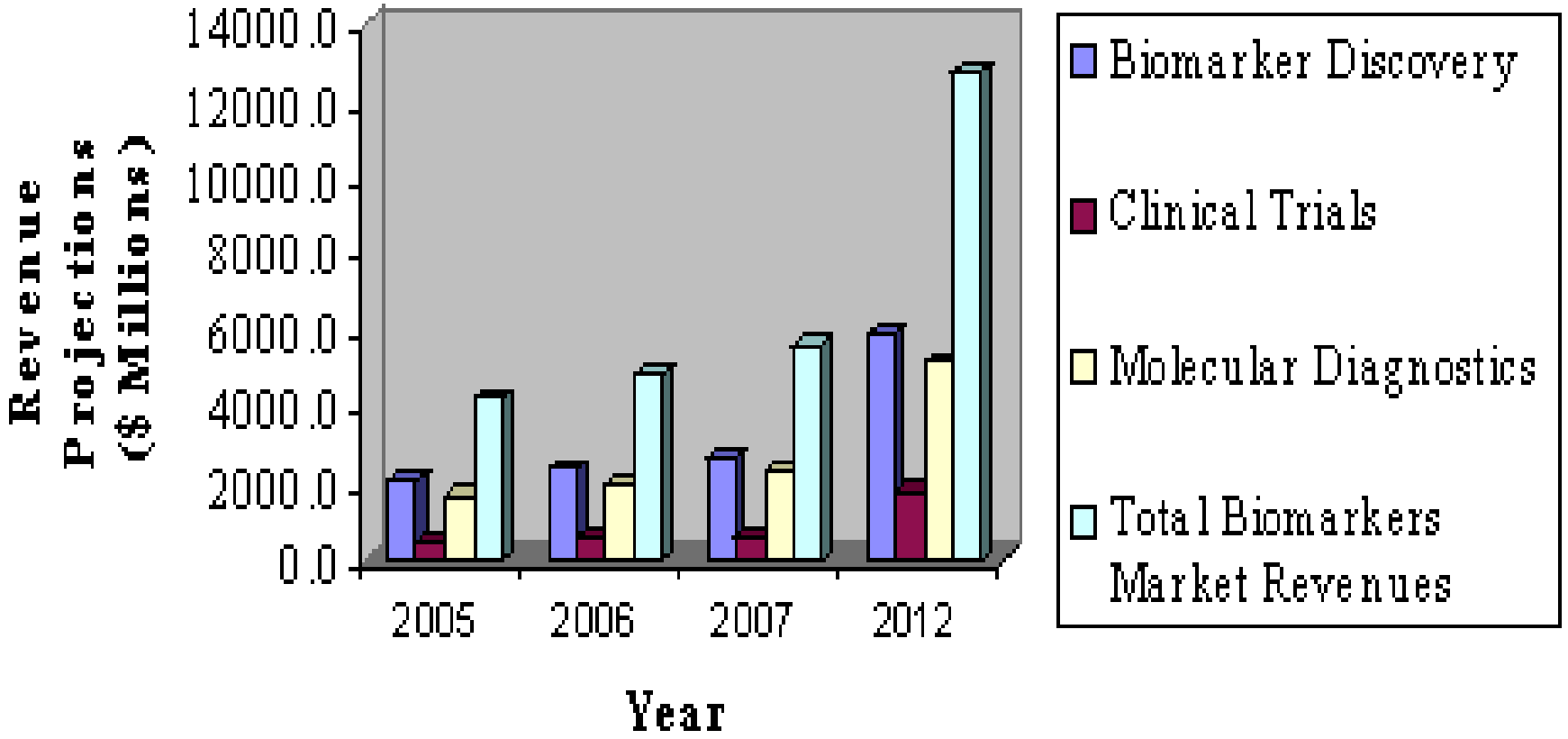
March 18, 2008

* We did not receive anything with monetary values from BioFortis and BioMax

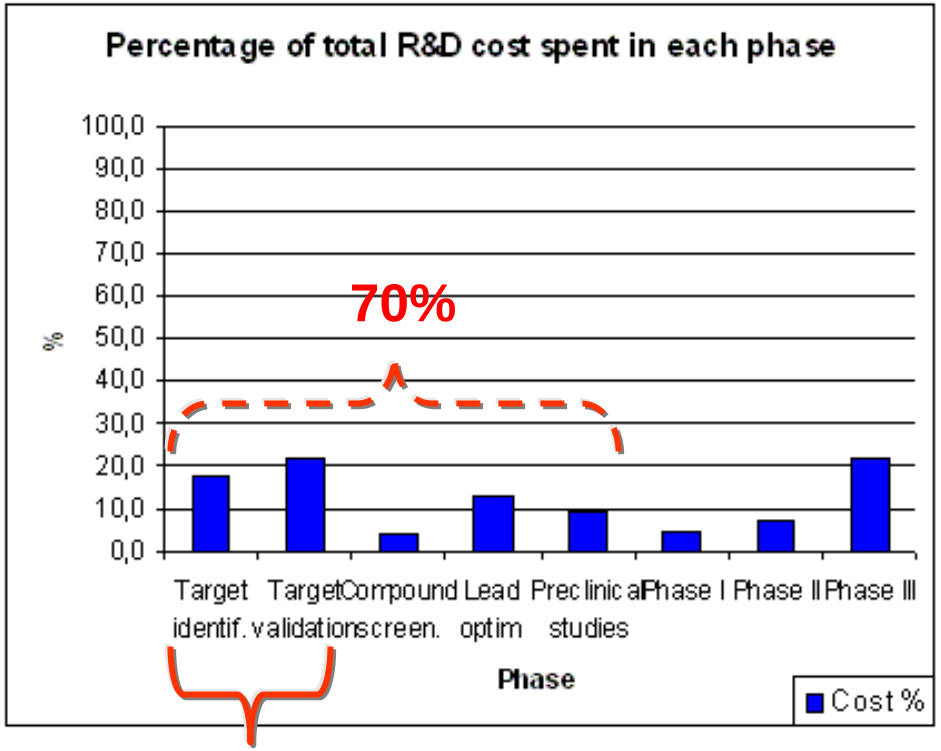
Demands for basic, translational and clinical sciences relevant to biomarker market will dramatically increase in future



Source: BCC Research, 2007

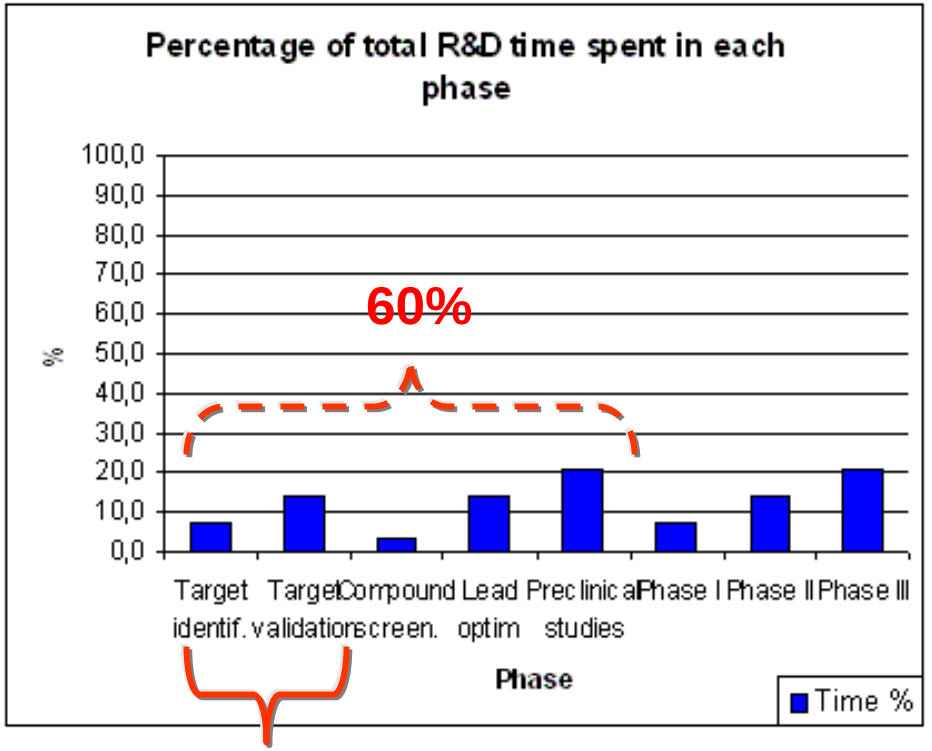
Biomarker discovery (target identification and validation) is associated with high cost and time

Cost



40%

Time

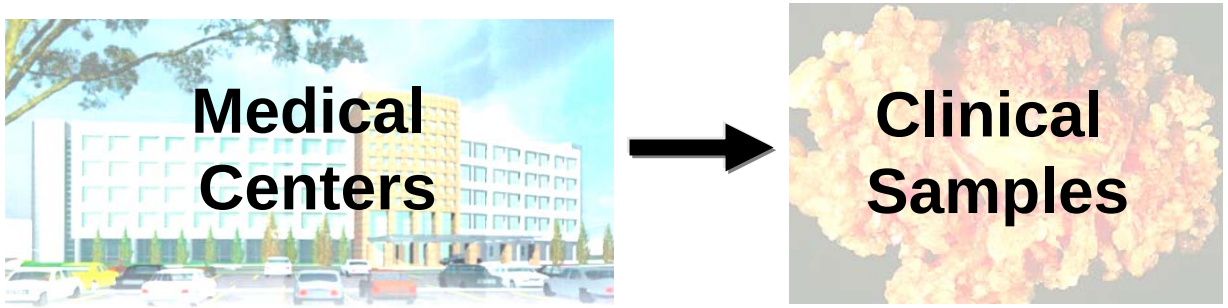


20%

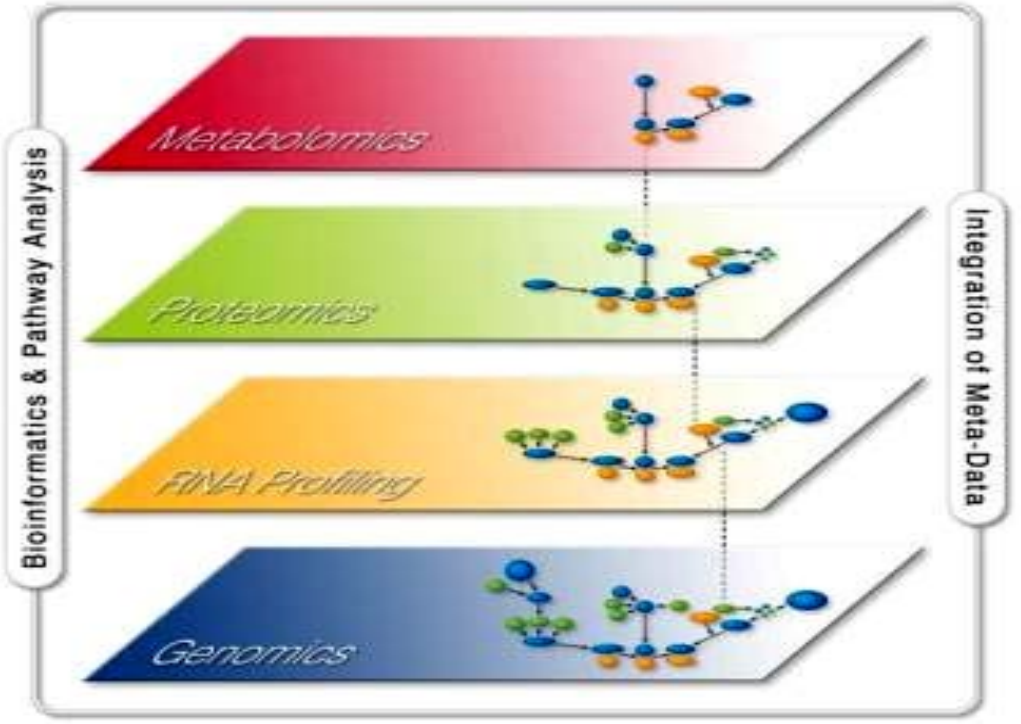
Source: Life Science Insights, Ernst & Young, Tufts CSDD and Boston Consulting Group, July 2004.

Two phases of biomarker discovery involve procurement of clinical samples and –omics research

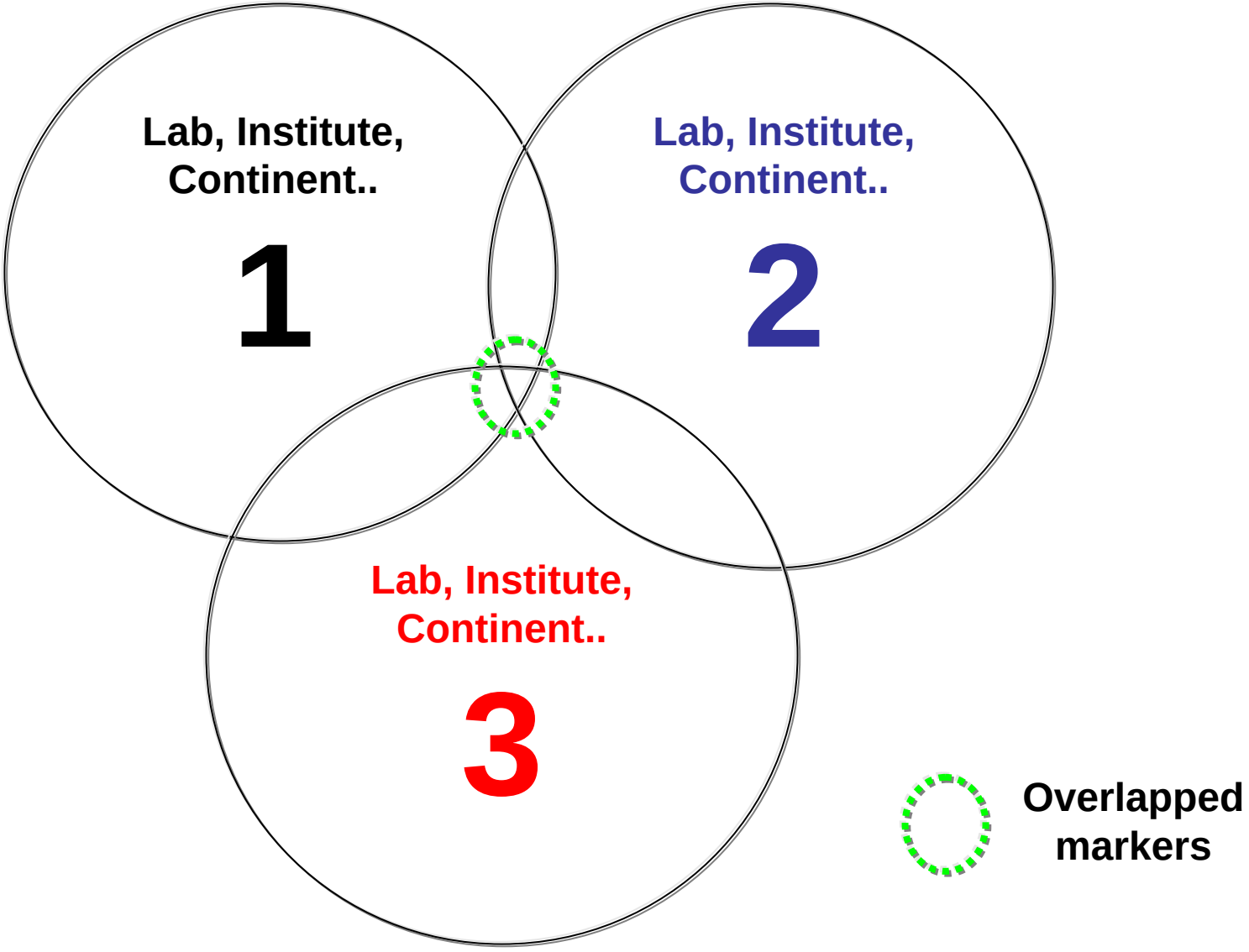
(1) "Procurement"



(2) "-omics Research"



A small number of tumor biomarkers overlap between laboratories, institutes and continents



Multiple departments are involved in the Tumor Bank tissue procurement workflow

DEPARTMENTS

A. **Outpatient clinic**
B. **Outpatient laboratory**
C. **Couriers**
D. **Surgical procedure room**
E. **Department of pathology**
F. **Information technology**
G. **Tissue repository and Research**

PEOPLE

- Research, Education and Charge Nurses
- Schedule, Research and Data Coordinators
- Receptionist and Assistants ..etc

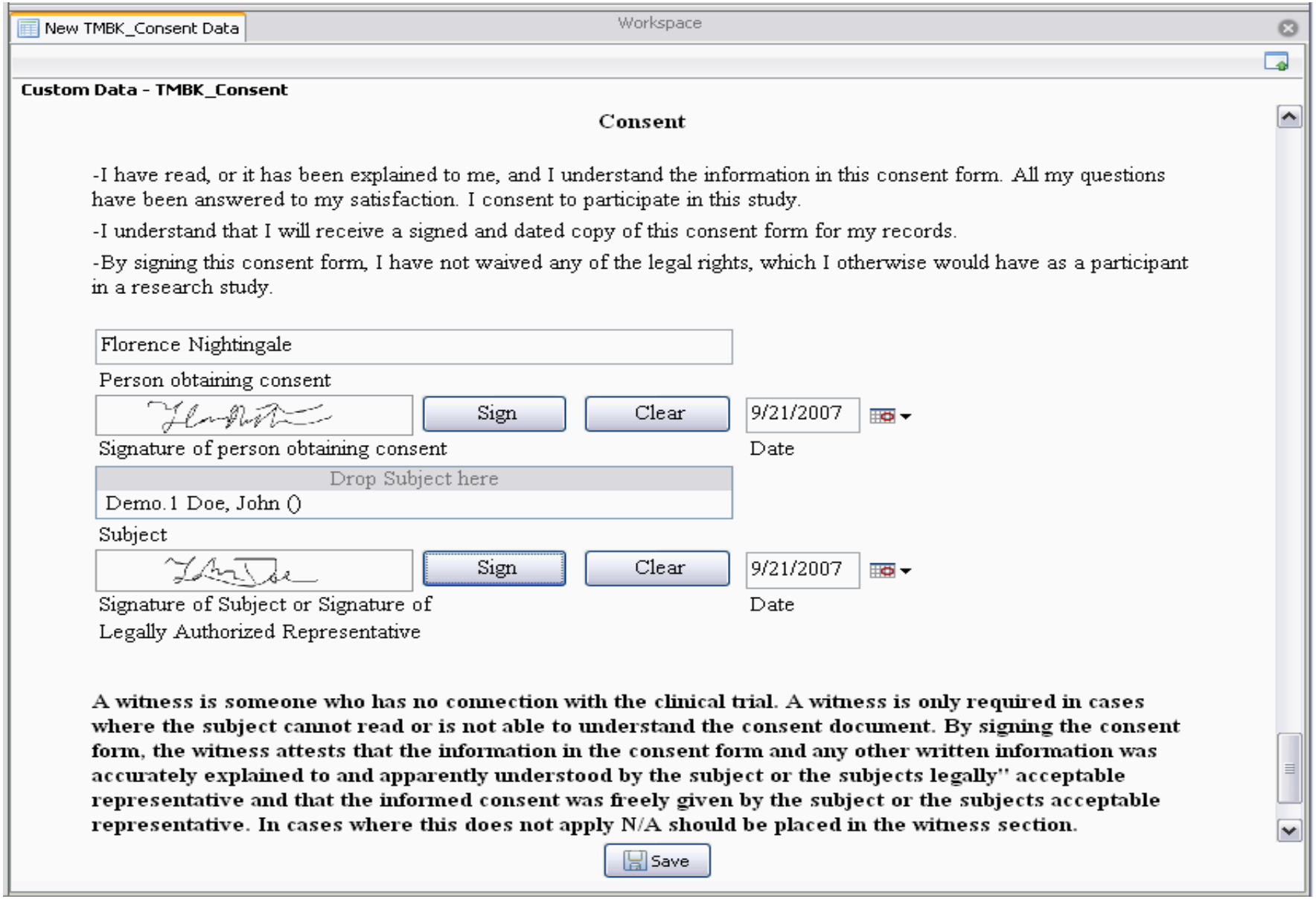
PROBLEMS

1. **Sample loss (-$300 to -$500) due to lack of communication & information**
2. **Structural integrity and quality of biomaterials compromised due to lack of coordination**
3. **Disruption of routine workflows in Operating Rooms, Special Procedures and Pathology due to unexpected arrival of patients or samples without consent forms**
4. **IT- and Tele-communication not frequently accessible due to high patient volume and short staff**

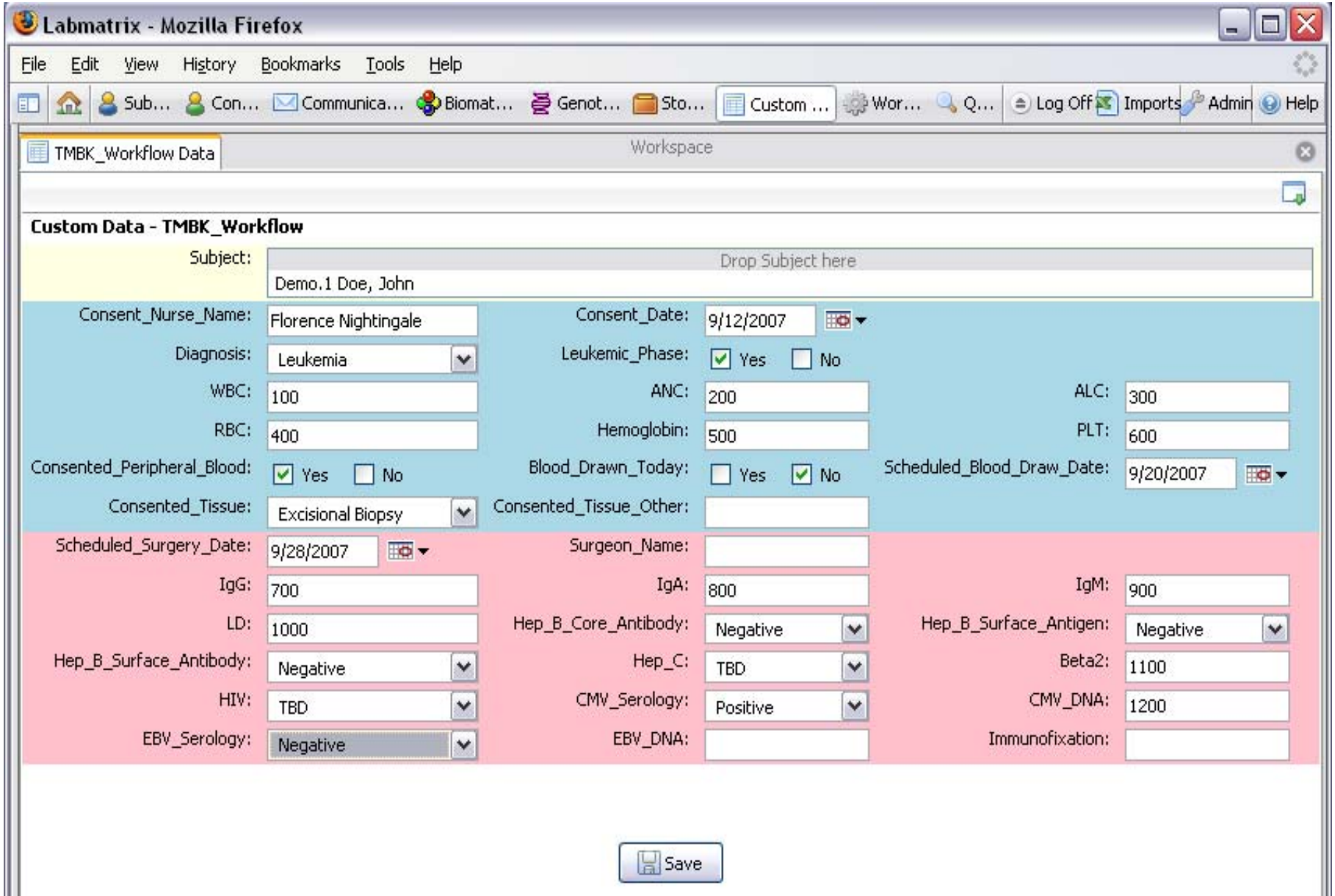
Solution

Translational bioinformatics is used to help the workflow associated with procurement of clinical samples

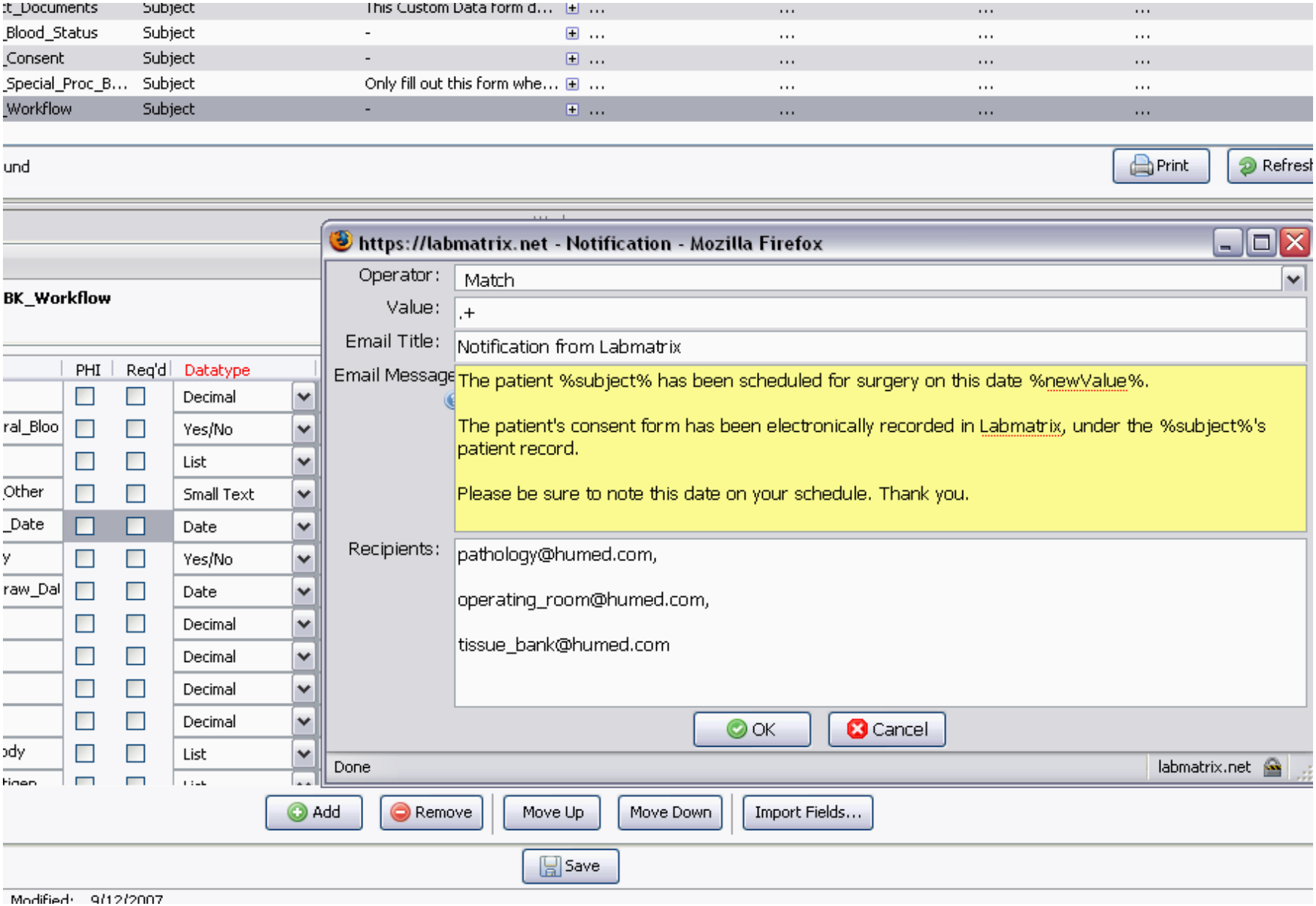
A combination of patient education and consent procedures are accomplished in digitized formats



Research nurses and coordinators initiate bioinformatics-guided tissue procurement process (*Lymphoma Division)

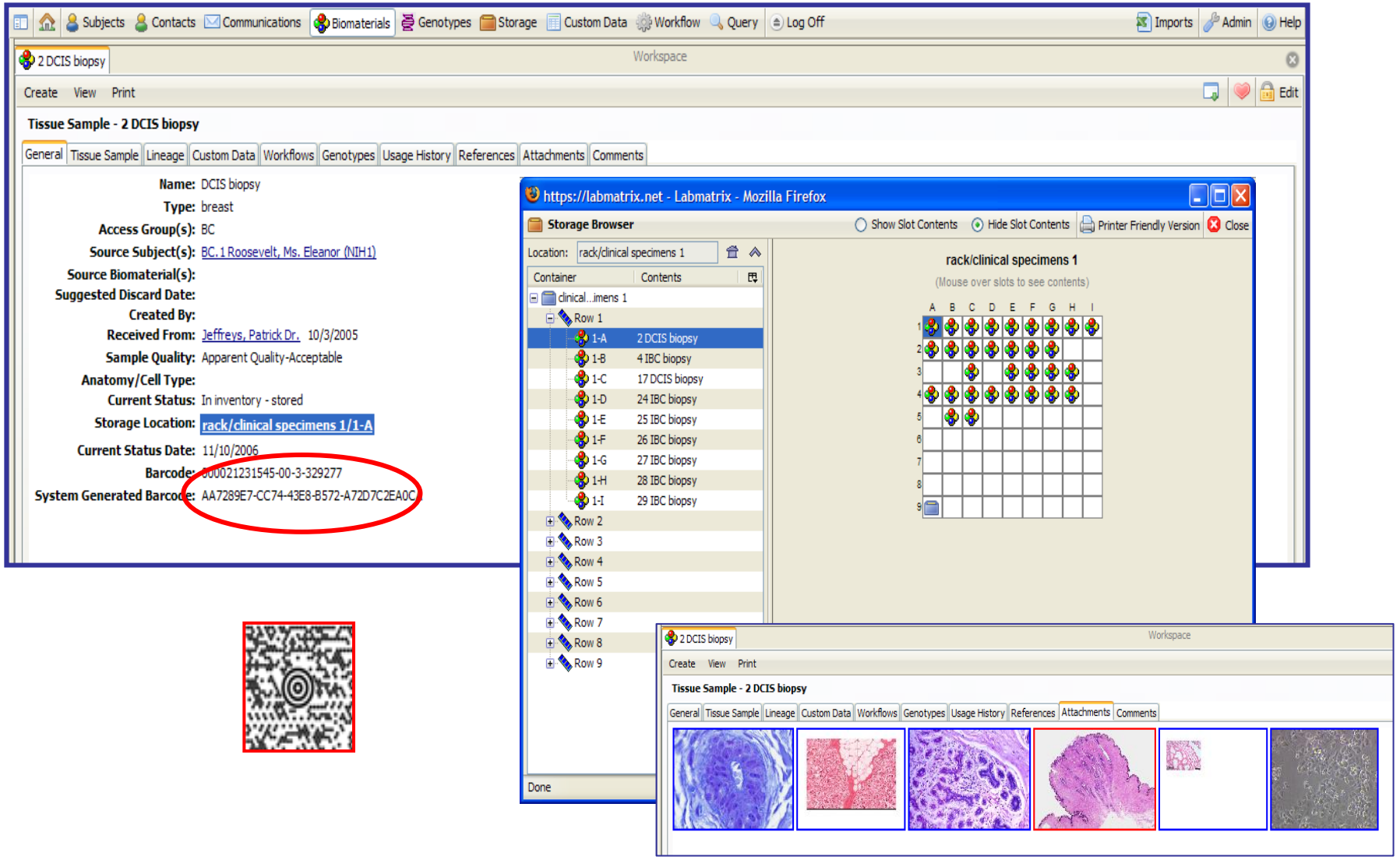


Automated emails and paging procedures alert members of the tissue procurement “TEAM” in real-time



All digitized data associated with clinical samples are stored and documented

(Biospecimen management and tracking)



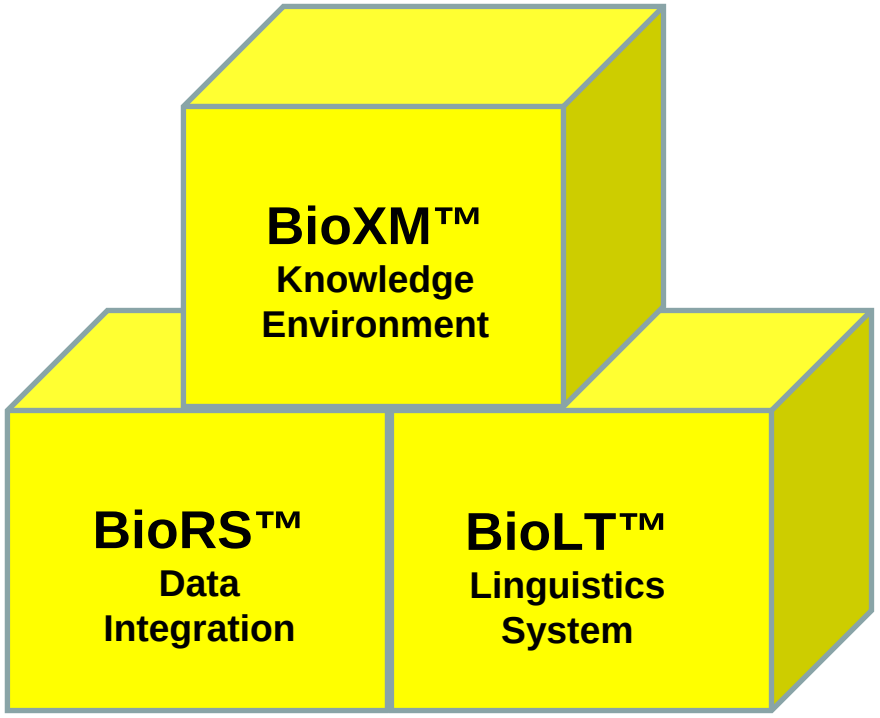
Summary

- **Translational Bioinformatics to guide the procurement process for clinical samples**

1) **Real time and Web-based information management system**

2) **Integrating clinical and molecular data for:**
    a) Translational Clinical Research
    b) Collaborative Research Studies
    c) Biospecimen Management
    d) Biomarker Discovery
    e) Personalized Medicine

Knowledge Management Environment



Internal & External Data Sources

- 70+ Public Databases i.e.. - PDQ, HUGO, GenBank, EMBL, Omim, MEDLINE, RefSeq, Taxonomy, UniGene, Swissprot, etc.
- Other Analysis sub-systems – commercial & in-house developed systems and databases.

3rd Tier – Knowledge

Configured to assemble your information objects, find, show, document relationships, mange projects, collaborate.

2nd Tier – Information

Middle layer configured to access curated information provided by commercial and internal analysis tools.

1st Tier – Data

Launch complex queries across internal and external databases and text sources.

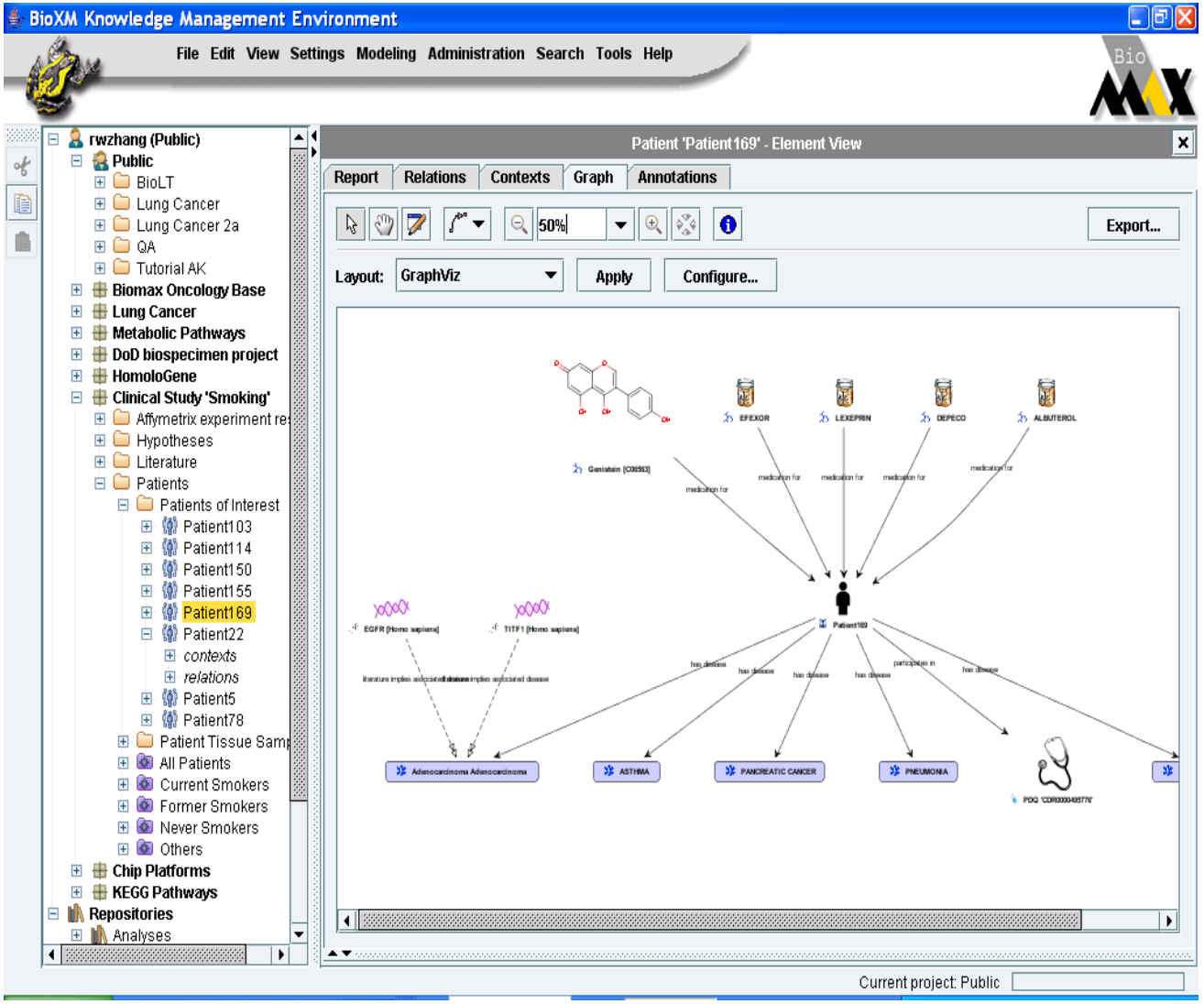
Scientists and clinicians must create a knowledge management system to control explosions of data and information

(1) Compilation of databases from both public and private sectors in one knowledge management system will be the most powerful tool for scientists and clinicians in the future.

- **(i) DNA, Protein, Metabolite, Mutations, Toxicology, Compounds, References, Clinical Trials, Patents ..etc**
- **(ii) –omics Experimental databases (e.g. microarray)**
- **(iii) Institutional databases (e.g. Tumor Registry- patient outcome)**
- **(iv) Laboratory database (e.g. LabMatrix)**

(2) Thus, institutions that construct informatics infrastructure that is based on knowledge-management in the form of a neural network will become future leaders in health care.

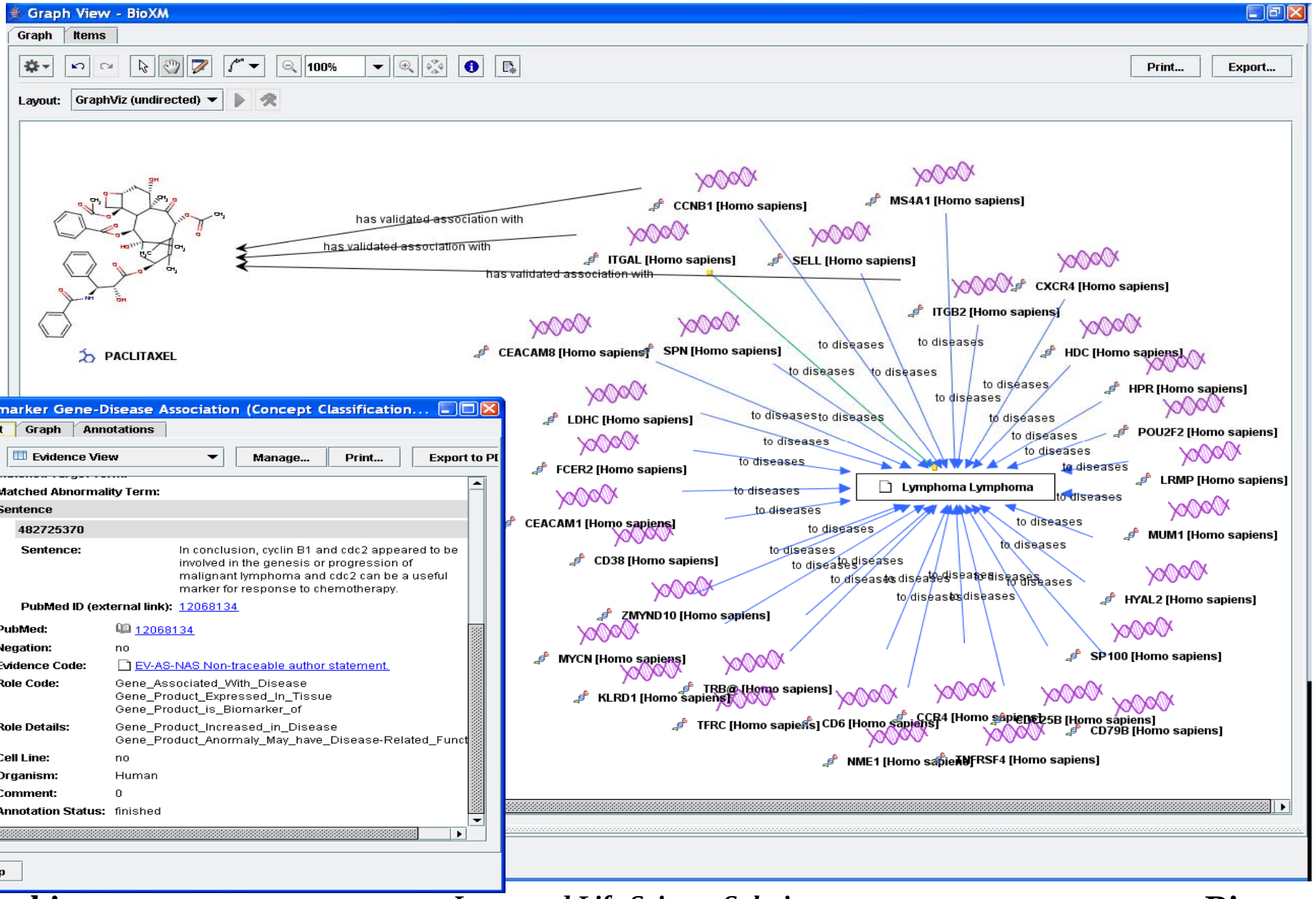
Visualize Knowledge



- Integrates information from various sources to find and show complex relationships.
- Supports iterative process of developing a hypothesis, integrating elements, viewing results, understanding how and why parts fit together and documenting findings.
- Capture, preserve, share and institutionalize information to build knowledge across organizations.
- Software developed for non-technical researchers and MDs. No technical skills required.
- Flexible, configurarable to support new research as biomedical science evolves.
- Scalable across organizations to support collaboration.

BioXM™ Knowledge Management System is a Biomax Informatics AG Product

30 lymphoma biomarker-genes



1. Spheroid- 3D cell culture technology

- Construction of tumor spheroids by mixing with primary normal human fibroblasts to mimic human tumors *in vitro* (e.g. library of tumor cell lines)
- High throughput *in vitro* preclinical testing of drugs currently used in clinics (e.g. HUMC)
- Generation of xenografts by embedding spheroids for *in vivo* model

2. Impedance technology

- Signature database for cell culture (e.g. MCL, Ovarian, Prostate and etc.), clinical samples (serum, bodily fluids and tissue lysates)

3. Paramagnetic particle technology

- Rapid Magneto-Immunoassay for PSA/ prostate cancer project

All data will be integrated to knowledge management system