

WU ADRC DATA INTEGRATION AND SHARING: PLAN & PROGRESS

<http://nagarajanlab.wustl.edu>

Nagarajan LAB

Washington University in St. Louis SCHOOL OF MEDICINE

Research Publications Projects People Employment/Training Opportunities

Welcome to Nagarajan Lab

Mission

The goal of biomedical research is to uncover perturbations in important pathways that lead to disease states so that therapeutic treatments may be designed. It is clear that most diseases are caused by a set of alterations at one or more levels of the genetic program.

Only through simultaneous monitoring of DNA, RNA, and protein can the comprehensive understanding of underlying processes occurring in multi-factorial diseases may be made. While there is a great need to integrate data derived from functional genomic experiments (e.g. expression, mutation, CGH, and proteomics profiling) with that ascertained clinically from the evaluation and treatment of patients, there are no software, analytical, or visualization applications which can perform this task.

Thus, the primary, long term goals of the Nagarajan lab are to conduct clinical and biomedical informatics research, to develop software applications which will simultaneously co-analyze and co-visualize a wide variety of functional genomics datasets, gene annotation, and clinicopathological data, and to utilize these heuristic algorithms in order to identify potential diagnostic markers and putative therapeutic targets.

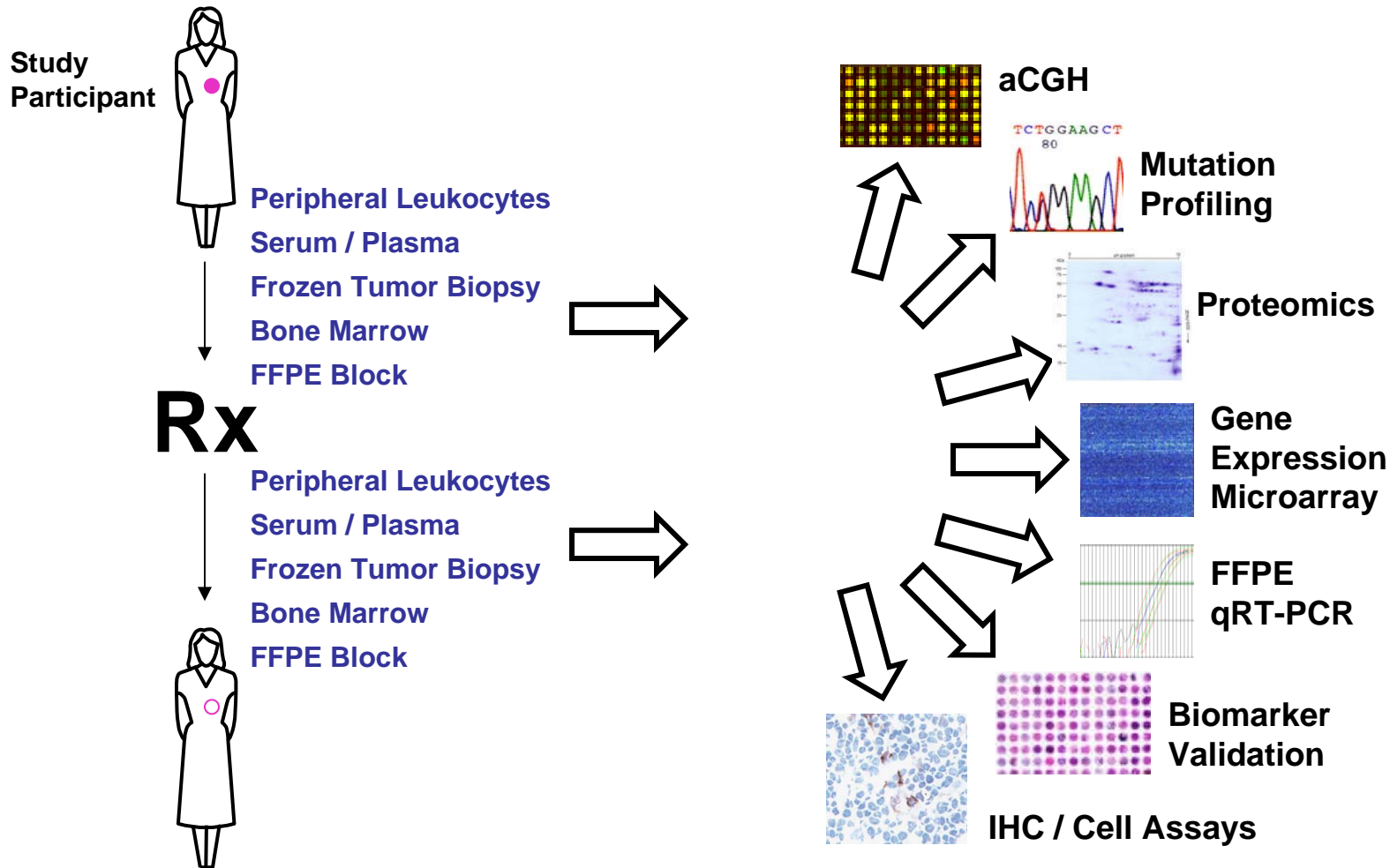
These software based multiparametric medical diagnostic tests will be used for molecular "fingerprinting" of tumors and polyfactorial diseases and will ultimately lead to rational drug design to combat such illnesses.

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*Dr. Nagarajan is on the Scientific Advisory Board of Persistent Systems. Persistent Systems does not fund Dr. Nagarajan's research.

Translational Research Paradigm

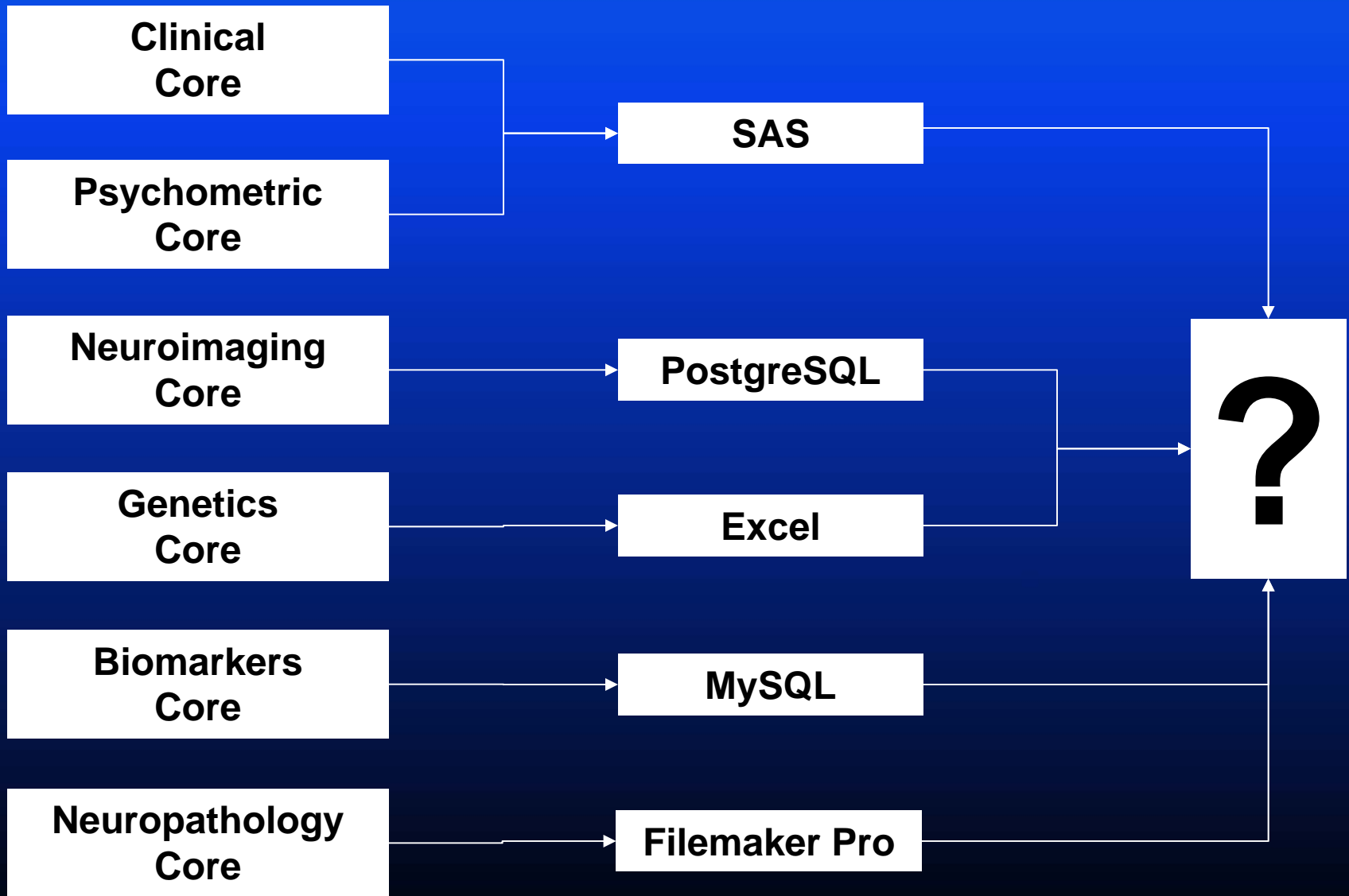


WU Alzheimer's Disease Research Center Cores

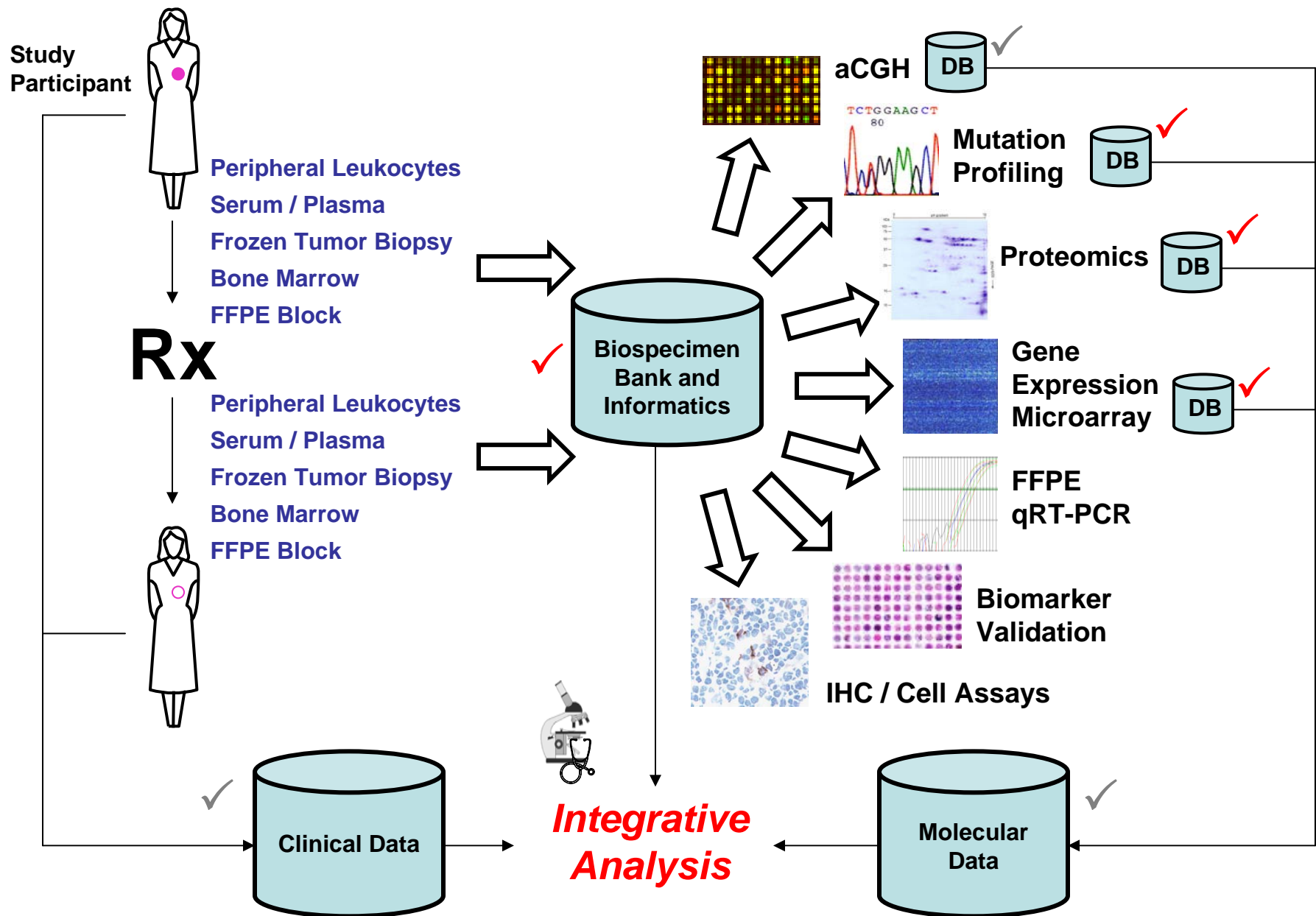
- **Clinical Core**
 - Patient demographic information, family history, health history, depression inventories, physical examination, standard cognitive tests , and CDR
- **Biomarkers Core**
 - Fasting plasma and cerebrospinal fluid- Levels of total protein, hemoglobin A1C, homocysteine, folate, A β , tau, apoE, and other biomarkers
- **Genetics Core**
 - Non-fasting blood, plasma, serum, buffy coat, and DNA during the initial visit and every 3 years thereafter for genotyping APOE and other genetic risk factors
- **Neuropathology Core**
 - Post-mortem frozen and fixed brain tissue- Quantitation of senile plaques, neurofibrillary tangles, neuron counts, amyloid angiopathy, Lewy bodies, and vascular pathology
- **Psychometric Core**
 - Primary, working, episodic, and semantic memory, abstract reasoning, visuospatial/visuoconstructive dysfunction, psychomotor deficits
- **Neuroimaging Core**
 - MRI (3D T1- and T2-weighted scans, diffusion-weighted scans, echo-planar imaging scans); Amyloid PET scan data and derived images

Core	Participants	Encounters	Biospecimens
Clinical	3,489	11,486	N/A
Psychometric	3,036	9,554	N/A
Neuroimaging	716	1,346	N/A
Neuropathology	1,255	1,255	~62,000
Genetics	3,669	5,467	~170,000
Biomarkers	465	497	~25,000

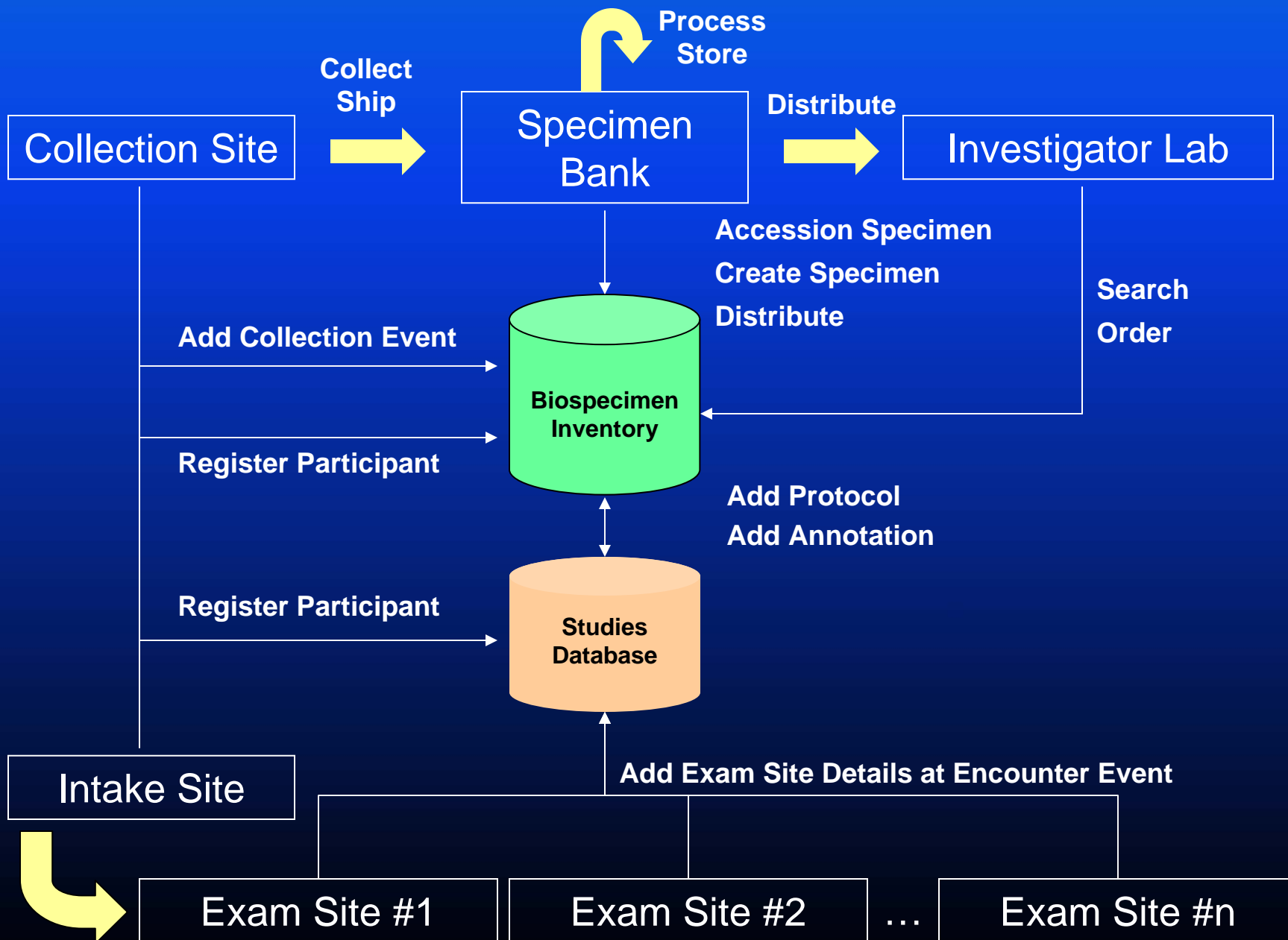
WU ADRC Data Integration Problem



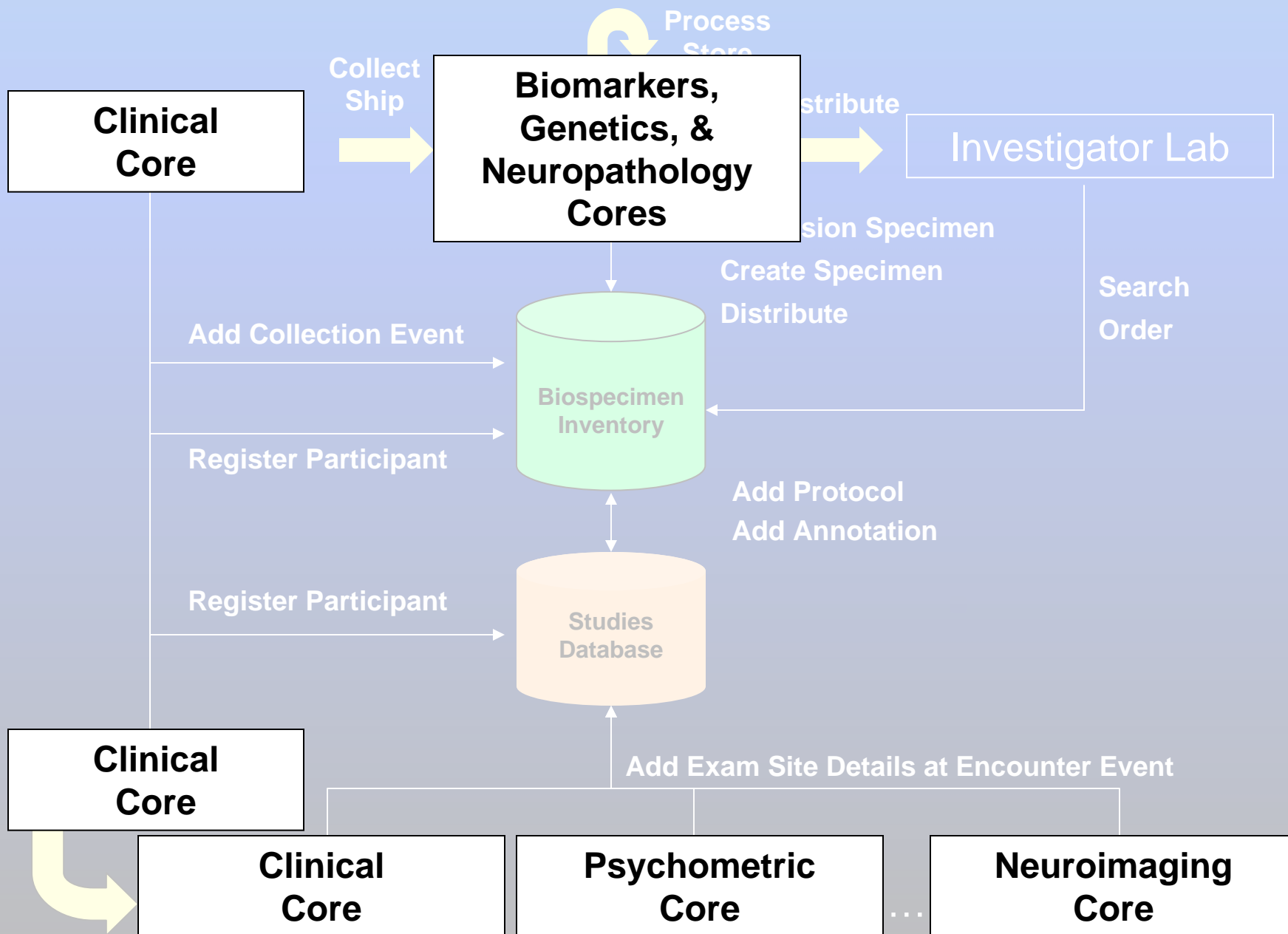
Translational Research Paradigm



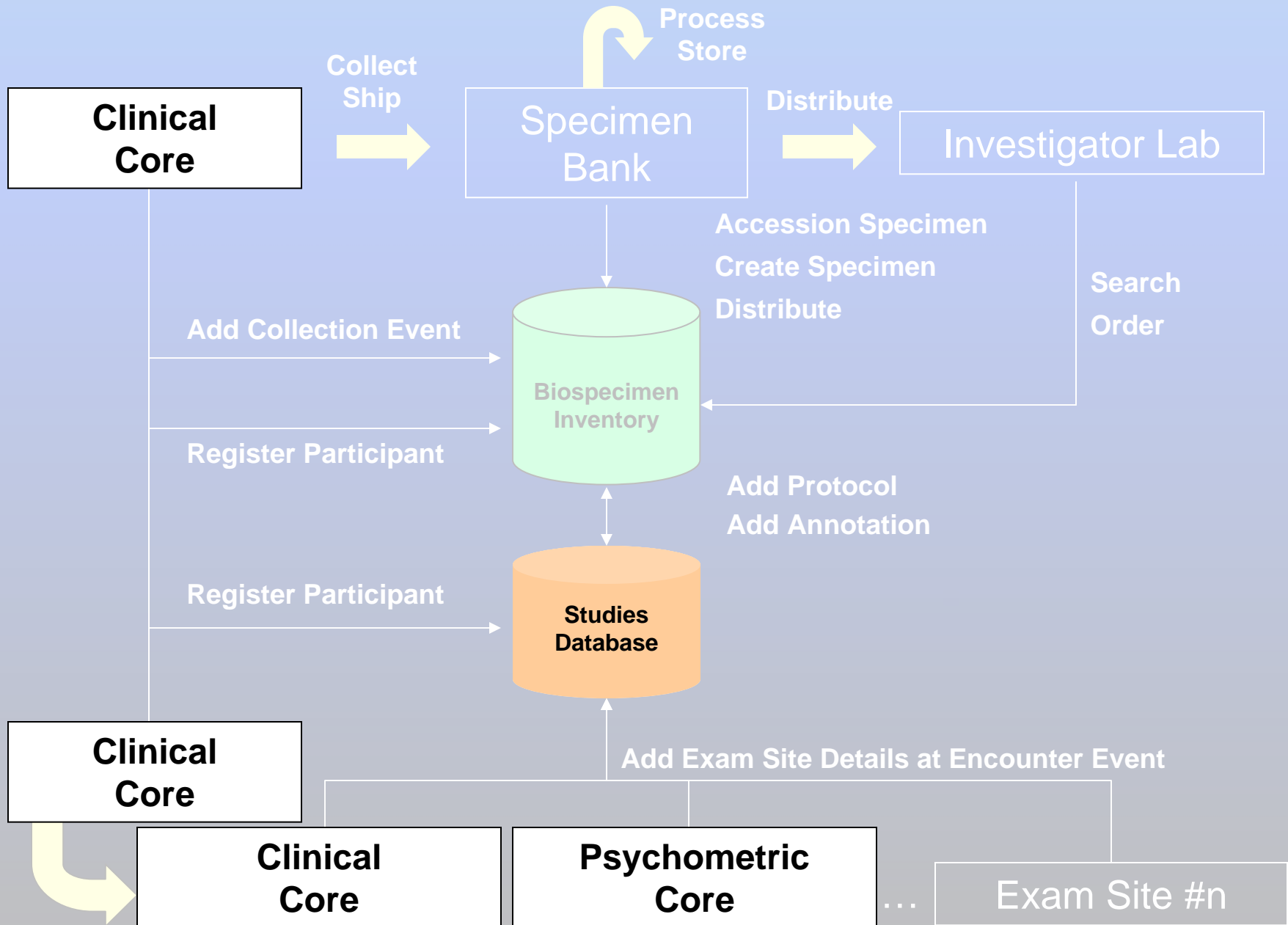
Workflow of a Translational Research Study



Workflow of the WU ADRC



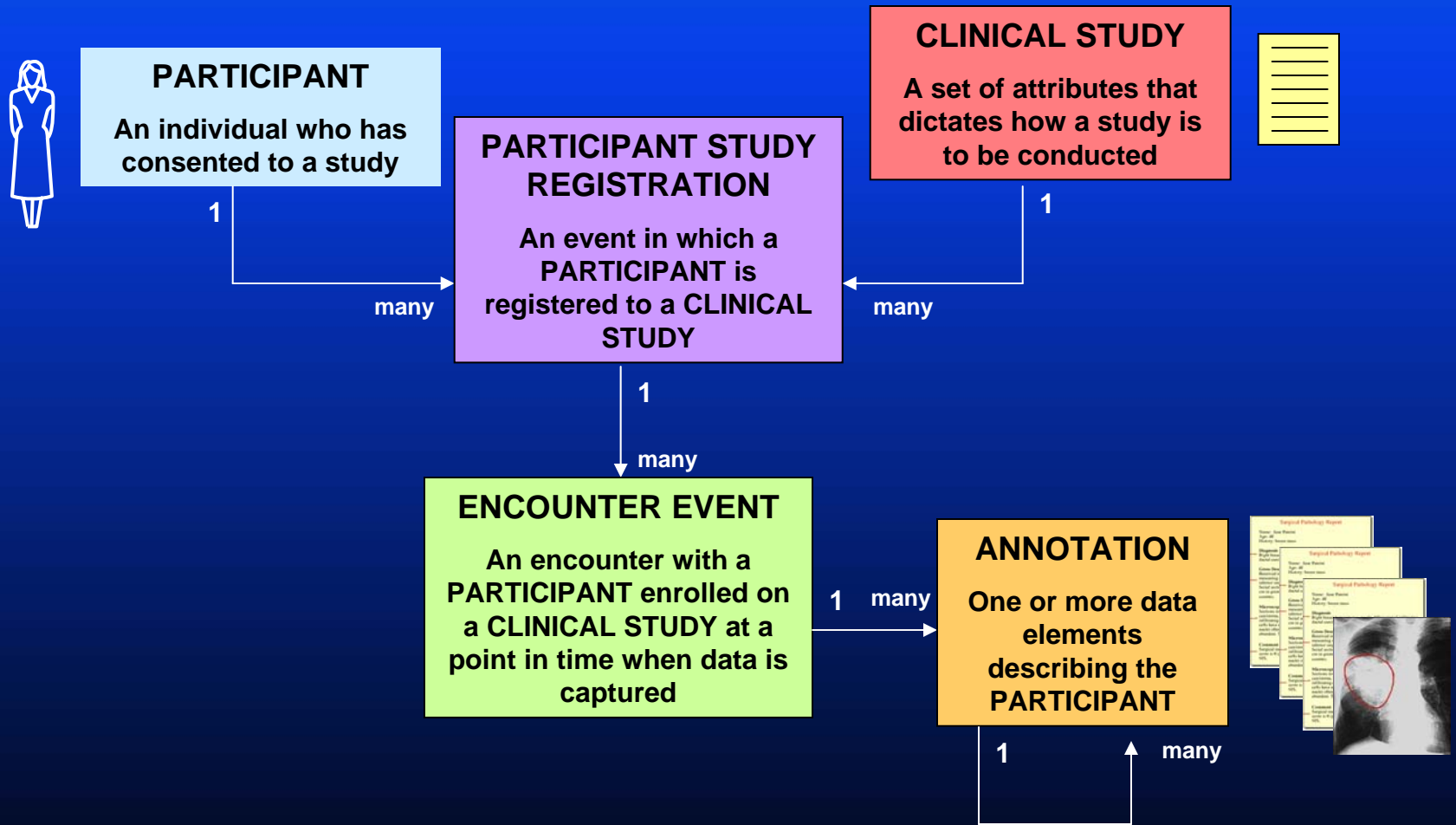
Clinical Studies Data Management



ClinPortal: Representing & Storing Clinical Studies

- Robust and scalable clinical studies management system
- End user graphical design of clinical case reports
- Automatic generation of forms for data entry
- Graphical interface to query and download study data

ClinPortal Concepts



ClinPortal Study Definition

- Define clinical study encounter events
- Define data elements (attributes or variables) to capture at each encounter event
- Model data elements as appropriate to the biomedical domain (e.g. group biomarkers together and organize physical exam findings per anatomic location)
- Create forms containing variables
- Associate form(s) to one or more encounter events

ClinPortal: Encounter Event and Data Entry

HOME ADMINISTRATIVE DATA DATA ENTRY REPORT SEARCH Sign Out

Clinical Study:
Neuro Muscular Genetics

Participant (Protocol ID): Register New

N/A (01)

Event Details for N/A (01)

- Neuro Muscular Genetics: Sep-17-2008
 - Entry-1
 - Genetic Testing
 - Sample management
 - Patient Data
 - Clinical Eval
- Followup Visit: Sep-18-2008
 - Entry-1
 - Clinical Eval

Primary Diagnosis

Diagnosis: -- Select --

Other Primary Diagnosis:

Year of Onset: YYYY

Inheritance Pattern: -- Select --

Medical History

Medical Condition	Year of Onset
<input type="text"/>	<input type="text"/>

Delete Add More

Medication History

Medication	Dose	Dose Unit	Comments
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Delete Add More

Social History

Current Employment: 1 - unknown 2 - employed 3 - unemployed 4 - retired

Status

Current Job:

Longest Held Job:

Highest Education Level: --Select--

Smoking History

Packs Per Day:

Years Smoked:

Currently Smoking: 1 - unknown 2 - currently smoking 3 - not currently smoking

Alcohol Consumption History

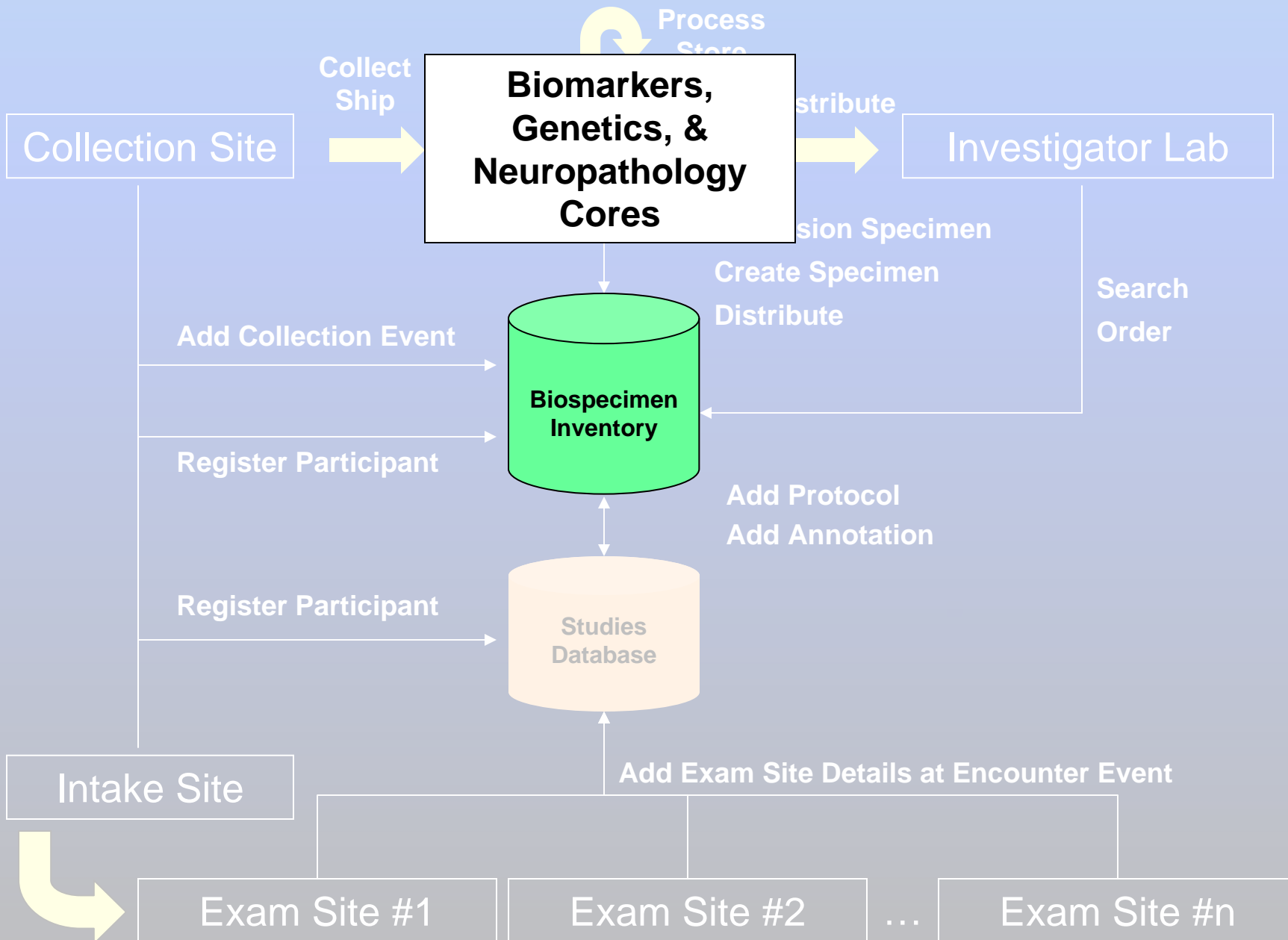
Drinks per Week:

Data entry form(s)

Encounter events and annotations

CONTACT US PRIVACY NOTICE DISCLAIMER ACCESSIBILITY REPORT PROBLEMS

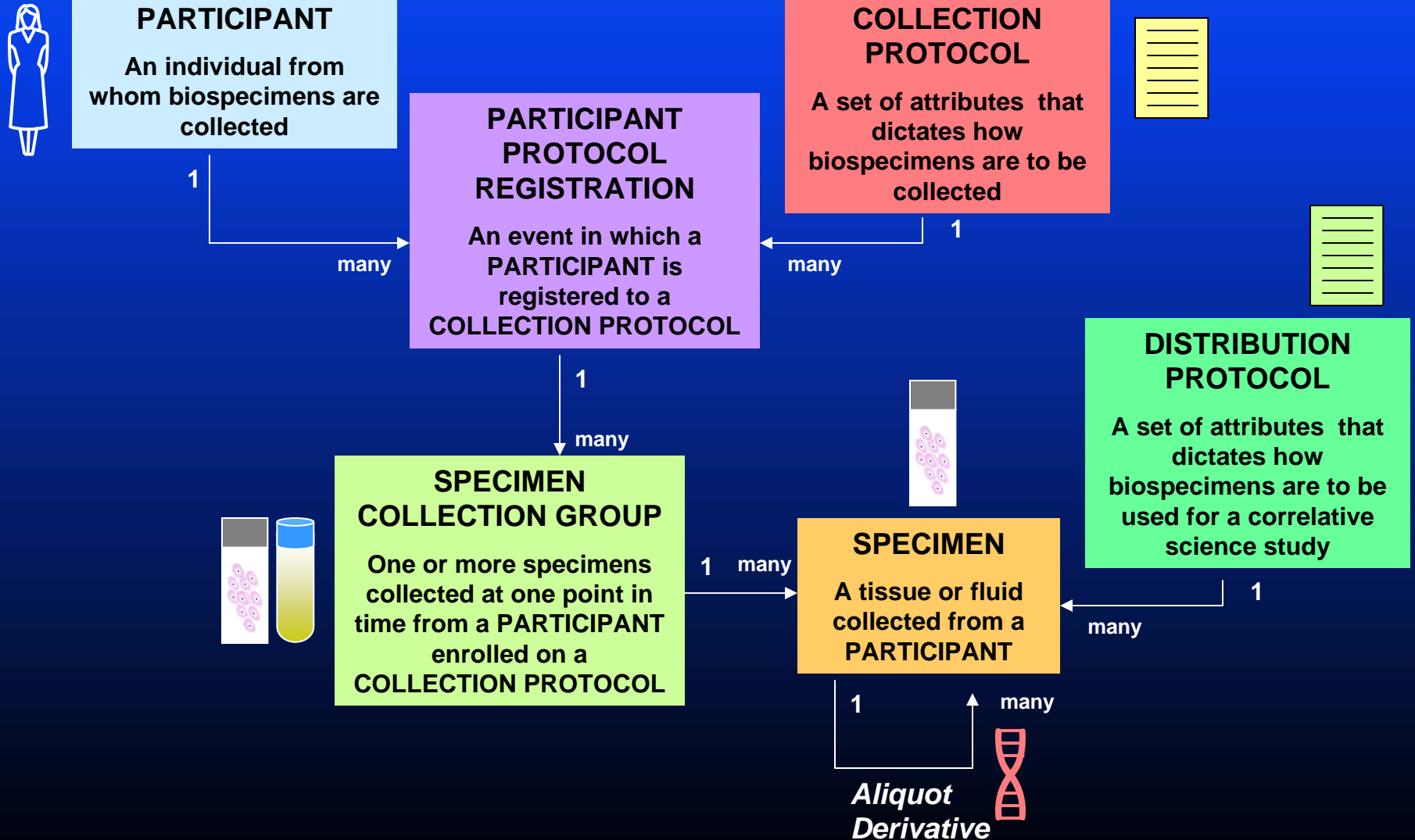
Workflow of the WU ADRC



Tissue Suite

- Comprehensive biospecimen informatics system
 - Tissue bank functions
 - Protocol Management
 - Inventory Tracking
 - Quality Assurance / Quality Control Parameters
 - Annotation Features
 - Concept-coded surgical pathology reports
 - Discrete Clinical and Pathology Attributes
 - Researcher functions
 - Graphical query interface
 - Biospecimen ordering system

Tissue Suite Concepts



Tissue Suite: Participant Registration

Collection Protocol:

Complicated BRCA

Participant (Protocol ID):

Register New

Click to register new Participant

Specimen Details for

Add Participant

Social Security Number (SSN)

666 - 77 - 8888

Last First Middle

Name

Nobody

Nancy

N

Birth Date

08-16-1945

[MM-DD-YYYY or MMDD/YYYY]

Vital Status

Alive Dead Unknown Unspecified

Death Date

[MM-DD-YYYY or MMDD/YYYY]

Gender

Female Gender Male Gender Unknown Unspecified

Sex Genotype

Unknown

Race

Native Hawaiian or Other Pacific Islander
Not Reported
Unknown
White

Ethnicity

Unknown

Medical Identifier(s)

Add More

Delete

Source

Medical Record Number

Delete?

-- Select --

Participant Registration(s)

Add More

Delete

Collection Protocol

Participant Protocol ID

Registration Date

Activity Status

Consent

Delete?

Complicated BRCA

08-9999

02-15-2008

Active

Enter Response

Participant demographics page

CP registration page

Tissue Suite: Add Specimen Collection Group

HOME ADMINISTRATIVE DATA BIOSPECIMEN DATA SEARCH SUMMARY HELP Sign Out

Collection Protocol:
Complicated BRCA

Participant (Protocol ID): Register New
Noboby , Nancy (08-9999)

Specimen Details for Noboby , Nancy (08-9999)

- T1.0: Pre-RX Biopsy: 02-16-2008
 - 1044
 - 1045
 - 1046
 - 1047
 - 1047_1
 - 1047_2
 - 1047_3
 - 1047_4
 - 1047_5
- T14.0: Operative: 02-29-2008
 - 1041
 - 1042
 - 1043

Creation of all expected specimens, derivatives, and aliquots based on CP definition

Edit Specimen Collection Group View Surgical Pathology Report View Annotation Consents

Collection Protocol Title Complicated BRCA

Participant Name (Protocol ID) Noboby, Nancy(08-9999)

Collection Site **Calendar clock offset**

Specimen Group Name

Study Calendar Event Point Offset 0 Days

Clinical Diagnosis Not Specified

Clinical Status Pre-Therapy

Medical Record Number -- Select --

Surgical pathology number

Comments

Activity Status

Collection Status **Collection event (SCG) status**

Collected Event

Collector Admin, Admin

Date 02-16-2008 [M] [MM-DD-YYYY]

Time 22 Hr 49 Min

Procedure Not Specified

Container Not Specified

Comments

Uncollected Event

Collector Admin, Admin

Date 02-24-2008 [M] [MM-DD-YYYY]

Time 22 Hr 49 Min

Procedure Not Specified

Comments

Pending
Pending-Partially Complete
Overdue
Overdue-Partially Complete
Complete
Complete-Late
Incomplete
Not Collected

Tissue Suite: Add Specimen Collection Group

Collection Protocol:

Complicated BRCA

Participant (Protocol ID): Register New

Nobody , Nancy (08-9999)

Specimen Details for Nobody , Nancy (08-9999)

T1.0: Pre-RX Biopsy: 02-24-2008

1044

1045

1046

1047

1047_1

1047_2

1047_3

1047_4

1047_5

T14.0: Operative: 02-29-2008

Print Labels

Submit

Label printing

1. Indicate expected specimens collected

Specimen details

	Label	Barcode	Type	Qty	Conc.	Location	<input type="checkbox"/> Apply First to All	Collected?
<input checked="" type="radio"/>	1046	1046	Whole Blood	10.0		Virtual		<input checked="" type="checkbox"/>
<input type="radio"/>	1045	1045	Frozen Tissue	0.05		Penn_Box_12 1 3		<input checked="" type="checkbox"/>
<input type="radio"/>	1044	1044	Frozen Tissue	0.05		Penn_Box_12 1 4		<input checked="" type="checkbox"/>

Aliquot Details

Parent	Label	Barcode	Type	Qty	Conc.	Location	<input type="checkbox"/> Apply First to All	Created?
1047	1047_3	1047_3	Plasma	1.0		Penn_Box_11 7 2		<input checked="" type="checkbox"/>
1047	1047_5	1047_5	Plasma	1.0		Penn_Box_11 10 4		<input checked="" type="checkbox"/>
						Penn_Box_11 10 5		<input checked="" type="checkbox"/>
						Penn_Box_12 1 1		<input checked="" type="checkbox"/>
						Penn_Box_12 1 2		<input checked="" type="checkbox"/>

3. Pre-defined / editable labels, quantities, and storage destination

Derivative Details

Parent	Label	Barcode	Type	Qty	Conc.	Location	<input type="checkbox"/> Apply First to All	Created?
1046	1047	1047	Whole Blood	10.0		Virtual		<input checked="" type="checkbox"/>

2. Indicate expected derivatives / aliquots created

Submit

Tissue Suite: Other Features

Search for Frozen Breast Tumor Tissue from Patients with Last Name Starting with "W"

SPECIMEN QUERY RULE Add

Class	Equals	Tissue
Type	Equals	Frozen Tissue
Tissue Site	Equals	Breast, NOS
Tissue Side	Equals	Left
Pathological Status	Equals	Malignant
Concentration	Any	_____ To _____ ug/ml
Available Quantity	Any	_____ To _____ gm
Actual Quantity	Any	_____ To _____ gm

Rules Add Edit Delete Operator

- Last Name Starts With W
- ANY
- ANY

Scientist Results View

SEARCH RESULTS Showing Results 1 - 4 of 4

Search Results: 100 Records Per Page

	First Name : Participant	Last Name : Participant	Middle Name : Participant	Birth Date : Participant	Gender : Participant	Social Security Number : Participant	Identifier : Participant
<input type="checkbox"/>	##	##	##	##	Male	##	10
<input type="checkbox"/>	##	##	##	##	Female	##	11
<input type="checkbox"/>	##	##	##	##	Female	##	12
<input type="checkbox"/>	##	##	##	##	Male	##	13

Check All

Administrator / Supervisor Results View

SEARCH RESULTS Showing Results 1 - 4 of 4

Search Results: 100 Records Per Page

	First Name : Participant	Last Name : Participant	Middle Name : Participant	Birth Date : Participant	Gender : Participant	Social Security Number : Participant	ID
<input type="checkbox"/>	Angela	Walker		02-24-1956	Female	123-45-6789	11
<input type="checkbox"/>	Sandra	Walzig		04-14-1966	Female	123-45-6787	12
<input type="checkbox"/>	Mike	Waters		01-11-1923	Male	123-45-6789	10
<input type="checkbox"/>	Arthur	Warman		05-16-1934	Male	123-45-6776	13

Check All

Protocol PI Scientist Results View

SEARCH RESULTS Showing Results 1 - 5 of 5

Search Results: 100 Records Per Page

	First Name : Participant	Last Name : Participant	Middle Name : Participant	Birth Date : Participant	Gender : Participant	Social Security Number : Participant	Identifier : Participant
<input type="checkbox"/>	##	##	##	##	Male	##	10
<input type="checkbox"/>	##	##	##	##	Female	##	11
<input type="checkbox"/>	##	##	##	##	Female	##	12
<input type="checkbox"/>	##	##	##	##	Male	##	13
<input type="checkbox"/>	Wendy	Willing		09-15-1977	Female	123-45-7777	14

Check All

Progress to Date

- Neuropathology Core migrated to Tissue Suite for prospective biospecimen collection: Creating forms for

Vascular Pathology

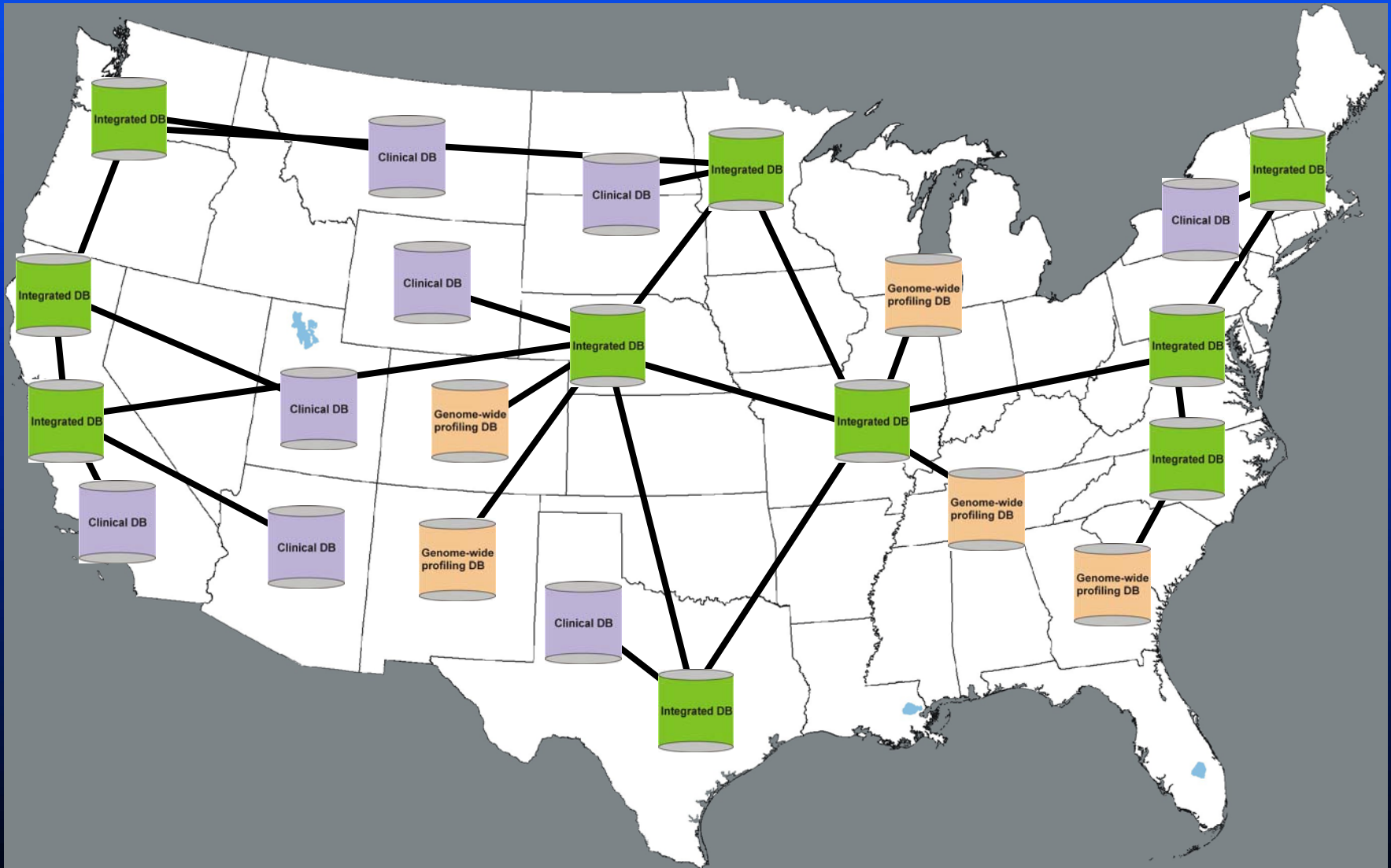
Is ischemic pathology present?	<input type="radio"/> 1 Yes	<input type="radio"/> 2 No	<input type="radio"/> 3 Not assessed	<input type="radio"/> 4 Missing/unknown		
Is hemorrhagic pathology present?	<input type="radio"/> 1 Yes	<input type="radio"/> 2 No	<input type="radio"/> 3 Not assessed	<input type="radio"/> 4 Missing/unknown		
Is vascular pathology present?	<input type="radio"/> 1 Yes	<input type="radio"/> 2 No	<input type="radio"/> 3 Not assessed	<input type="radio"/> 4 Missing/unknown		
Are one or more large artery cerebral infarcts present?	<input type="radio"/> 1 Yes	<input type="radio"/> 2 No	<input type="radio"/> 3 Not assessed	<input type="radio"/> 4 Missing/unknown		
Are one or more cortical microinfarcts (including granular atrophy) present?	<input type="radio"/> 1 Yes	<input type="radio"/> 2 No	<input type="radio"/> 3 Not assessed	<input type="radio"/> 4 Missing/unknown		
Are one or more lacunes (small artery infarcts and/or hemorrhages) present?	<input type="radio"/> 1 Yes	<input type="radio"/> 2 No	<input type="radio"/> 3 Not assessed	<input type="radio"/> 4 Missing/unknown		
Are single or multiple hemorrhages present?	<input type="radio"/> 1 Yes	<input type="radio"/> 2 No	<input type="radio"/> 3 Not assessed	<input type="radio"/> 4 Missing/unknown		
Is subcortical arteriosclerotic leukoencephalopathy present?	<input type="radio"/> 1 Yes	<input type="radio"/> 2 No	<input type="radio"/> 3 Not assessed	<input type="radio"/> 4 Missing/unknown		
Is cortical laminar necrosis present?	<input type="radio"/> 1 Yes	<input checked="" type="radio"/> 2 No	<input type="radio"/> 3 Not assessed	<input type="radio"/> 4 Missing/unknown		
Is medial temporal lobe sclerosis (including hippocampal sclerosis) present?	<input type="radio"/> 1 Yes	<input type="radio"/> 2 No	<input type="radio"/> 3 Not assessed	<input type="radio"/> 4 Missing/unknown		
Is atherosclerotic vascular pathology (of the circle of Willis) present?	<input type="radio"/> 1 Yes	<input type="radio"/> 2 No	<input type="radio"/> 3 Not assessed	<input type="radio"/> 4 Missing/unknown		
Is arteriosclerosis (small parenchymal arteriolar disease) present?	<input type="radio"/> 1 Yes	<input type="radio"/> 2 No	<input type="radio"/> 3 Not assessed	<input type="radio"/> 4 Missing/unknown		
Is amyloid angiopathy present?	<input type="radio"/> 1 None	<input type="radio"/> 2 Mild	<input type="radio"/> 3 Moderat	<input type="radio"/> 4 Sever	<input type="radio"/> 5 Not assessed	<input type="radio"/> 6 Missing/unknown
Is another type of angiopathy (e.g.	<input type="radio"/> 1 None	<input type="radio"/> 2 Mild	<input type="radio"/> 3 Moderat	<input type="radio"/> 4 Sever	<input type="radio"/> 5 Not assessed	<input type="radio"/> 6 Missing/unknown
Is there other pathology related to ischemic or vascular disease not previously specified present?	<input type="radio"/> 1 None	<input type="radio"/> 2 Mild	<input type="radio"/> 3 Moderat	<input type="radio"/> 4 Sever	<input type="radio"/> 5 Not assessed	<input type="radio"/> 6 Missing/unknown

- Neuroimaging Core integration by late 2009

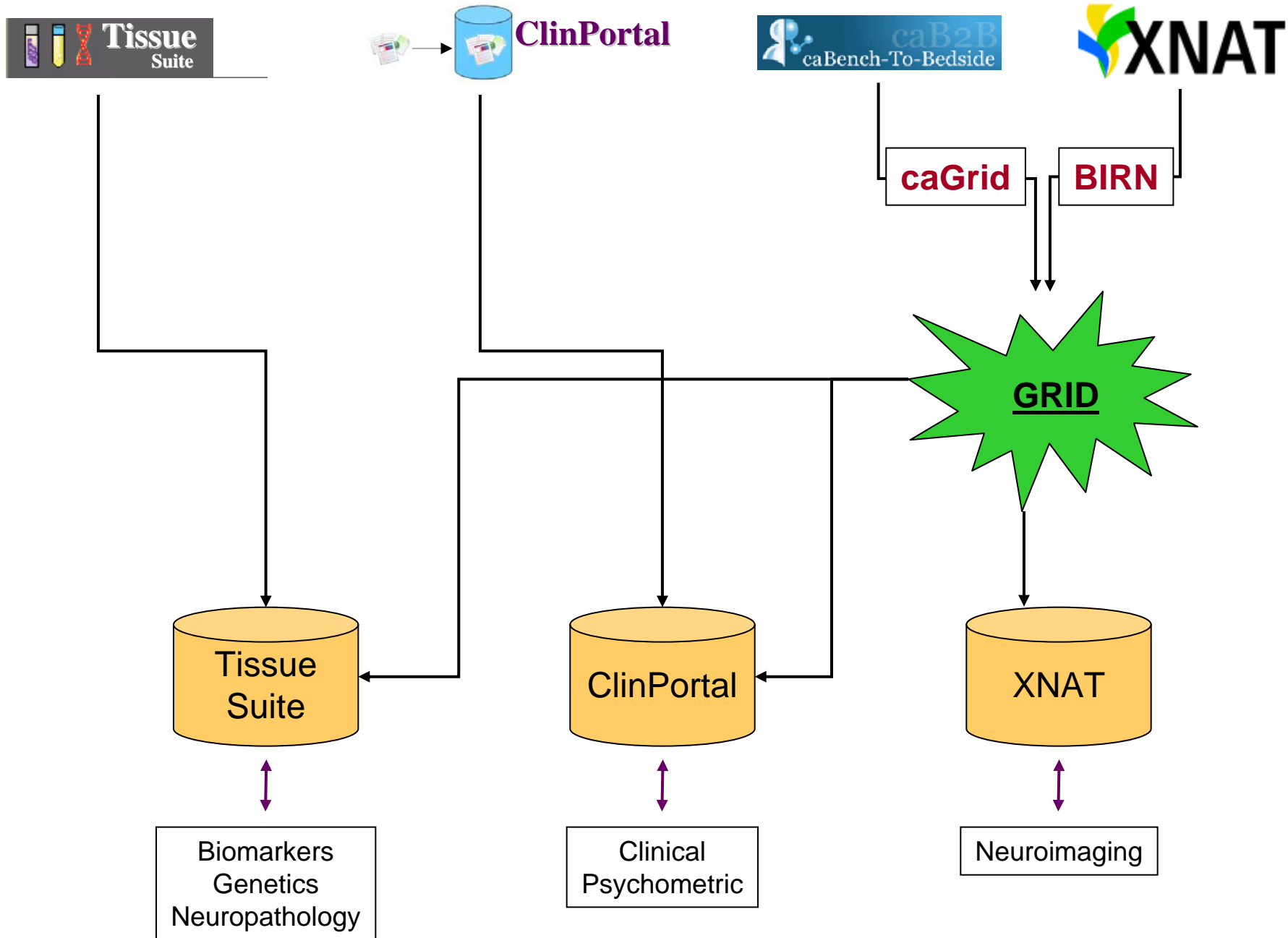
Institution to Global Integration

caBIG: cancer Biomedical Informatics Grid

CTSA: Clinical and Translational Science Award



Summary: ADRC Data Integration and Sharing



Acknowledgments

On-site Team

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