

The Biomedical Informatics Infrastructure for Translational Research at MUSC

Jihad S. Obeid, MD, FAMIA
Co-director, BMIC

jobeid@musc.edu



Outline

- Biomedical Informatics for Translational Research
- EHR Data for Research
- Research Permissions
- Data Capture
- Epic Services
- Other Informatics Tools and Services
- Data Science Research and Education



Learning Objectives

- What are the components of the biomedical informatics infrastructure for translational research?
- How to access and leverage the informatics resources and services at MUSC?
- Learn about some examples of data science and AI research projects.



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Translational Research Informatics Infrastructure

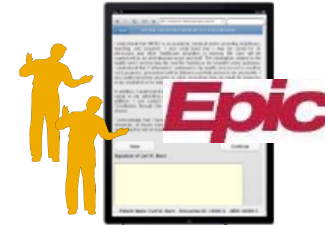
Statewide IRB Reliance



Patient Engagement & Recruitment



Research Permissions



RDW (MUSC)
HSSC CDW (Statewide)
& Master Patient Index



CTSA Services, Budgeting,
Epic Integration for Clinical Trials



Statewide Clinical Trial
Feasibility & Cohort Analysis



Research Collaboration

The Biomedical Informatics Center (BMIC)

Themed around the Learning Health System

› a Learning Health System *in which*

- **Every patient** has the opportunity to benefit from research
- **Every clinician** has their cohort of patients from which to learn
- Every scientist has the human-derived **materials** needed for study
- Every interdisciplinary team can **influence the health system** to learn from it

Leadership



Dr. Leslie A. Lenert
Director



Dr. Jihad Obeid
Co-director



BMIC Faculty: Academic Home in DPHS



Leslie Lenert, MD, MS
Professor,
CRIO
Director, BMIC



Jihad Obeid, MD
Associate
Professor
Co-director



Lewis Frey, PhD
Associate
Professor



**Alexander
Alekseyenko, PhD**
Associate Professor



Brandon Welch, PhD
Assistant Professor



**Vivienne Zhu,
MD, MS**
Assistant Professor



**Stephane Meystre,
MD, PhD**
Associate Professor

Part time



Christine Carr, MD
Professor

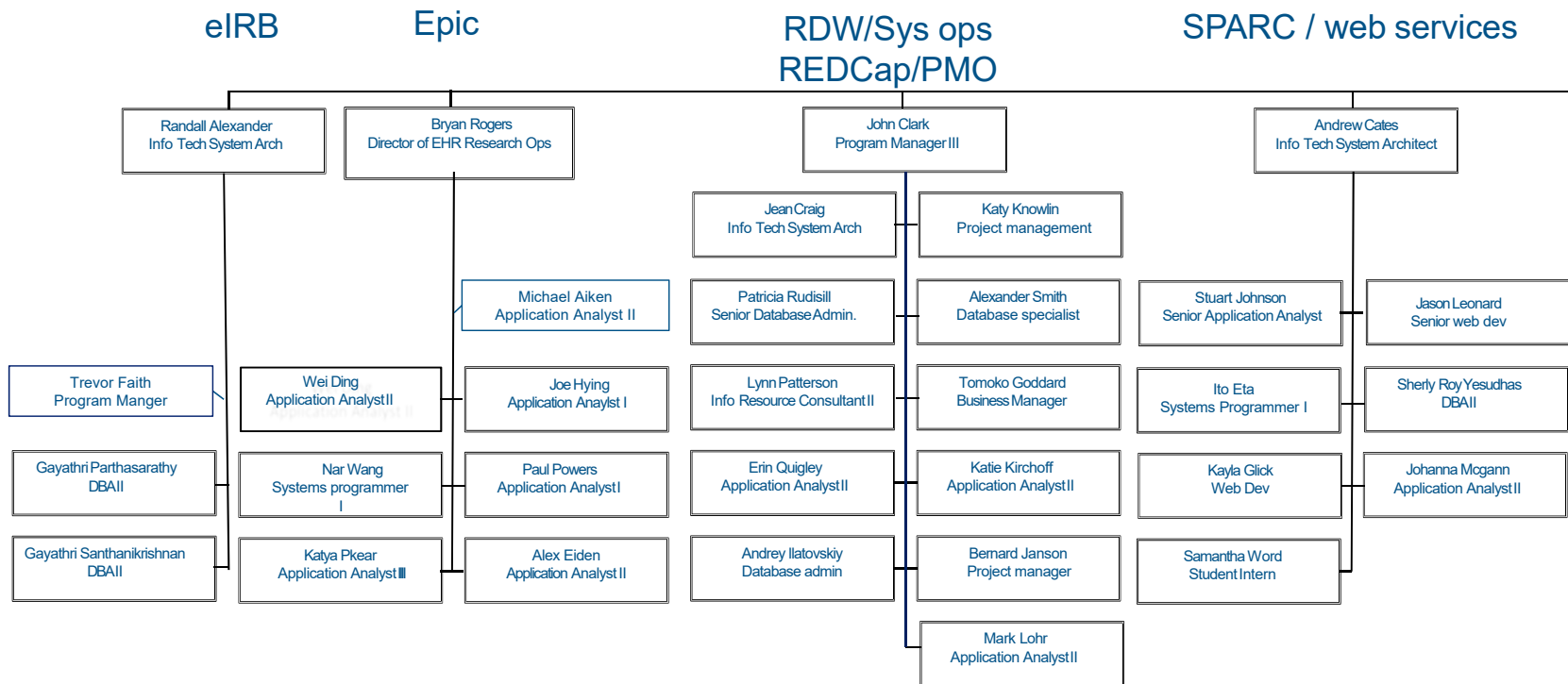


Christopher Metts, MD
Assistant Professor

THE ONLY BIOMEDICAL INFORMATICS PROGRAM IN SC



BMIC Operations Teams



SPARC Request: <https://sparc.musc.edu/>



South Carolina
Clinical & Translational
Research Institute



SPARCRequest

SPARCDashboard

SPARCInfo

Login / Sign Up



STEP 1: Add/Update Services

Browse Service Catalog

Medical University of South Carolina

CEDAR: Comparative Effectiveness and Data Analytics Research Resource

Center for Biomedical Imaging

Center for Genomics Medicine

ClinCard by Greenphire

Cores & Facilities

Laboratory Services

National Center of Neuromodulation for Rehabilitation (NC NM4R)

Office of Clinical Research (OCR)

Office of Research Integrity

South Carolina Clinical and Translational Research Institute (SCTR)

Search by Service Name, CPT Code, or EAP ID



South Carolina Clinical and Translational Research Institute (SCTR)

The South Carolina Clinical and Translational Research Institute (SCTR) is the catalyst for changing the culture of biomedical research, facilitating sharing of resources and expertise, and streamlining research-related processes to bring about large-scale, change in the clinical and translational research efforts in South Carolina.

News

There is no recent news. Please check back later.

Calendar

Dec 11 SPARC OS Technical Committee Monthly Call
3:00 PM - 4:00 PM
[Show Details](#)

Dec 12 SPARC OS _Operations Review
3:00 PM - 4:00 PM
[Show Details](#)

Dec 19 SPARC OS _Operations Review
3:00 PM - 4:00 PM
[Show Details](#)

My Services

Open

Completed

You do not have any active requested Services

Continue

Help/FAQs

Feedback

Contact Us

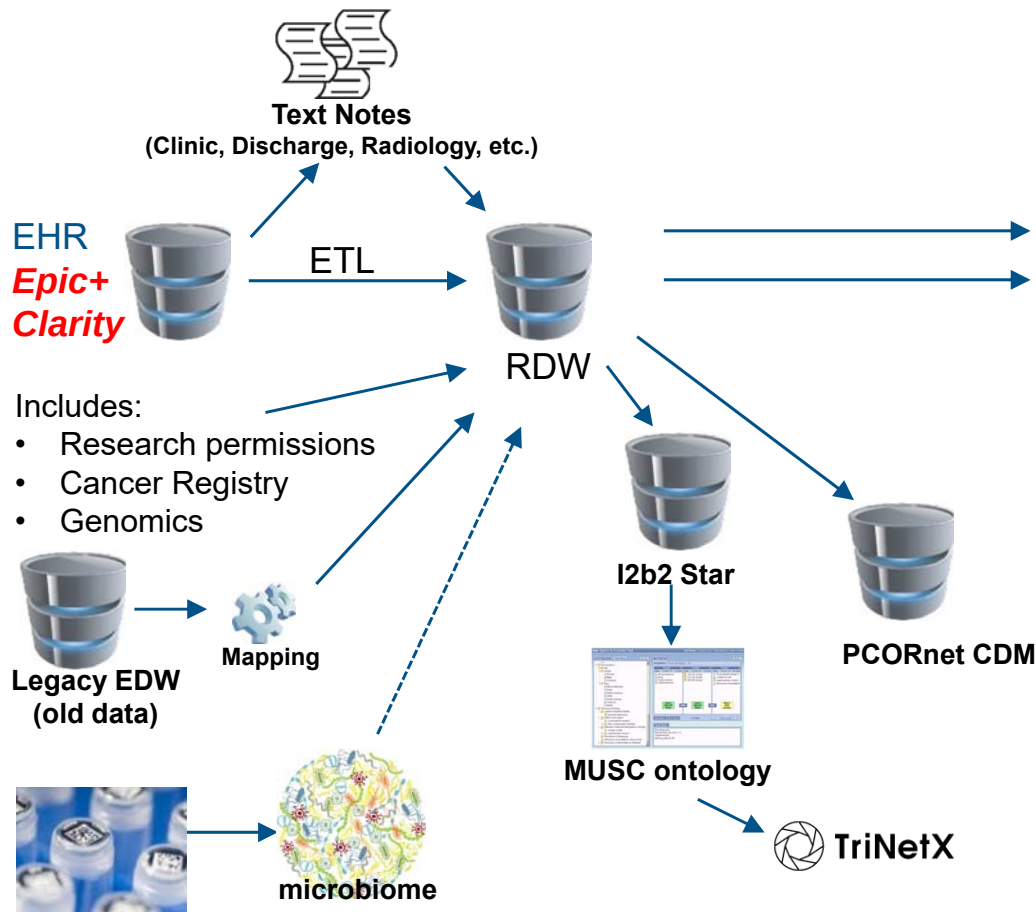


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MUSC Research Data Warehouse (RDW)



Research Data Marts:
Analytics, Machine Learning,
NLP, Reporting Dashboards

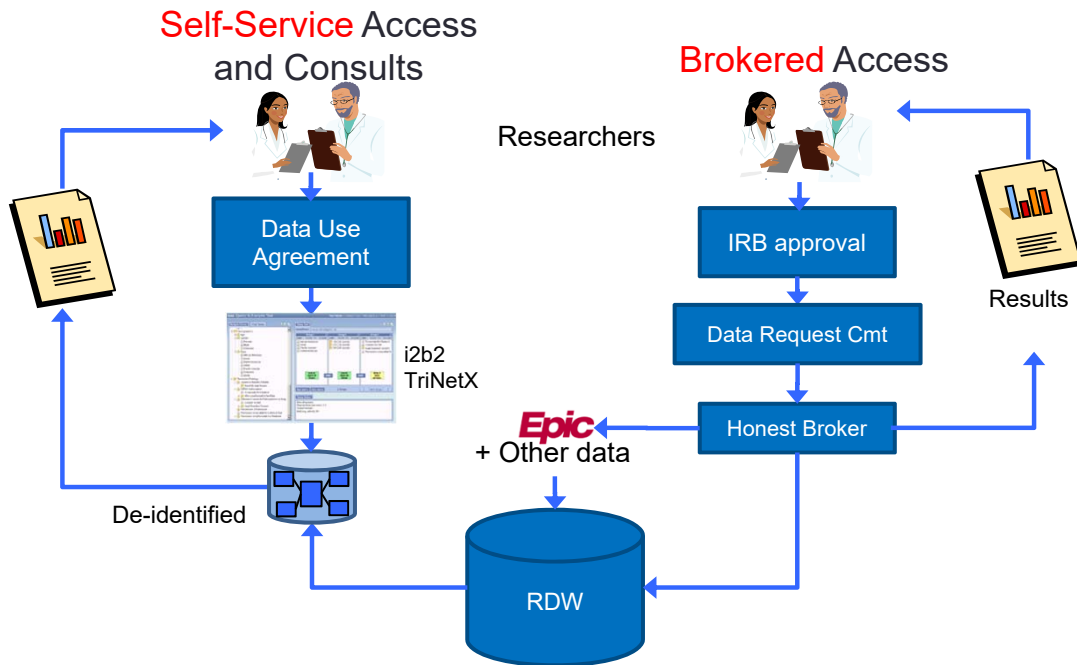
RDW Assets:

- Rich domain data
- Standards-based (LOINC, RxNorm, ICD9-10)
- Enriched with other data sources (e.g. genomics, text, ect.)
- Optimized for queries/analytics



Governance of EHR Data for Research (IRB Approved)

Including **data consults** and **honest broker** for identified data access



i2b2 Query & Analysis ToolProject: MUSCUser: jio2Find Patients | Analysis Tools | Help | Change Password | Logout

Navigate Terms

Find

- Allergies
- Assessments
- Cancer Registry
- Clinical Results
- Clinical Trials
- Computable Phenotypes
- Demographics
- Diagnoses
- Immunizations
- Labs
- Medications
- Problem List
- Procedures
- Research Permissions
- Supplemental Data Available

Workplace

SHARED

jio2@musc.edu

Previous Queries

Find

- a. <= 5 Mile@08:08:28 [12-18-2018] [jio2@musc.edu]
- AMD_v1 [9-6-2018] [jio2@musc.edu]
- All enc in 2 yrs@16:06:57 [7-9-2018] [jio2@musc.edu]
- All Encou@16:05:42 [7-9-2018] [jio2@musc.edu]

Query Tool

Query Name:

Temporal Constraint:

Group 1		Group 2		Group 3	
Dates	Occurs > 0x	Dates	Occurs > 0x	Dates	Occurs > 0x
Treat Independently		Treat Independently		Treat Independently	
drop a term on here					

Run Query Clear 0 Groups

Show Query Status Graph Results Query Report

My Studies

Trial Connect

Query Builder

Explore Cohort

Demographics

Diagnoses

Procedures

Medications

Labs

Genomics

Analyze Criteria

Rate of Arrival

MUSC demographics

SCD (ischemic stroke)

Jihad Obeid - TriNetX Live
Community | Help

☆ MUSC only

1,700 PATIENTS **1** HCOS

Jun 19, 2019, 4:51 pm. Jihad Obeid.
Medical University of South Carolina.

Run

View History

Demographics

Range: Months (0-36) **Years (0-89)**

Type of Graph: Grouped **Stacked**

Sex: Female ☒ Male ☒

Number of Patients

Age in years

Patients Over 90: 4

Total Patients	Minimum Age	Maximum Age	Mean Age	Standard Deviation
1,700	0	90	29	18

Sex

Female **56%**

Race

Black or Afri... **93%**

New Query

Hide

Filter By: Filter Sort By: Most Recent

☆ Unnamed

10 Patients 1 HCOS

☆ IC

90 Patients 1 HCOS

☆ MUSC only

1,700 Patients 1 HCOS

Medical University of Sout... May 15, 2019, 3:50 pm
By Jihad Obeid

☆ SCD+IC+ICH

20 Patients 3 HCOS

☆ SCD+IC (new)

220 Patients 4 HCOS

☆ SCD all

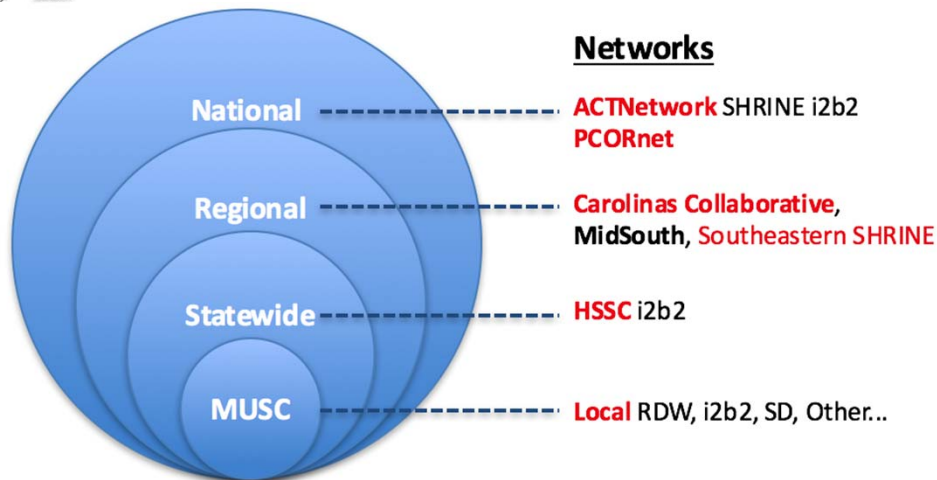
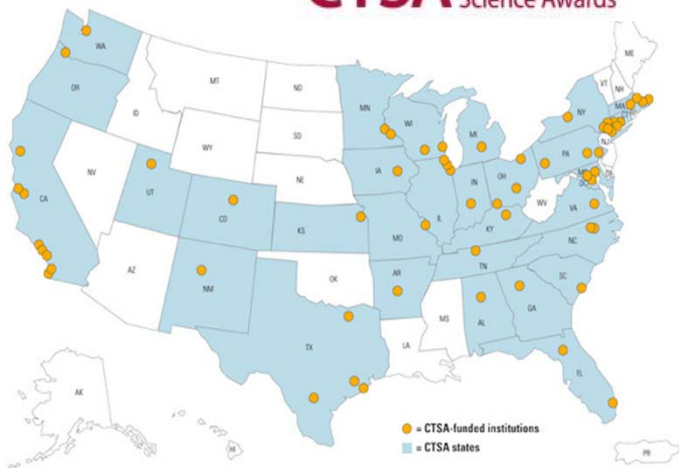
3,840 Patients 4 HCOS

Medical University of South Carolina

Collaborative Networks



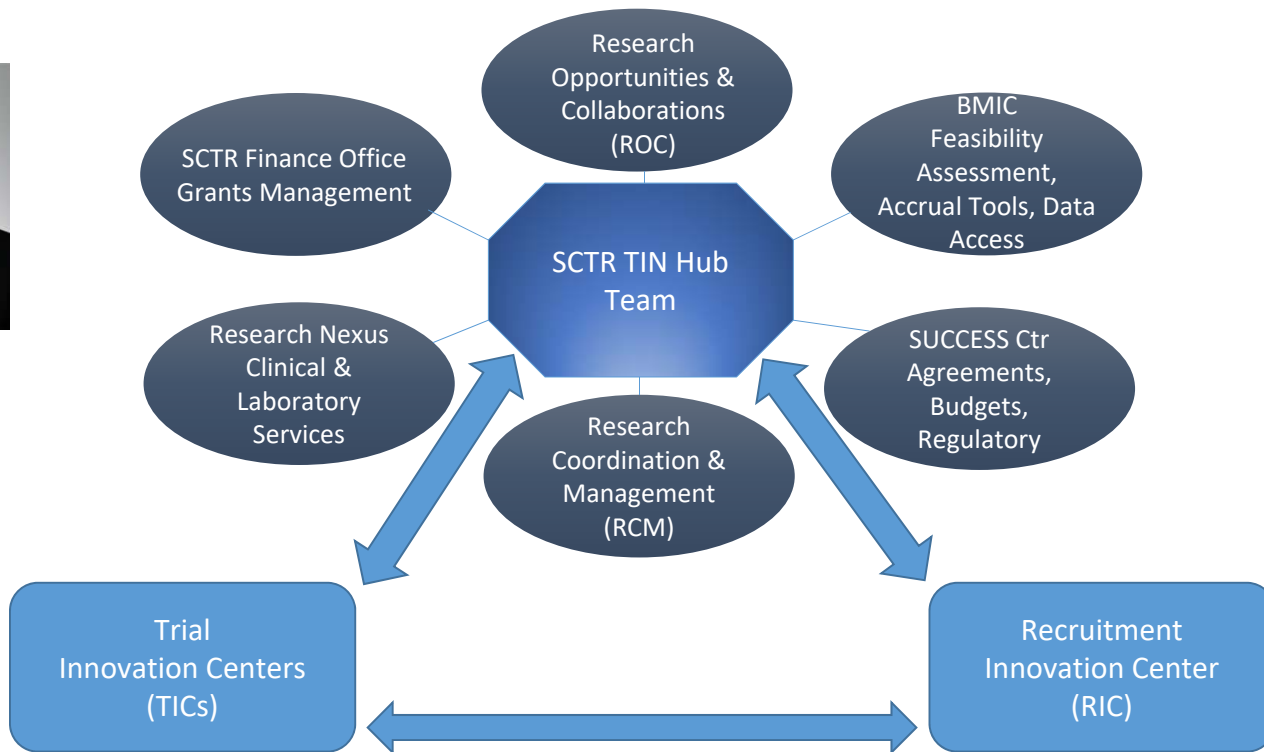
CTSA Clinical & Translational Science Awards



Network Capacity (SCTR)



Dr. Marc
Chimowitz
Program Director



Signe Denmark, MS, CCRP
Associate Director,
Research Opportunities &
Collaborations

Aim 1: Optimize processes to operationalize TIN clinical trials

Aim 2: Train and assist clinicians for multisite clinical trials

Aim 3: Enhance novel recruitment strategies: NLP, telehealth, community...



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MUSC Research Preferences

Questionnaire in Epic MyChart & in clinic

Biobank

Retention / Disposal and Use of Blood, Body Fluids, or Tissue.

I understand that any blood, body fluids or tissues normally removed from my body by MUSCHealth, including its hospital(s), physicians and staff, in the course of any diagnostic procedures, surgery, or medical treatment that would otherwise be disposed of may be retained, and used for research, including research on the genetic material (DNA) or other information contained in those tissues or specimens. I acknowledge that such research by MUSCHealth, may result in new inventions that may have commercial value and I understand that there are no plans to compensate me should this occur, regardless of the value of any such invention. I understand that any research using these leftover specimens or tissues will be done in a way that will not identify me. If I have questions, I should call (843) 792-8300 or visit <http://www.muschealth.org/clinical-trials/>.

I AGREE to have my leftover blood, body fluids or tissue used for future research studies.

I do not agree to have my leftover blood, body fluids or tissue used for future research studies.

I am not ready to make a decision at this time

Contact

Preference for Contact by Research Studies.

I understand I may be contacted about future research studies at MUSC for which I may be eligible. If I have questions, I should call (843) 792-8300 or <http://www.muschealth.org/clinical-trials/>

I AGREE to be contacted about future research studies.

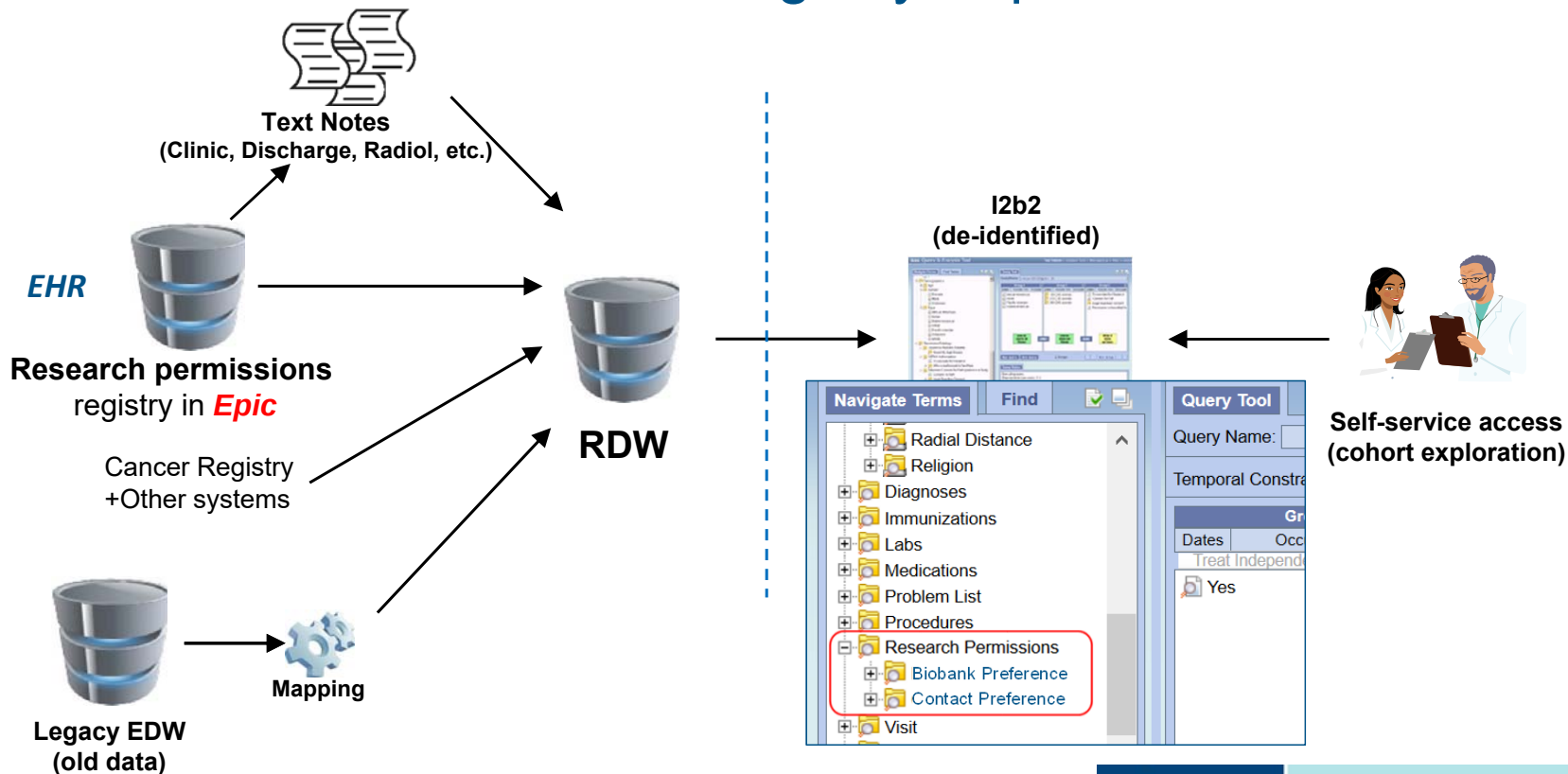
I do not agree to be contacted about future research studies.

I am not ready to make a decision at this time.

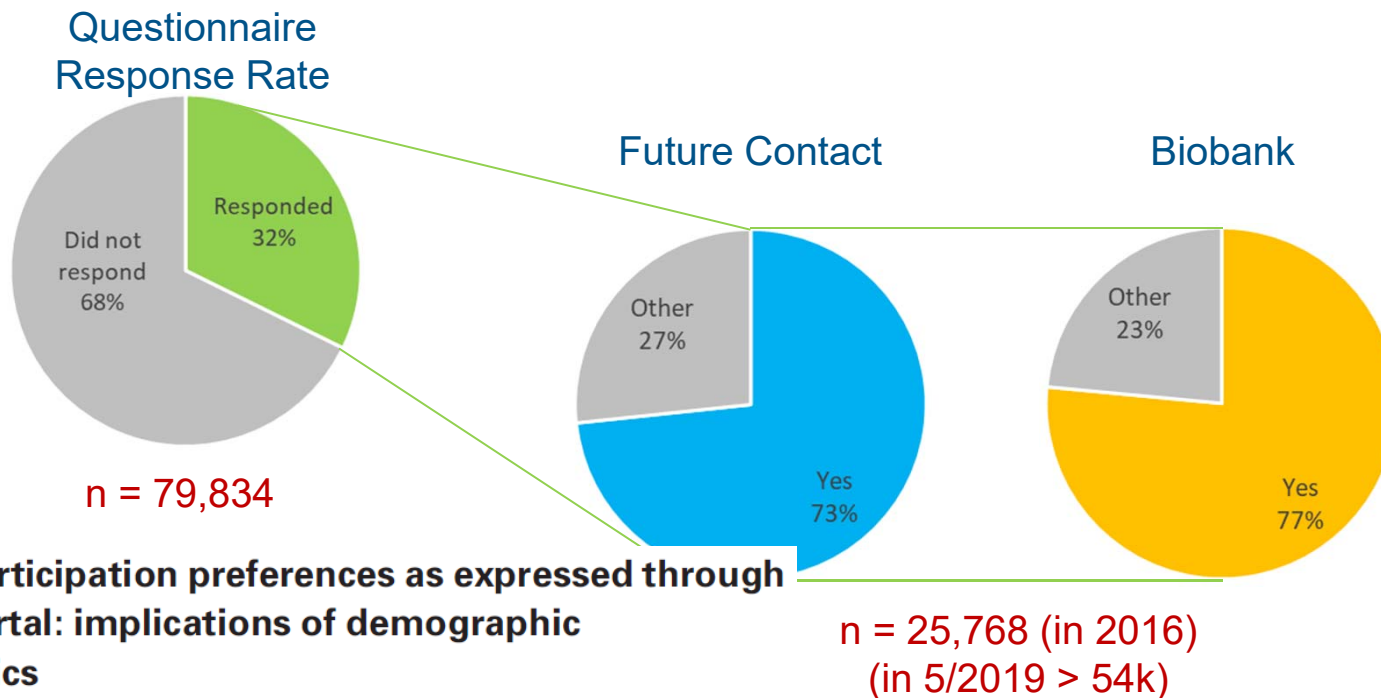
If at any time you would like to update your research preferences, you may modify them from the Questionnaires section...



Research Permissions Registry Expressed in i2b2



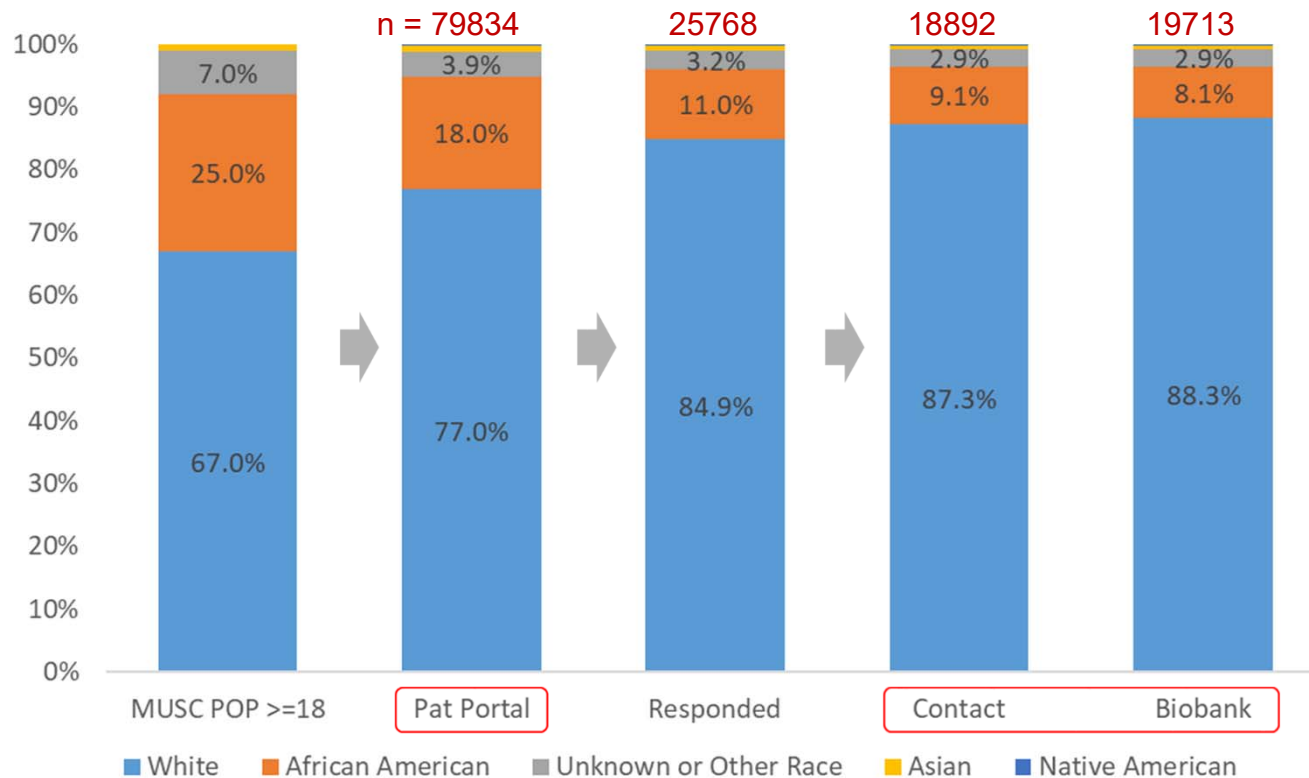
Response Breakdown



Jihad S. Obeid,¹ Azza Shoaibi,¹ Jim C. Oates,^{2,3} Melissa L. Habrat,¹
Chanita Hughes-Halbert,⁴ and Leslie A. Lenert¹

JAMIA Open, 1(2), 2018, 202–209
doi: 10.1093/jamiaopen/ooy034

Race Breakdown: across patient portal and research permissions



Attrition in minorities across the process

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- Electronic Data Capture for research studies:
 - Allows you to construct case report forms (CRF) online
 - Enter data via the web or mobile app
- Allows design of surveys
 - Collect data directly from participants
 - Can send links to specific individuals or via MyChart or online link
- Allows you to import/export data to statistical packages (SAS, R, SPSS) and CSV/Excel
- Easy to share data dictionary
- Secure web interface; Data integrity; Data center security and backup; HIPAA compliance





Example Form

Editing existing Study ID 101

Event Name: **Event 1**

Study ID 101
(To rename this record, modify the value immediately below.)

Study ID 101

Demographics Characteristics

Date subject signed consent

First Name

Last Name

Patient Contact Information

Street, City, State, ZIP

Phone number

Second Phone number

E-Mail

Gender

Has the subject given birth before? ☐ No ☐ Yes

Ethnicity ☐ Hispanic or Latino ☐ NOT Hispanic or Latino ☐ Unknown / Not Reported

Race ☐ Amer. Indian/Alaska Native ☐ Asian ☐ Native Hawaiian or Other Pacific Islander ☐ White ☐ More than one race ☐ Unknown / Not Reported

Date of Birth

Branching Logic

Drag-N-Drop Logic Builder

Displaying field choices for the following data collection instrument:

Demographics

Field choices from other fields
(drag a choice below to box on right)

study_id = (define criteria)
last_name = (define criteria)
first_name = (define criteria)
dob = (define criteria)
sex = Female (0)
sex = Male (1)
address = (define criteria)
phone_number = (define criteria)
problems = a (1)

⇒
Drag
and
Drop
⇒

Show the field **ONLY** if...

- ☒ ALL below are true
☐ ANY below are true

[Clear logic](#)

Save

Cancel





Supports Consent/Assent Forms + electronic signatures

Alternative Procedures:

If you do not want to participate in this study, please inform your counselor and you will continue with typical counseling sessions.

Confidentiality:

All of the information provided in this survey will remain completely anonymous and confidential. All information will be coded with a number so that names will not be present on any of your records. All of your information will be stored securely on password protected computers. Only study personnel will have access to your information unless we learn of clear and imminent danger to you or someone else, reasonable suspicion that a child or elder is currently being abused, or by court order.

Person to Contact:

For more information or to obtain answers to any questions, please contact Dr. Mark Weist, professor at USC and lead for the study at (803)777-0449; weist@mailbox.sc.edu or Research Coordinator, **Name**, **phone number**, **email** at any time. Please also visit our website, **website** link, for more information.

Institutional Review Board:

If you have questions about you or your child's rights in this study, please contact the IRB Manager, Office of Research Compliance, University of South Carolina, 1414D, Columbia, SC 29208, phone: **phone number** or **email**.

Consent:

By signing this form, I confirm that I have read and understand the information provided, I have given the opportunity to ask questions or request more information, and I have voluntarily and that I have the opportunity to withdraw at any time.

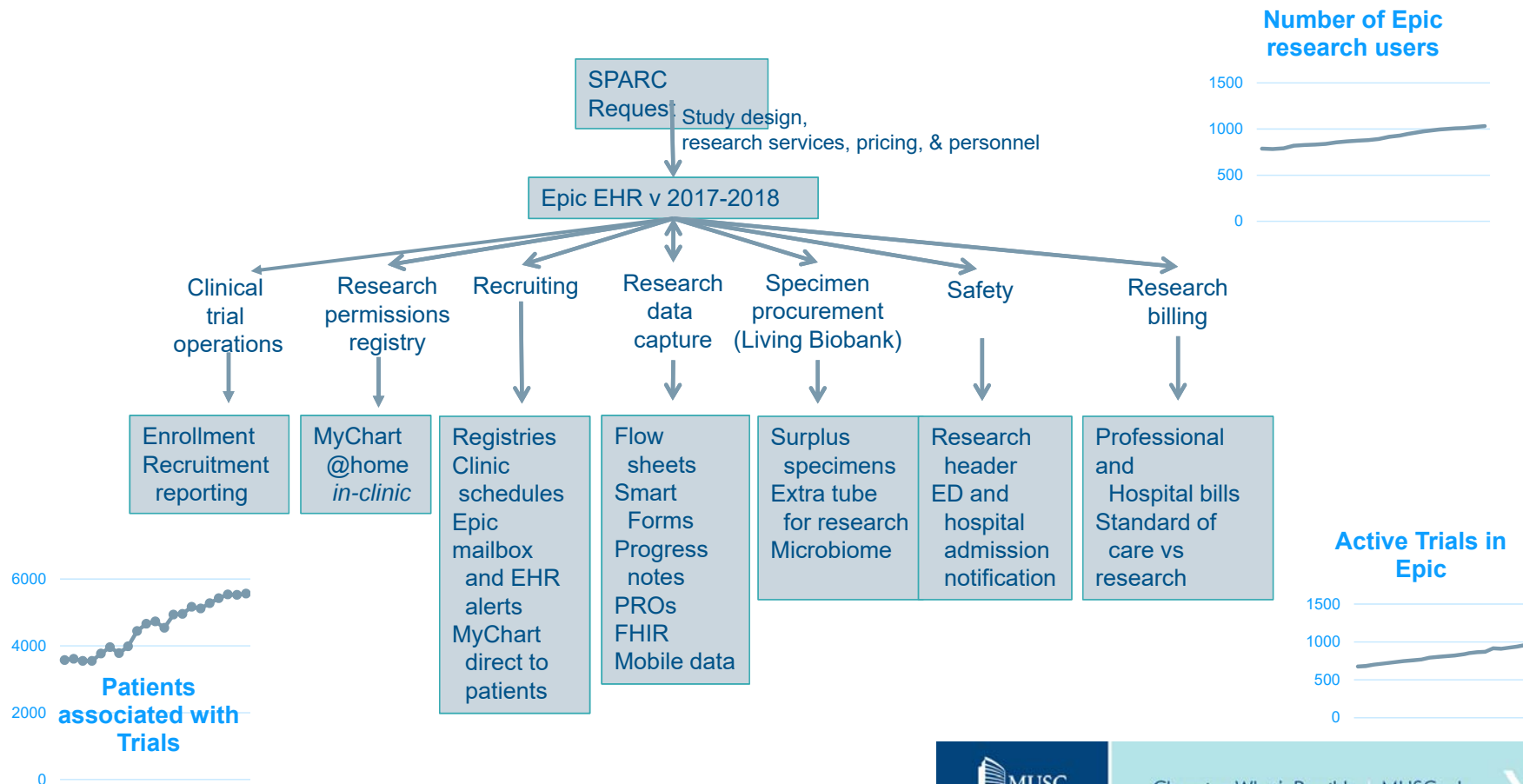


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Epic Research Team



Living Biobank: Specimen/data request submission

New Specimen Request

Protocol Information

Please provide your [Research Master ID](#) so that we can fill in information about your Protocol for you.

Research Master ID *

2761

Could not find a corresponding Protocol. Please fill in the information below to create a new Project

Title *

Increasing Access to Clinical Microbiome Specimens via a Living Biome Bank

Short Title *

Living Biome Bank

Brief Description

Funding Status *

Funded

Funding Source *

Federal

Timeline *

09/30/2019

to

09/30/2020

Primary PI *

Alekseyenko

Request Specimens

Information about creating an i2b2 Query can be found at <http://academicdepartments.musc.edu/bmic/DataRequest.html>

Specimen Source *

Please Select

Please Select

Blood

Nasal Swab

Perianal Swab

i2b2 Query *

Sparc12419-0004_14_Lenert_uncontrolled_diabetes_w_depression

Quantity Requested *

20

Submit for Inquiry

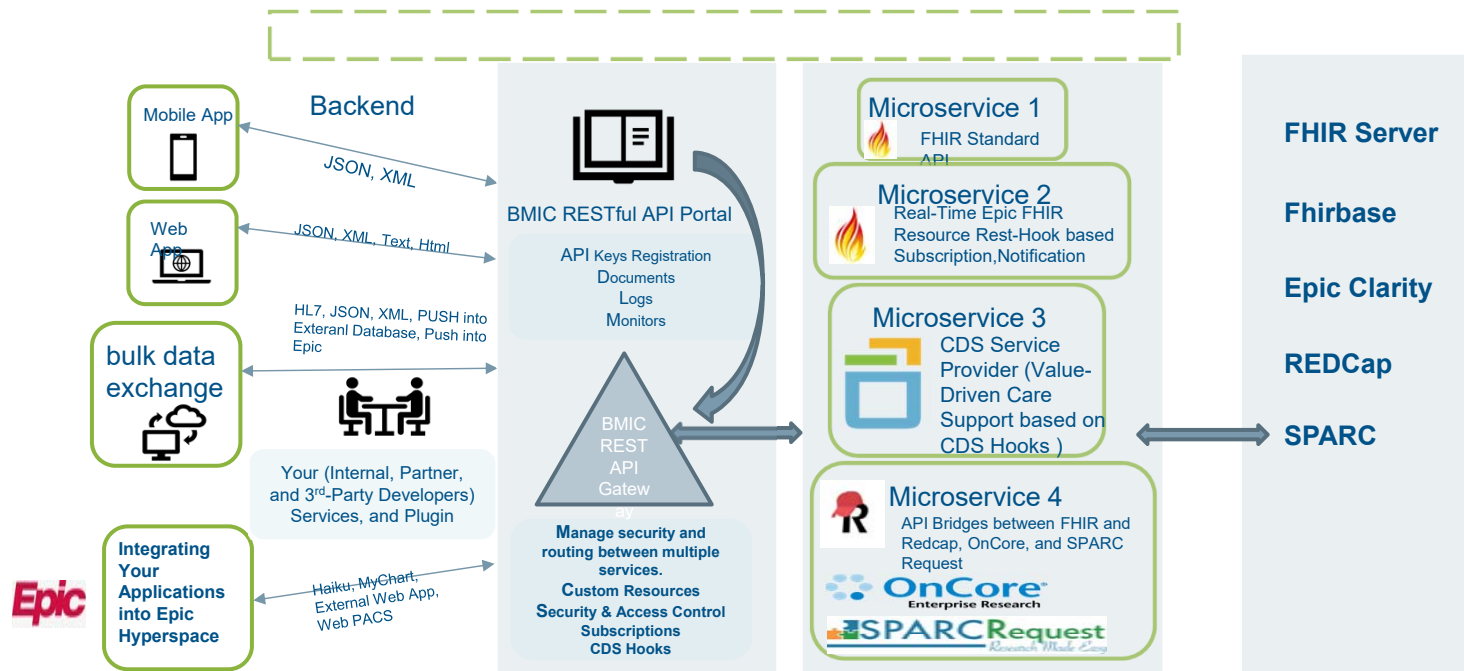
Save as Draft

Close

Medical University
of South Carolina

Changing What's Possible | MUSC.edu

BMIC Gateway Streamlines Two-way Integration with Epic



Patient Reported Outcomes (PRO): e.g HIV/Infectious Disease Clinic PRO

Clinic Screening Questionnaire

Thank you for answering the following questions about your health today. Your doctor will use your responses to better understand how you are doing and how they might best address your health needs.

When was the last time you missed taking any of your HIV medications?

How many days have you missed your HIV medications since your last visit?

Since your last visit in our clinic, how often have you:

had little interest or pleasure in doing things?

felt down, depressed, or hopeless?

had trouble falling or staying asleep, or sleeping too much?

felt tired or had little energy?

had poor appetite or overeaten?

felt bad about yourself, or that you are a failure, or have let yourself or your family down?

had trouble concentrating on things, such as reading the newspaper or watching television?

moved or spoken so slowly that other people could have noticed. Or the opposite, been so fidgety or restless that you have been moving around a lot more than usual?

How often do you have a drink containing alcohol?

How many drinks containing alcohol do you have on a typical day when you are drinking?

How often do you have six or more drinks on one occasion?

- Combination of the PHQ2, a custom medication adherence PRO, and a validated alcohol screening assessment into one streamlined PRO
- Automated send out of assessments through MyChart prior to clinical visit
- In clinic collection of PRO for those that do not use MyChart or complete the PRO ahead of time.



Patient Questionnaire: e.g. IPV Screening Tool

This is a non-production environment. If you are a patient, contact the system administrator immediately. [X]

Healthy Relationships Screening

For an upcoming appointment with **James C. Oates, MD** on 10/16/2019

Because violence is common in many people's lives and can impact health, we would like to ask you a few questions about safety in your relationship. Your answers on this self-report measure will be confidential and no one will take action based upon your responses on this screening without further speaking with you. Your doctor may follow-up with you about the information you provide to ensure your safety.

* Indicates a required field.

* Have you been hit, kicked, punched, pushed, shoved, or otherwise hurt by someone at home in the past year?

* Do you feel safe in your current relationship?

* Is there a partner from a previous relationship who is making you feel unsafe now?

Proceed to next page



Provider Smart Form: e.g. IPV Screening Tool

IPV

Historical QNR Data

Historical Provider...

QNR Response

Documentation

IPV Provider Assessment Smartform

Suggested verbiage for physician

As your doctor, I am concerned about your safety in your relationship. I want you to know that you are not alone and help is available. I do have several questions that may assist me in best being able to help you.

Provider Follow-up Safety Questions

Does your partner have access to a firearm?



Yes

No

Is your partner here at the clinic today?



Yes

No

I am concerned that you are in danger. For your safety do you want me to help you connect to police to make a report and keep you safe?



Yes

No

For your safety do you want me to help you connect to the local domestic violence shelter to hear about ways to stay safe either remaining in the relationship or how to leave is a safe way?



Yes

No

Physical Exam

Was a physical exam performed?

Yes

No

Pt declined

Strangulation Protocol

The pt answered that the strangulation took place within the past week. Examine inside of throat, neck, face, and scalp for physical signs of strangulation document in the physical exam section below.

Was there more than one strangulation attempts within the past week?

Yes

No

Recruitment Reports

Reports

NON-PRODUCTION - SUP

Research: Pro # [redacted] Chart Review - Cohort 1 [redacted] as of Wed [redacted] 3:54 PM

Filters Options Pt Research Studies Chart Encounter Communication Add to List Send Multi-Patient Message Send Recruitment Request More

Refresh Selected Select All

Patient Name	Internal ID	MRN	Age	Patient	DOB	Sex	Race	Ethnicity	Language	ZIP Code	Current Medications
[redacted]			14	[redacted]	[redacted]/2004	Female	Other	Hispanic or Latino [2]	Spanish	[redacted]	ketotifen (ZADITOR) 0.025 % (0.035 %) ophthalmic solution loratadine (CLARITIN) 10 mg tablet
[redacted]				[redacted]	[redacted]/2007	Male	Black or African American	Not Hispanic or Latino [1]	English	[redacted]	(E) a creat HFA mcg/ (QVA cetiri flutic
[redacted]				[redacted]	[redacted]/2004	Male	Other	Hispanic or Latino [2]	Spanish	[redacted]	

Snapshot

Demographics

[redacted] Female 15 y.o.

Problem List

None

Allergies

No Known Allergies

Current Outpatient Medications

ketotifen (ZADITOR) 0.025 % (0.035 %) ophthalmic solution
loratadine (CLARITIN) 10 mg tablet

3256 results found Load All

Research Coordinator Order Sets

The screenshot displays the MUSC EHR interface for a research coordinator. The top navigation bar includes a user profile for 'Zzztest, Qira' and various system links. The main content area is titled '10/16/2019 visit with James C. Oates, MD for Orders Only'. A left sidebar contains navigation options such as 'Snapshot', 'Chart Review', 'Review Flows...', 'Results Review', 'Medications', 'Immunizations', 'Enter/Edit Res...', 'Education', 'Communicatio...', 'Encounter', 'Customize', and 'More'. The 'SmartSets' section is active, showing a list of order sets under the heading 'ORDERS ONLY'. The 'Best Practice' section is highlighted. The 'SmartSets' list includes 'RHU Bursitis' with a 'Click here to select a pharmacy' link and buttons for 'Remove', 'Pend', and 'Sign'. Below this, the 'Documentation' section is expanded, showing 'Diagnoses' with checkboxes for 'Bursitis [727.3]', 'Enthesopathy of ankle and tarsus [726.70]', 'Enthesopathy of elbow [726.30]', 'Enthesopathy of hip region [726.5]', and 'Wrist tendonitis [727.05]'. The 'Labs / Imaging' and 'Medications' sections are also visible, with 'Depo-medrol' and 'methyLPREDNISolone acetate (DEPO-MEDROL) injection 40 mg/mL' listed under 'Medications'. The bottom of the interface features a '+ ADD ORDER' button and a 'SIGN ENCOUNTER' button.

Zzztest, Qira
Pref Name: None

29 y... P... MR... M... Las... Las... Is... *Code... B... L... Alle... L... Primary In... Seconda... P... Phone... Care... M... Referring Pro...
Las... Las... Inf... Advan... R... Unk... Coverage... Pharmac... Pt Ro... Dept/... Sp... Transplants...

10/16/2019 visit with James C. Oates, MD for Orders Only

Images References Media Manager Preview AVS Print AVS Request Outside Records Questionnaires TV Remote

ORDERS ONLY

SmartSets

Reconcile Dispen...
Verify Rx Benefits
Allergies
Progress Notes
Problem List
Visit Diagnoses
Meds & Orders
Therapy Plan 1
Therapy Plan 2

Best Practice

Follow-up
Sign Visit
Routing

SmartSets

Click here to select a pharmacy

RHU Bursitis

Documentation

Diagnoses

Diagnoses

☐ Bursitis [727.3]

☐ Enthesopathy of ankle and tarsus [726.70]

☐ Enthesopathy of elbow [726.30]

☐ Enthesopathy of hip region [726.5]

☐ Wrist tendonitis [727.05]

Labs / Imaging

Medications

Depo-medrol

☐ methyLPREDNISolone acetate (DEPO-MEDROL) injection 40 mg/mL

NSAIDs

Click for more

+ ADD ORDER

SIGN ENCOUNTER

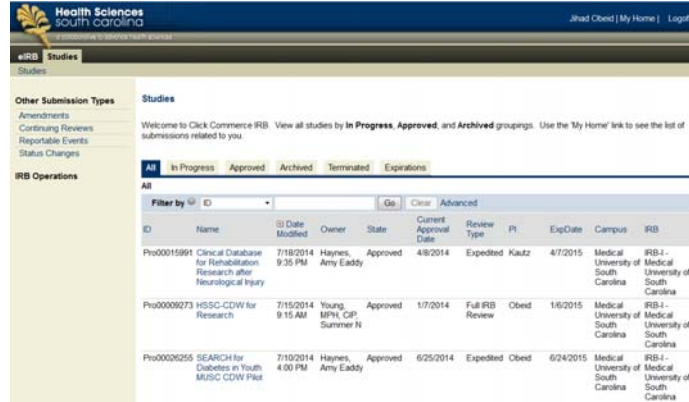


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State-wide IRB Cooperative Review: electronic IRB system (eIRB)



Health Sciences south carolina

Home | My Home | Logout

eIRB Studies

Other Submission Types: Amendments, Continuing Reviews, Reportable Events, Status Changes

IRB Operations

Studies

Welcome to Click Commerce IRB. View all studies by **In Progress**, **Approved**, and **Archived** groupings. Use the 'My Home' link to see the list of submissions related to you.

All In Progress Approved Archived Terminated Expirations

Filter by ID Go Clear Advanced

ID	Name	Q Date Modified	Owner	State	Current Approval Date	Review Type	PI	ExpDate	Campus	IRB
Pro00015991	Clinical Database for Rehabilitation Research after Neurological Injury	7/18/2014 9:35 PM	Haynes, Amy Eaddy	Approved	4/8/2014	Expedited	Kautz	4/7/2015	Medical University of South Carolina	IRB-I - Medical University of South Carolina
Pro00009273	HSSC-CDW for Research	7/15/2014 9:15 AM	Young, MPH, CP Summer H	Approved	1/7/2014	Full IRB Review	Obeid	1/6/2015	Medical University of South Carolina	IRB-I - Medical University of South Carolina
Pro00028255	SEARCH for Diabetes in Youth MUSIC CDW Pilot	7/10/2014 4:00 PM	Haynes, Amy Eaddy	Approved	6/25/2014	Expedited	Obeid	6/24/2015	Medical University of South Carolina	IRB-I - Medical University of South Carolina

Journal of Biomedical Informatics

Volume 60, April 2016, Pages 58-65



IRB reliance: An informatics approach

Jihad S. Obeid ^{a, *}, Randall W. Alexander ^a, Stephanie M. Gentilin ^a, Brigitte White ^a, Christine B. Turley ^b, Kathleen T. Brady ^a, Leslie A. Lenert ^a

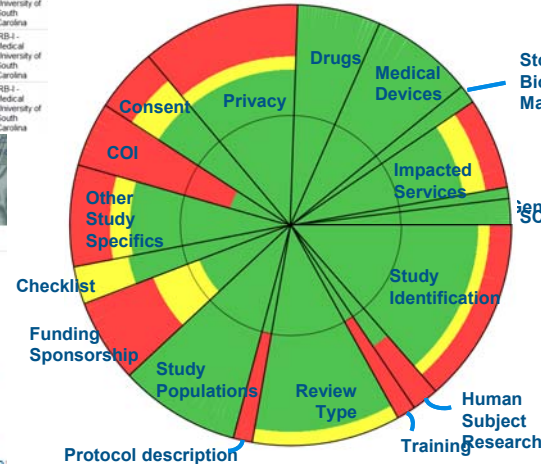
Show more

<https://doi.org/10.1016/j.jbi.2016.01.011>

Under an Elsevier user license

Get rights and

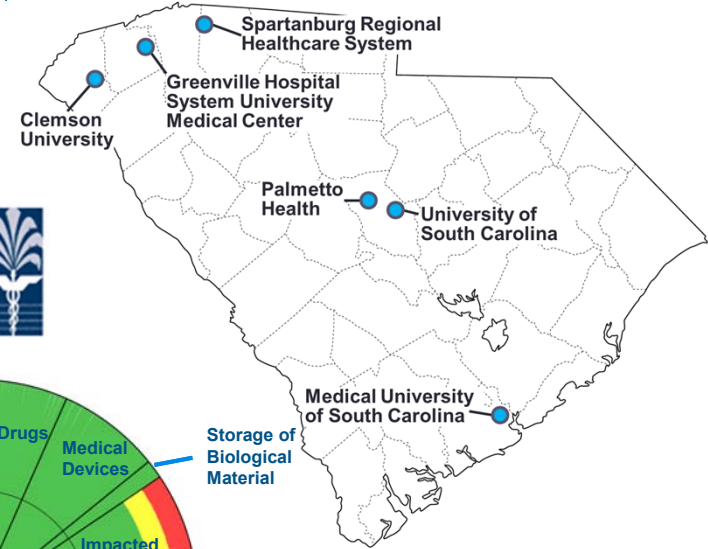
open ar



Storage of Biological Material

General Comments
SCResearch.org

Currently 5 institutions



SCresearch.org

Health Sciences south carolina

Studies

Other Submission Types

- Amendments
- Continuing Reviews
- Reportable Events
- Status Changes

IBS Operations

Studies

Welcome to Click Commerce IBS. View all studies by **In Progress**, **Approved**, and **Archived** groupings. Use the 'My Home' link to see the list of submissions related to you.

Filter by ☐ All ☐ In Progress ☐ Approved ☐ Archived ☐ Terminated ☐ Expirations

ID	Name	State	Owner	Status	Current Approval Date	Review Type	PI	ExpDate	Campus	IBS
Ph00010891	Clinical Database for Rehabilitation Research after Neurologic Injury	7/18/2014 9:35 PM	Haynes, Amy Eaddy	Approved	4/8/2014	Expedited	Kautz	6/7/2015	Medical University of South Carolina	IBS-I
Ph00008273	HSCG CDW for Research	7/15/2014 9:15 AM	Young MPH, CP Summer Is	Approved	1/7/2014	Full IRB Review	Obel	1/6/2015	Medical University of South Carolina	IBS-I
Ph00020255	SEARCH for Diabetes in Youth MUSIC CDW Pilot	7/19/2014 4:00 PM	Haynes, Amy Eaddy	Approved	6/25/2014	Expedited	Obel	6/24/2015	Medical University of South Carolina	IBS-I

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CTSA Clinical & Translational
Science Awards Program



Teleconsent: e-consent over telehealth platform (doxy.me)

Contemporary Clinical Trials Communications

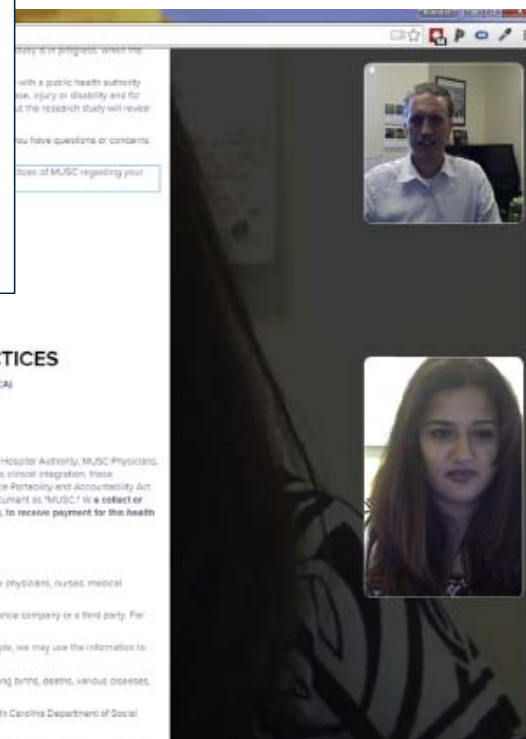
Teleconsent: A novel approach to obtain informed consent for research

Brandon M. Welch ^{a,*}, Elizabeth Marshall ^a, Suparna Qanungo ^b, Ayesha Aziz ^a, Marilyn Laken ^b, Leslie Lenert ^a, Jihad Obeid ^a

^a Biomedical Informatics Center, Medical University of South Carolina, 135 Cannon St, Suite 405, Charleston, SC, 29425, United States

^b College of Nursing, Medical University of South Carolina, 99 Jonathan Lucas St, Charleston, SC, 29425, United States

Grant number:
R21TR002088



Digital Health Solutions (DHS)



EHR & HIE Interoperability

DHS has cutting edge solutions to advance the semantic interoperability and standards-based health information technology systems allowing for critical and successful healthcare reform within digital health landscape.



Sachin Patel



Palmetto Profiles: Research Networking System

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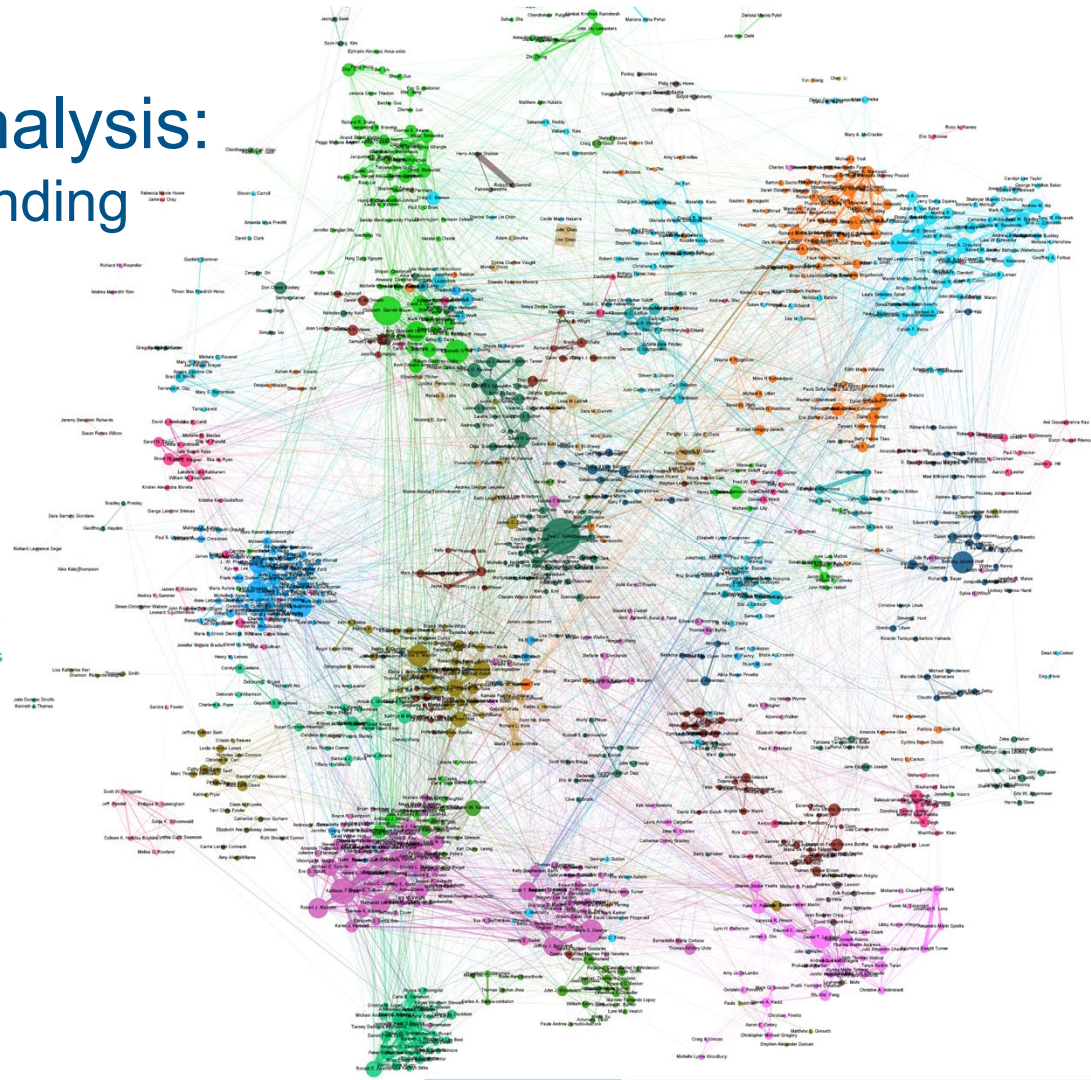
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May BE, Heidenreich P, Bolton D, Heavrin L, et al. Academic Profiles: A System for Medical Education

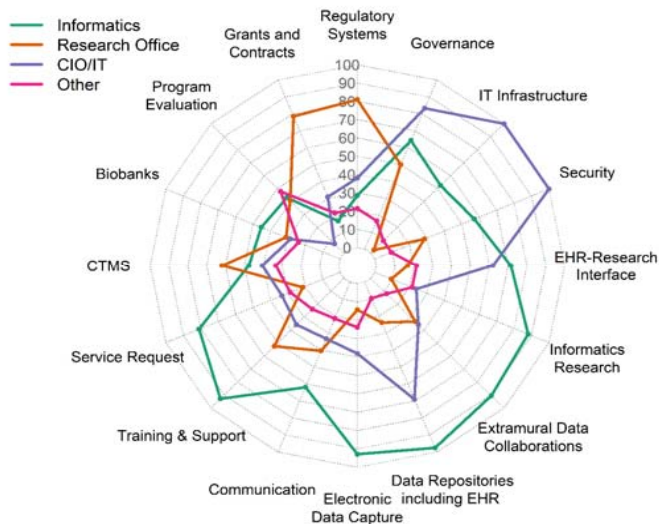
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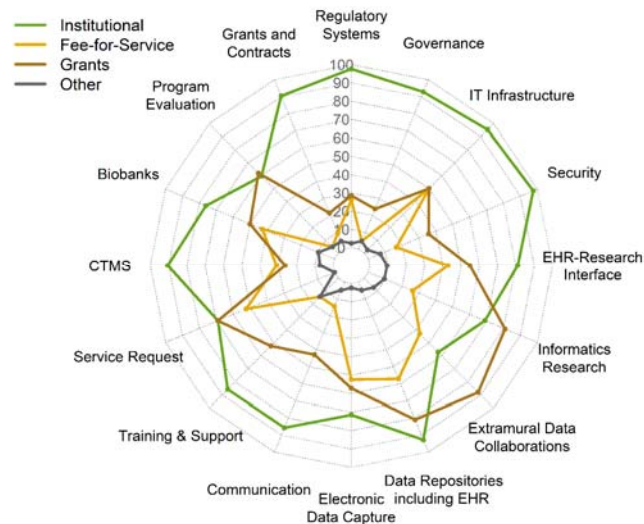
Research Network Analysis: Impact of CTSA & Pilot Funding (Based on RNS data)



Similar Infrastructure Across the Country: CTSA Survey



a. Locus of Control



b. Sustainability Model

Obeid JS, Tarczy-Hornoch P, Harris PA, Barnett WK, Anderson NR, Embi PJ, Hogan WR, Bell DS, McIntosh LD, Knosp B, Tachinardi U, Cimino JJ, Wehbe FH. Sustainability considerations for clinical and translational research informatics infrastructure. *J Clin Transl Sci.* 2018 Oct; 2(5):267-275. PMID: 30828467.



Outline

- Biomedical Informatics for Translational Research
- EHR Data for Research
- Research Permissions
- Data Capture
- Epic Services
- Other Informatics Tools and Services
- **Data Science Research and Education**



Informatics and Data Science Research

- › K07 CA211786 (Family History Data Capture)
- › 3UL1 TR001450-03S2 (Multisite e-IRB)
- › R21 TR002088 (Teleconsent for Remote Research)
- › R18 HS025654-01A (Pragmatic EHR-based trial of IPV screening)
- › R21 LM012945 (Intelligent Summarization of EHR records for IPV risk)
- › R21 TR002513 (Living Biobank: Microbiome specimens)
- › UL1 TR001450-04S1 (CTMS implementation)
- › K12 DA031794 (Zhu, Opioid abuse identification using NLP)
- › UL1 TR001450-04S2 (Cloud implementation SparcRequest)
- › U01 TR002628-01A1 (Opioid Overdose Network)
- › PCORI Improving Natural Language Processing Methods (NLP)
- › +Several Collaborative Grants



EHR Phenotyping: Machine Learning & Text Classification

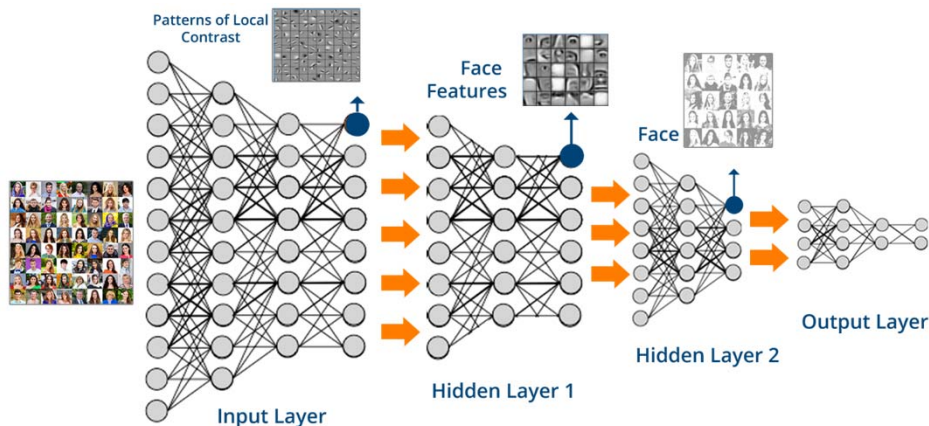
Examples outside healthcare industry:

- Sentiment analysis: e.g. book reviews
- Spam detection



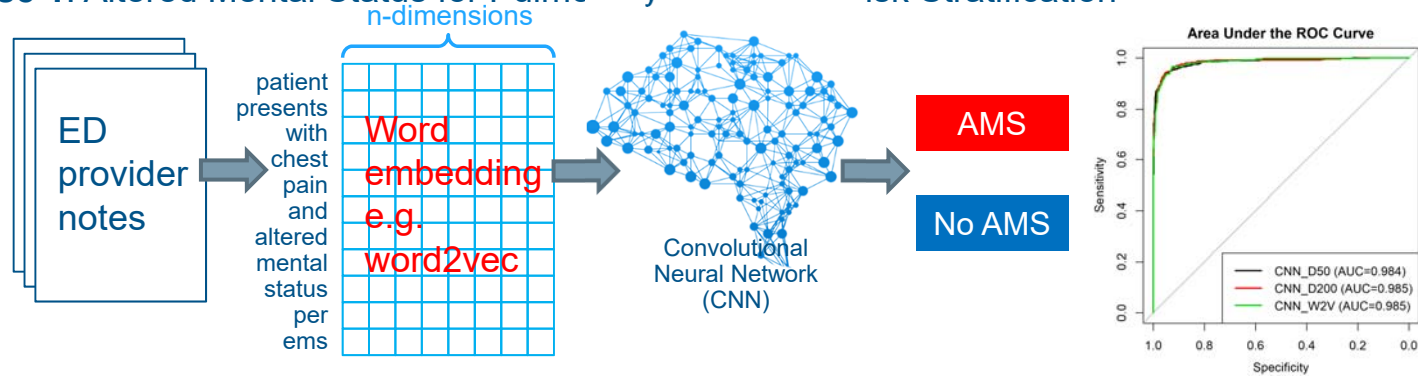
Machine learning:

- Traditional bag-of-words (BOW) models based on word frequencies
- More recently using deep learning classifiers

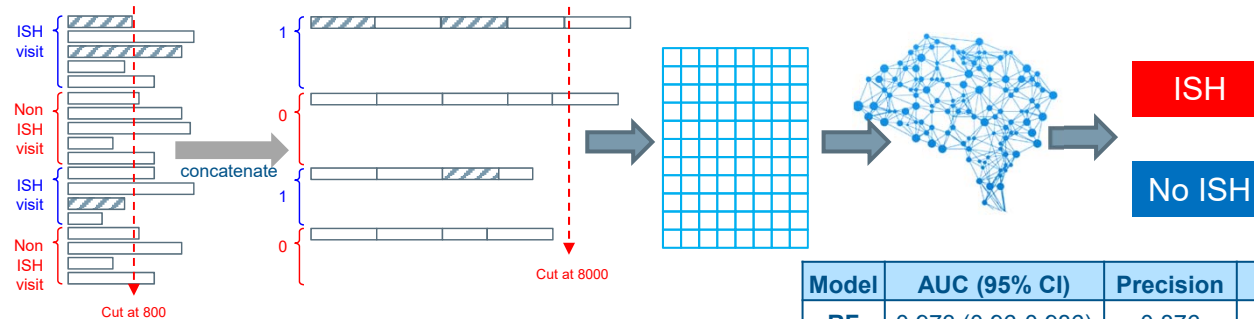


EHR Phenotyping using Deep Learning Text Classifiers

Use case 1: Altered Mental Status for Pulmonary Embolism Risk Stratification



Use case 2: Suicide Attempts (ISH=intentional self harm) ICD codes



Model	AUC (95% CI)	Precision	Recall	F1
RF	0.973 (0.96-0.986)	0.876	0.904	0.890
CNN	0.988 (0.981-0.996)	0.950	0.916	0.933

Can we predict Suicide Attempts before occurrence in EHR?

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Overview

Training in clinical research for health care professionals

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1. Conduct a comprehensive and systematic review of the literature
2. Formulate a well-defined clinical or translational research question
3. Select an appropriate study design to address a clinical or translational research question
4. Compute, describe, and evaluate descriptive and inferential statistics appropriate to the chosen study design
5. Apply ethical codes and professional standards for the conduct of clinical and translational research

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MCR 746-01 Informatics and Data Management for Clinical Research

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