

BIOMEDICAL INFORMATICS

OPEN HOUSE

Biomedical Informatics Services for Researchers: What We Can Do for You

Research professionals are invited to

- Hear an overview of the computational resources and services we offer
- Meet the team behind our services
- Discuss user needs and preferences

Presented by:

Greg Franseth

Director, Biomedical
Informatics Technical
Services

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Application Specialist

Brett Harnett, MS-IS

Director, UC Center for
Health Informatics



Wednesday, Sept 23
10 – 11 am
Cincinnati Children's, S1.203

Research IT



OR

Clinical IS



Services Offered to Research Faculty & Staff:

- Application development
- Data storage servers
- Epic Data extraction (I2B2)
- Licensed Software for Researchers
- General technology needs
- and many more...
- Contact: help@bmi.cchmc.org
- Support available: 8-5, M-F

Services Offered to the Enterprise:

- Application development
- Data storage servers
- Epic
- Licensed Software for Enterprise (MS Office, Outlook, Endnote)
- General desktop issues
- Other
- Contact: 636.4100
- Service Desk available 24x7

Research IT



OR

Clinical IS



Domain: CHMCRES

- Network
- CCHMC Employees
- Visiting Profs \ Observers
- ***External Collaborators***
- Res VPN (vpn.research.cchmc.org)

Domain: CHMCCORP

- Network
- CCHMC Employees
- Visiting Profs \ Observers
- Corp VPN (connect.cchmc.org)

Biomedical Informatics Services for Researchers

- Application Development
 - Biobanking Software
 - Cluster
 - CORES Billing
 - Database Hosting and Support
 - Data Services
 - Data storage servers
 - Research Electronic Data Capture
 - Sharing large datasets
 - Software licenses
 - Virtual Environment
 - Application hosting
 - Server Hosting and Support





Research IT Application Development

- We develop custom software to make your life easier!
- We work on large and small grant funded projects
 - develop stand alone software packages
 - custom web pages for form collection and reporting
 - mobile applications for data collection
- Also help with “one-off” requests
 - simplifying tasks by writing scripts or programs
 - modifying existing open source tools to suit your needs
- Most applications are now web based, so can be accessed from anywhere. No need to install software on every computer!



Research IT Application Development

- Work with a wide variety of divisions
 - Pediatric Neuroimaging Research Consortium
 - Sports Medicine
 - Rheumatology
 - Psychology
 - Anderson Center
 - Etc.
- Along with a variety of research cores
 - Flow Cytometry Core
 - Confocal Microscopy Core
- Contact us by emailing help@bmi.cchmc.org
 - For preliminary project discussion, contact Greg Franseth (636.2477)

Biomedical Informatics

Services for Researchers

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Biobanking Software

- Manages biomaterials tracking needs of both, employees and the public
- Modules for biofluid, tissue, nucleic acid and microorganism samples
- Workflow analysis
- Customized build, User setup and management
- Software training
- Data migration
- Custom upload process development
- Ongoing error monitoring



Biobanking Software

Biomaterial Tracking & Management



Track Sample Data

Accession Biofluid Sample

Bank Sample ID : _____ Project Sample ID : _____ External Sample ID : _____
 Patient First Name : _____ Patient Last Name : _____ Family Group : FID-0001
 Location : _____

General	Sample Description	Sample Comments	Oncology	Lab	Dates and Times
Initial Volume : <input type="text"/>	CC	Available Volume : <input type="text"/>	CC		
Visit Type : <input type="text"/>				Visit Date : 03/26/2015	
Number Of Containers : <input type="text"/>	1	Cell Count : <input type="text"/> x 10E <input type="text"/>		Cell Viability : <input type="text"/> %	
Sample Type : <input type="text"/>					
Source : <input type="text"/>					
Tissue Origin : <input type="text"/>					
Tube Type : <input type="text"/>					
Additive : <input type="text"/>					
Collection Procedure : <input type="text"/>					
Hemolysis Score : <input type="text"/>					
Health Status at Collection : <input type="text"/>					
Processing Method : <input type="text"/>					
Sample Characteristics					
Add More Characteristics					

Storage Hierarchy

Legend Tissue Biofluid NucleicAcid Microorganism Empty

- [-] CCHMC BMI Bank
 - [-] -80°C Freezer1 [5]
 - [-] {1} Shelf A [5]
 - [-] {1} Rack 1 [18]
 - [-] {1} F1-SA-R1-B01 [0]
 - [-] {1}
 - [-] {2}
 - [-] {3}

1	2	3
10	11	12
19	20	21

Track Patient Data

Create Edit Subject

Project: Test1 NC Research Subject: _____

General	Demographics	Consents	Family Members
Research Subject ID : S20150720B	Date of Registration : <input type="text"/>		
Family/ Group ID : <input type="text"/>	Family Genetic Categorization : <input type="text"/>		
Afflicted : <input type="checkbox"/>	Remove from Project : <input type="checkbox"/>		
Verification Complete : <input type="checkbox"/>	First Name : <input type="text"/>		
	Middle Name : <input type="text"/>		
	Last Name : <input type="text"/>		
	Suffix : <input type="text"/>		
	Alias : <input type="text"/>		
	Other Name : <input type="text"/>		
	MRN/ Unique ID : <input type="text"/>		
	Add More		

Assign Family/ Group ID to Subject

Upload Files

Add Consent

Patient Contact

Primary Diagnosis

Medications

Treating Physicians

Afflicted



Biobanking Software

Patient Report

Patient Search

Demographics Information

Medical Facility:

Race:

Gender:

Postal Code:

Last Name:

Alias:

Patient Clinical Information

Primary Diagnosis:

Concurrent Diagnosis:

Contact Type:

Project Information

Project:

Subject ID:

Verification Complete:

Other

Social History Item:

Status:

Sample Information

Sample Type:

MRN/ Unique ID:

Ethnicity:

Cause of Death:

Age:

First Name:

Verification Complete:

Disease Activity:

Treating Physician:

Age at Diagnosis:

Family/ Group ID:

Family Genetic Categorization:

Units:

Diagnostic:

Sample Report

Sample Search

Sample Filters

Date Entered Range From:

Date Entered Range To:

Sample Category:

Tissue Category:

Tumor-Normal-Metastasis:

Primary Diagnosis:

Health Status at Collection:

External Source:

Verification Complete:

Sample Age:

Patient Filters

Medical Facility:

Primary Diagnosis:

Race:

Gender:

Age at Collection:

Project Filters

Project:

Subject ID:

Sample Type:

Sample Status:

Visit Type:

Bank Sample IDs:

External Sample IDs:

Diagnostic:

MRN/ Unique ID:

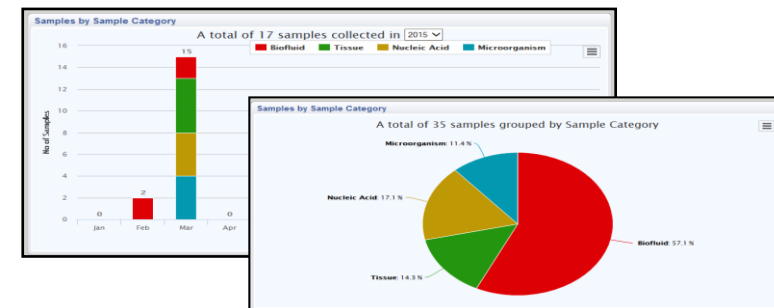
Disease Activity:

Ethnicity:

Current Age:

Project Sample ID:

Dashboard



Inventory Report

View Inventory

Show/Hide Menu

<input checked="" type="checkbox"/> Aliquots/Derivatives	<input checked="" type="checkbox"/> Arrival Date (GMT)	<input checked="" type="checkbox"/> Bank Sample ID	<input checked="" type="checkbox"/> Bank Kit Number	<input checked="" type="checkbox"/> Cell Type	<input checked="" type="checkbox"/> Collection Date (GMT)
<input checked="" type="checkbox"/> Collection Site	<input checked="" type="checkbox"/> Container Type	<input checked="" type="checkbox"/> Current Donor Age	<input checked="" type="checkbox"/> Date of Entry (GMT)	<input checked="" type="checkbox"/> Diagnostic	<input checked="" type="checkbox"/> Donor Age at Collection
<input checked="" type="checkbox"/> External Source/Sample ID	<input checked="" type="checkbox"/> Holder Id	<input checked="" type="checkbox"/> Kit Type	<input checked="" type="checkbox"/> Location	<input checked="" type="checkbox"/> MRN/Facility	<input checked="" type="checkbox"/> OD260/280
<input checked="" type="checkbox"/> Pair	<input checked="" type="checkbox"/> Paired Normal	<input checked="" type="checkbox"/> Patient	<input checked="" type="checkbox"/> Primary Diagnosis	<input checked="" type="checkbox"/> Prior Chemotherapy	<input checked="" type="checkbox"/> Prior Hormone Therapy
<input checked="" type="checkbox"/> Prior Radiation	<input checked="" type="checkbox"/> Procured not Banked	<input checked="" type="checkbox"/> Project name/Sample ID	<input checked="" type="checkbox"/> Progenitor	<input checked="" type="checkbox"/> Quantitation Method	<input checked="" type="checkbox"/> Sample Age In Biobank
<input checked="" type="checkbox"/> Sample Annotation	<input checked="" type="checkbox"/> Sample Type	<input checked="" type="checkbox"/> Size	<input checked="" type="checkbox"/> Subject ID	<input checked="" type="checkbox"/> Surgical Pathology/Clinical Lab Accession Number	<input checked="" type="checkbox"/> Tissue Category
<input checked="" type="checkbox"/> TNM	<input checked="" type="checkbox"/> First Name	<input checked="" type="checkbox"/> Last Name	<input checked="" type="checkbox"/> Alias	<input checked="" type="checkbox"/> Gender	<input checked="" type="checkbox"/> Race
<input checked="" type="checkbox"/> Ethnicity	<input checked="" type="checkbox"/> Subject Family/GroupID	<input checked="" type="checkbox"/> Patient Family/GroupID			
<input checked="" type="checkbox"/> Export as XML	<input checked="" type="checkbox"/> Export as CSV	<input checked="" type="checkbox"/> Export as PDF	<input checked="" type="checkbox"/> Export as Excel		

Show All

Bank Sample ID	Progenitor	Amount	Project Name / Project Sample ID	External Source / External Sample ID	Holder ID	Patient	Subject ID	Location
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Quality Report

BTM Data Quality Check Report

Bank:	Date:	Count:
Missing CollectionSite/numID Sample GUID	Bank Specific Sample Id	Count: 1
Missing CollectionDate/From Sample GUID	Bank Specific Sample Id	Count: 0
Collection/Arrival Difference Sample GUID	Bank Specific Sample Id	Count: 3
Incorrect MostRecentMedicalFacilityID Sample GUID	Bank Specific Sample Id	Count: 3
Incorrect Project Name Sample GUID	Bank Specific Sample Id	Count: 7
Space In ProjectSampleID Sample GUID	Bank Specific Sample Id	Count: 1

Help Site

Please select one of the following:

- [Demo Request](#)
- [PI Designee](#)
- [Bank Request](#)
- [Project Request](#)
- [Access Request](#)
- [Storage](#)
- [Report Bugs](#)
- [Data Change Request](#)
- [Data QI](#)
- [Template Files](#)
- [Other Requests](#)

As of Sept. 15, 2015, BTM has 21 banks, 716,219 samples and 99,361 patients.

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Cluster

- Build and support necessary infrastructure for high throughput and computationally intensive analysis.
- The cluster is Linux-based
- Preferred method of access is either SSH or NX
- High Performance Computing (HPC) Cluster Summary
 - About 1000 compute cores in 100 servers
 - Intel / AMD processors
 - Up to 24 cores in some servers
 - Up to 256GB memory in some servers
 - nVidia GPUs
- More information at: <https://bmi.cchmc.org/resources/clusters>



Cluster

Research performed using the HPC

- Whole-genome / exome analysis
- Microbial ecology
- Protein docking, folding and structure prediction
- Natural language processing
- Functional neuroimaging
- Confocal microscopy analysis
- Molecular dynamics
- Pharmacodynamics
- Large scale rendering

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CORES is a centralized interface for ordering, billing and reporting

- **More efficient interaction with Shared Facilities**
 - All-in-one interface
- **Streamlined invoicing process**
 - Financial information will be up to date
 - Budget numbers selected at order entry
 - Efficient, automatic cost transfers
 - Direct approval and dispute initiation
- **User-friendly reporting**
 - Ease of reporting improves compliance
- **Increased transparency of how research dollars are being spent**

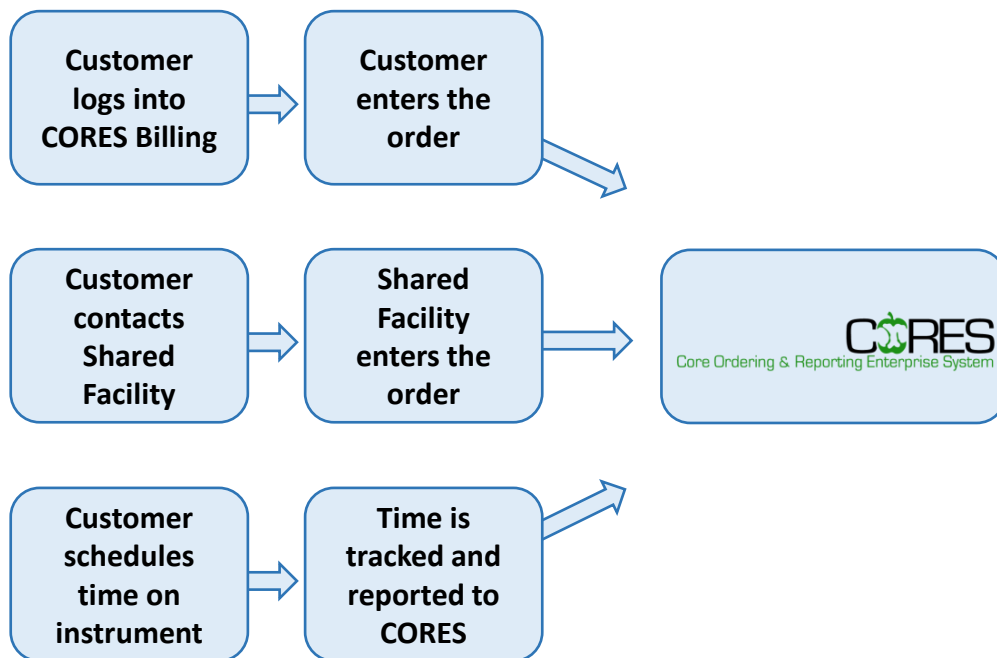


Core Ordering & Reporting Enterprise System

More info at: <http://centerlink.cchmc.org/content1/110696/>



Core Ordering and Reporting Enterprise System (CORES)



SHARED FACILITIES

Animal Behavior Core
Cell Manipulation Lab
Cell Processing Core
Comprehensive Mouse and Cancer Core
Confocal Imaging Core
DNA Sequencing and Genotyping Core
Gene Expression Core
Imaging Research Center
iPSC Characterization Core
Mass Spectrometry (Clinical and Biomedical)
MEG Core
Mouse Cytogenetics Core
NMR-based Metabolomics Core Facility
Office for Clinical & Translational Research
Pathology Research Core
Pluripotent Stem Cell Facility
Pyrosequencing Lab
Research Flow Cytometry Core
Transgenic Animal and Genome Editing Core
Vector Production Facility
Viral Vector Core

More info at: <http://centerlink.cchmc.org/content1/110696/>

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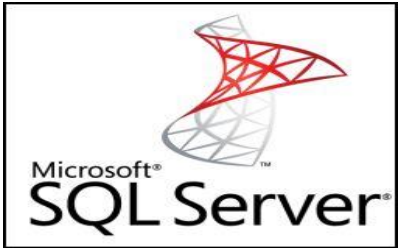




Database Hosting and Support

Database Flavors

ORACLE



PostgreSQL



- Offer a variety of different platforms so we can provide the one that best fits your need.
- Have the ability to manage either large or small user groups.
- Offer clustering on all platforms for performance and stability.
- Constant monitoring for availability and security.
- Can analyze your database needs.
- Have recently added non-clustered PostgreSQL which is touted for reliability, data integrity, and correctness.

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Data Services

- Extraction of clinical data for research purposes
 - Epic, lab data systems (Cerner), billing, and sample tracking (BTM)
- Development and support of Informatics for Integrating Biology and Bedside (I2B2) research data warehouse
 - Research cohort identification
 - Hypothesis generation
- Learning and distributed research networks
- Development of web \ mobile applications that integrate with clinical data in novel ways
 - Automated care management reports (pre-visit planning and population management)
 - Study apps pre-populated with EHR data



Data Services

How to request these services:

- Data requests: submit online request using the CCHMC central intake form <http://iportal.cchmc.org/sites/is/EpicDataRequest/Sitepages/datarequestmenu.aspx>
- Via email:
help@bmi.cchmc.org
- New collaboration \ project requests:
Ron Bryson, Manager
ron.bryson@cchmc.org
636-0271

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Data Storage Servers (CHMCRES)

- 2PetaBytes of raw space
- Hardware \ Software redundancies to protect against data loss
- Backups for recovery of deleted \ corrupted files
- Performance for accuracy, responsiveness, and stability
- Affordable cost
- Manage access via CHMCRES Permissions Manager
- Accessible by external (non-CCHMC) collaborators
- Requires a Research Network Environment (RNE) account



Data Storage Servers (RDS)

- 500TB of scalable raw space
- Research Data Storage (RDS) in CHMCCORP domain, hosted by IS
- Hardware \ Software redundancies to protect against data loss
- Backups for recovery of deleted \ corrupted files
- Performance for accuracy, responsiveness, stability
- Affordable cost
- Manage access via Permissions Manager
- Accessible ONLY by internal CCHMC collaborators
- Requires a CCHMC network id
- More information at: <https://bmi.cchmc.org/resources/data-storage>

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Research Electronic Data Capture (REDCap)

- Securely build online surveys and databases
- Fast and flexible
- Export data to common data analysis packages
- Ad Hoc Reporting
- Scheduling
- Easily manage a contact list of survey respondents
- Save your data collection instruments as a PDF to print
- Advanced features
 - Auto-validation
 - Calculated fields
 - Branching/skip logic
 - Survey stop actions
- More information at: <https://cctst.uc.edu/redcap>

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Sharing Large Datasets - Xythos

- A secure web-based tool for sharing files across the globe
- Encrypted
- Can organize files in folders and share individual files or folders via the web interface.
- No size limit for files shared via Xythos, unlike in regular email
- Ideal when writing papers \ book chapters with external collaborators
- Affordable cost
- Account can be created for CCHMC employees only (CHMCCORP id)
- Account not needed for recipients of shared files
- More information at: <https://bmi.cchmc.org/resources/collaboration-tools/xythos-user-guide>

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Software Licenses

- Have site licenses for several research related software
- Some individual licenses, some concurrent
- Charges are per license, not per user; subject to changes in user pool
- Most software is renewed annually
- Perpetual licenses have an annual maintenance cost, akin to renewal
- Most software installed remotely via the network, some installed manually
- For a list of BMI Licensed software, visit <https://bmi.cchmc.org/resources/software/software>

Note: Installing software purchased from UC on CCHMC owned computers is a violation of the license agreement!

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Virtual Environment and Physical Servers

- Hosting environment:
 - 19 HP Blade Enclosures (approx. 280 physical blade servers)
 - Other misc. physical servers (30 Windows, 200 Linux)
- VMware (for server, desktop and private cloud)
 - 53 VMware ESXi physical servers (13 clusters)
 - 5.43TB Physical memory
 - 284 Physical Processor Cores
 - 821 Virtual Machines (Windows and Linux)
- Citrix (for applications and desktop publishing)
 - 11 XenApp servers
 - 1 XenDesktop servers



Virtual Environment

- Virtual Desktop Infrastructure (VDI)
 - Virtualization of end-user desktops or applications
 - Software with special requirements installed on one or multiple computers
 - Users have the ability to disconnect and reconnect to a running application
 - Accessible from within CCHMC as well as from Internet
 - Easy remote access: Clients can be on a tablet or slow PC
- Some virtualized Servers \ Desktops \ Applications :
 - Biomedical Informatics Desktops (management tools)
 - Imaging Research Center Desktops (CCHIPS, MATLAB, MicroDicom, etc...)
 - NextGENe Desktop Viewers
 - GeneSpring Application, Toad, MS Visual Studio, etc.



Application Hosting

- Securely publish web applications to internal and external users using Single Sign On (SSO) and Federation
- Help application developers integrate their apps seamlessly with our network infrastructure
- Manage federation authentication with partner institutions like NIH and UC for REDCap, ePAS, CORES
- Some of the hosted applications are:
 - GeneSpring DNA sequencing tools\analysis
 - NextGENe DNA sequencing tools\analysis
 - BTM (Biomaterial Tracking & Management)
 - WebCamp: Grant Tracking
 - Sharepoint
 - DataPrivilege: used to manage permissions on RDS
 - DataAdvantage: used to audit data stored on RDS
 - Password Vault – Enterprise password solution
 - IIS Web servers (WebApps)
 - MSSQL Clusters
 - Xythos
 - Strand NGS
 - SAS
 - Mascot

Biomedical Informatics Services for Researchers

- How to contact: email help@bmi.cchmc.org
- When to contact: As soon as a need for our services is identified
- Who to contact: Give as much detail as you can in the email. We will hook you up with the right person 😊
- Where to get info: <https://bmi.cchmc.org>





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