



IDeA States  
Pediatric Network



# Leveraging the OUHSC Clinical Research Data Warehouse to Inform Research & Practice

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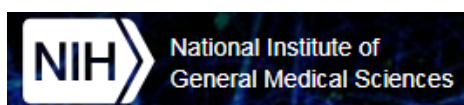
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Biomedical & Behavioral Methodology Core (BBMC)

November 2024

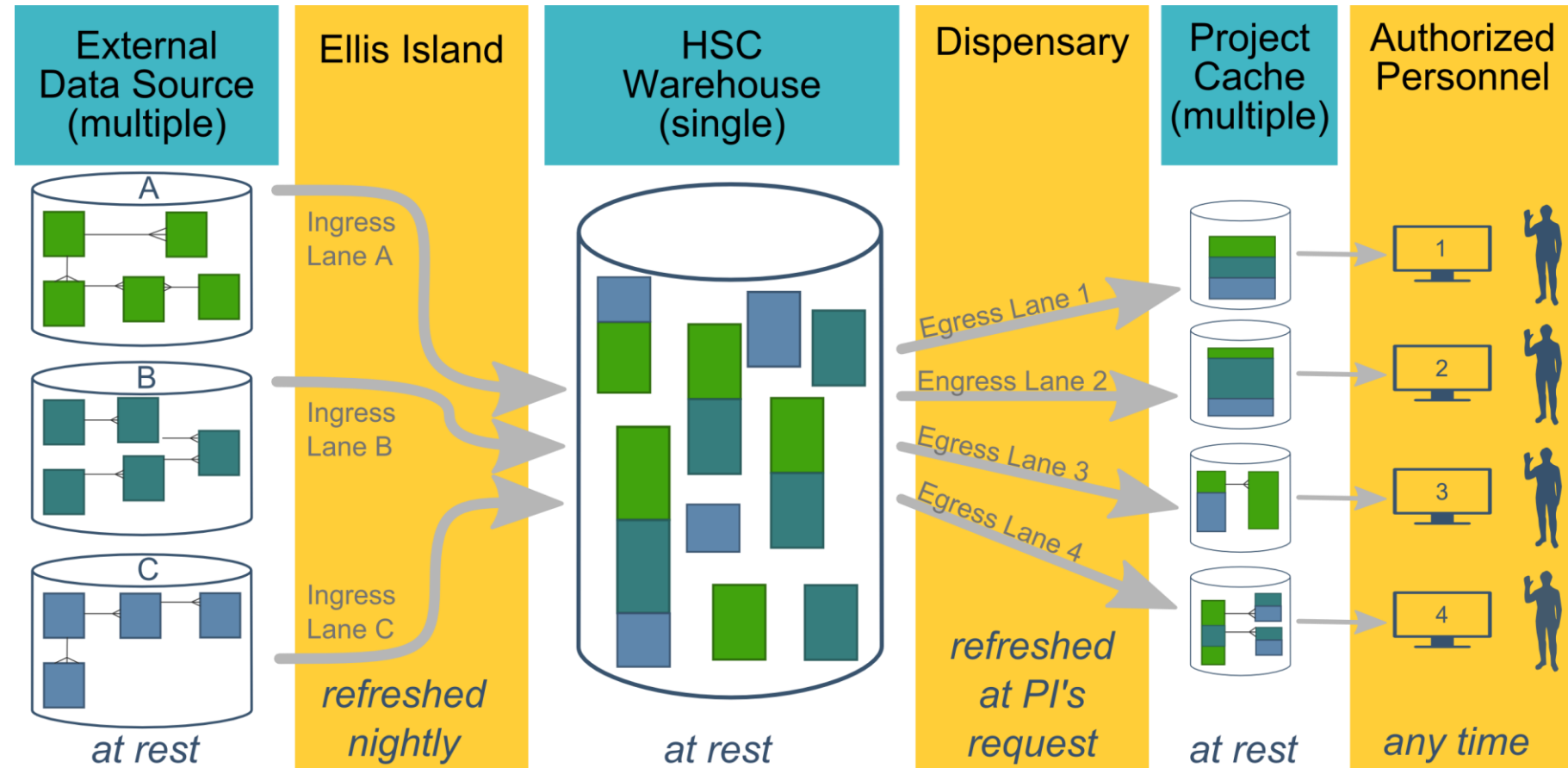
Award Numbers:  
UG1OD024950  
U54GM104938



# CRDW (Clinical Research Data Warehouse)

<https://github.com/OuhscBbmc/prairie-outpost-public>

## Ecosystem Architecture



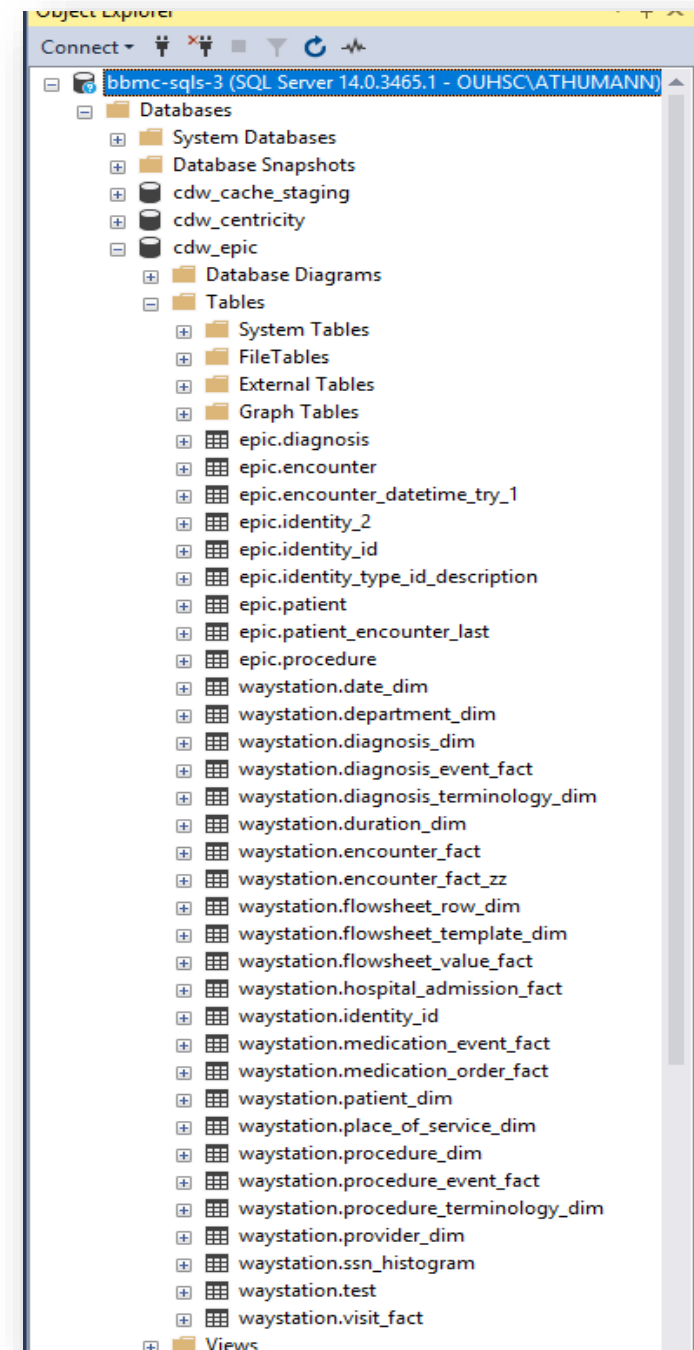
- **Data Source** (column 1): contains unique info
- **Warehouse** (column 3): contains copy after manipulation
- **Project Cache** (column 5): transformed to facilitate analyses of a specific research project

# *HSC Data Sources*

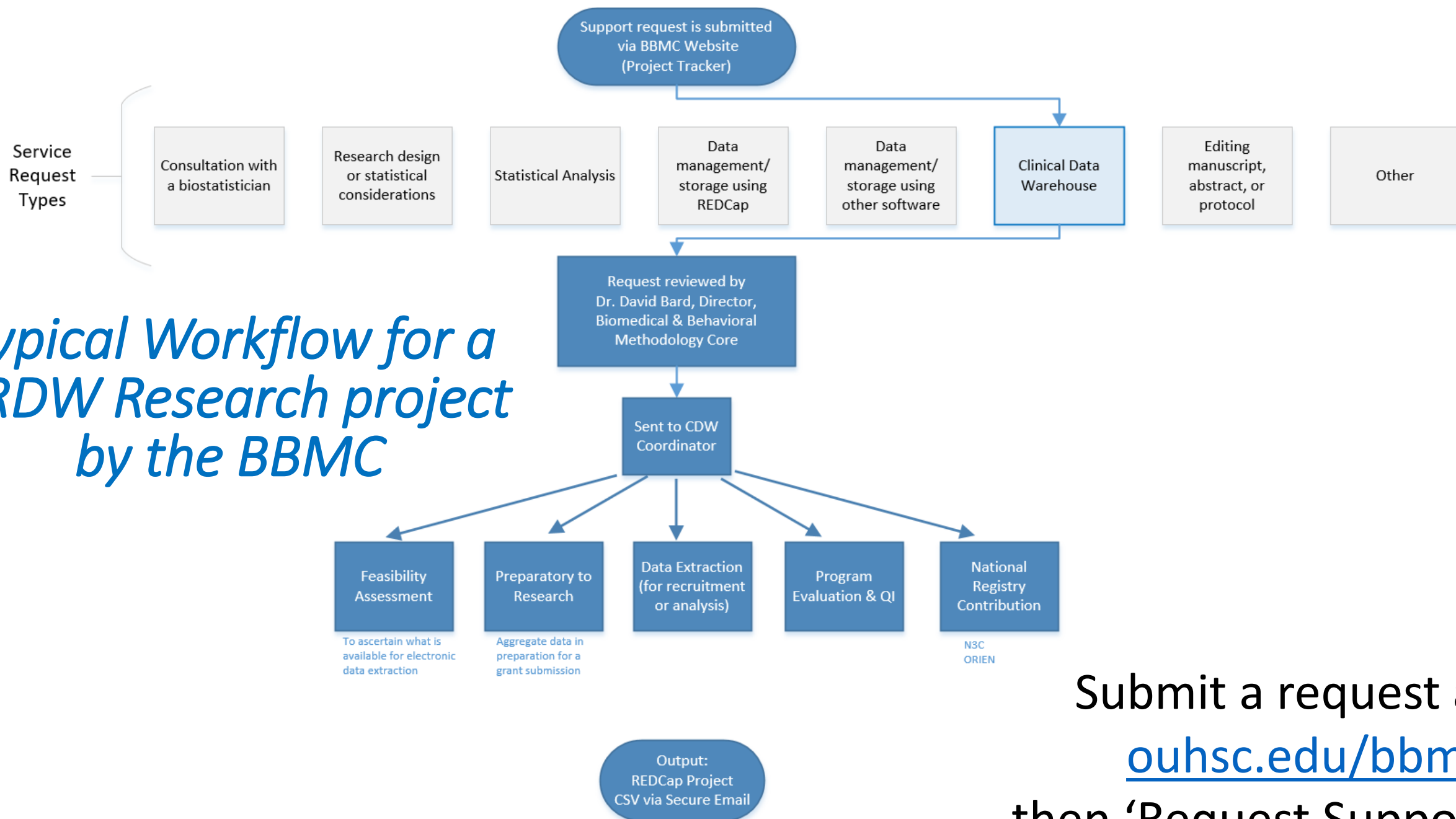
- Patient
  - Epic (we have the basics, and will be adding for a while)
  - Legacy Outpatient (Centricity)
  - Legacy Billing and Claims Data (GECB)
  - Legacy Inpatient (Meditech)
  - Dozens of departmental sources
  - Biomedical Research Data
- Provider
- External Agencies
  - Service Provided (by the Health Dept of Oklahoma)
  - Child Protective Services (Oklahoma Dept of Human Services)
  - Immunization (Health Dept of Oklahoma)
  - Vital Records (Health Dept of Oklahoma)
  - ...
  - Multi-state collaborations (in the future)
- Administrative Cost
- Employee & Student

# Integration of Epic

- Current Tables – automatically updated nightly
  - Patient
  - Diagnosis
  - Encounter
  - Procedure
  - Medication
  - Flowsheet
  - Labs
  - Orders
  - Immunizations
  - Dozens more



# Typical Workflow for a CRDW Research project by the BBMC

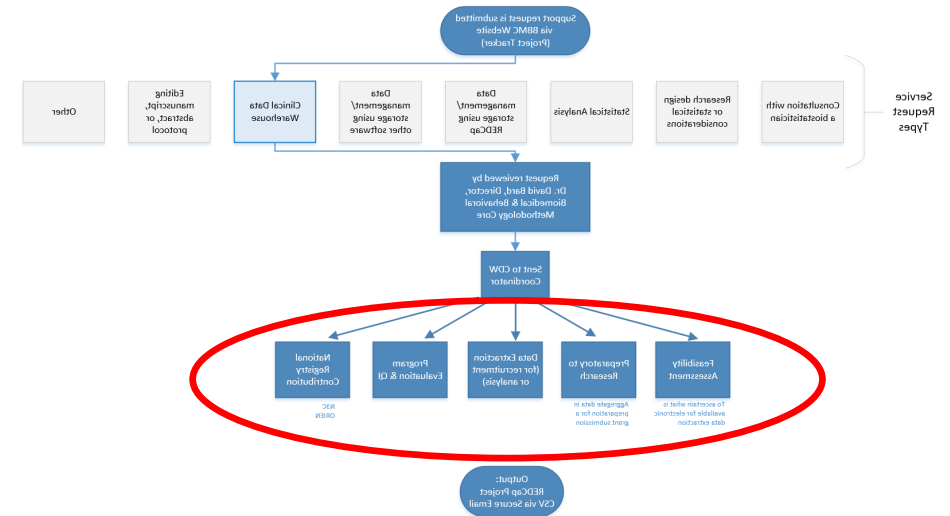


Submit a request at:  
[ouhsc.edu/bbmc/](https://ouhsc.edu/bbmc/)  
then 'Request Support'

# *Two Definitions of “QI” –depends on your audience*

- There are two campus groups who query Epic & the EMRs
    - OUHSC has the BBMC (ie, us)
    - OUH has the DnA group (“Data and Analytics”, also known as “Health Informatics”)
  - “QI with intent to publish or present”
    - Routes to the OUHSC group
      - Go to <https://ouhsc.edu/bbmc/> and click “Request BBMC Services”
    - Applies to most of your resident research projects
    - Typically has an IRB approval or IRB exemption letter
  - “QI to improve an internal process (with no intent to publish)”
    - Routes to the OUH group
      - Go to <https://ouhealth.service-now.com/> (with your OUH account)
- No IRB approval is required for internal QI
- Human subjects aren’t involved; data will not be shared outside OU

- **Feasibility assessment in preparation for research**  
(20% of projects; 10% of CRDW staff time)
- **Static eligibility**  
(70% of projects; 20% of CRDW staff time)
  - Virtually all projects require identification of a patient pool
- **Rolling eligibility**  
(30% of projects; 30% of CRDW staff time)
  - Remember study team's assessment of eligibility as well as response
  - Daily automation requires stability & good logging;  
*e.g.*, a 3 hour delay might mean zero subjects are enrolled
- **Clinical outcomes for retrospective investigations**  
(50% of projects; 30% of CRDW staff time)
- **Administrative outcomes for quality improvement**  
(10% of projects; 2% of CRDW staff time)
- **Program evaluation**  
(20% of projects; 8% of CRDW staff time)





ββMC

First go to:

<https://ouhsc.edu/bbmc/>



Then  
click

HOMEPAGE

REQUEST BBMC  
SERVICES

REDCAP

BBMC TEAM  
MEMBERS

CLINICAL RESEARCH  
DATA WAREHOUSE

FIND US ON GITHUB

STATISTICAL  
COMPUTING USER  
GROUP (SCUG)

## Biomedical & Behavioral Methodology Core

The BBMC mission is to support and enhance study design, data capture, and analytics for academic research.

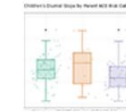
Established in 2013, BBMC is a collaboration with [College of Medicine - Department of Pediatrics](#), [Department of Biostatistics and Epidemiology](#), and [College of Public Health](#). Our team is comprised of biostatisticians and experienced researchers. The Core offers a variety of support services for projects at any stage of development.

In addition to the consultation services our team provides, many members of the team continue to lead their own research studies within their own departments. BBMC is home to the EmBRACER Center and has close affiliations with the Child Study Center and the Center on Child Abuse and Neglect (both within OU Pediatrics).

BBMC also provides general and advanced research training opportunities for researchers at all levels of experience. If you would like to receive methodology support, including statistics consultation, project design help, or database support, please submit a request [here](#) for a free one-hour consult with a member of our team.

For general inquiries about BBMC, please reach out to us at [bbmc@ouhsc.edu](mailto:bbmc@ouhsc.edu).

## Expertise



**Biostatistician Support:** Our team has several faculty and staff biostatisticians with specialized expertise in Pediatric research, quantitative methods, Bayesian statistics, genetics, and much more.



**Research Support:** We can help with planning for sample size, analytics, protocol writing, and consulting on project aims. We can also help with manuscripts, reviewing publications, as well as mentoring and graduate committee memberships.



**Database management:** We are the campus maintainers of REDCap. Our Clinical Research Data Warehouse



Then “Yes”  
to CRDW

# BBMC Research Support Request

~~~ Welcome! ~~~

Please provide us with information about you, your project, and the services being requested.

NOTICE: If you were directed to fill out this form by **ORA** or as part of a **Data Use Agreement**, please use this form instead: [https://redcap.link/cricoc\\_review](https://redcap.link/cricoc_review)

Date Submitted 2022-06-07 Y-M-D

The Principal Investigator is ultimately responsible for this project:

| Contact   | First Name | Last Name | Role on Project        | Email | Phone |
|-----------|------------|-----------|------------------------|-------|-------|
| PI        |            |           | Principal Investigator |       |       |
| Secondary |            |           |                        |       |       |

If the PI belongs to a non-college entity such as Stephenson Cancer Center, please select **None** for the College and enter the organization's name under Department.

| PI's College | PI's Department (if applicable) | PI's Section (if applicable) |
|--------------|---------------------------------|------------------------------|
|              |                                 |                              |

~~~ Please tell us about your project ~~~

Project Title

\* must provide value

Expand

Does this request include **BBMC CRDW** retrieval of electronic medical records (such as Centricity, Meditech, etc.)?

Yes

No

reset

Please provide at least one study aim (if applicable):

|             |                      |
|-------------|----------------------|
| Study Aim 1 | <input type="text"/> |
|-------------|----------------------|

Expand

|             |                      |
|-------------|----------------------|
| Study Aim 2 | <input type="text"/> |
|-------------|----------------------|

Expand

|             |                      |
|-------------|----------------------|
| Study Aim 3 | <input type="text"/> |
|-------------|----------------------|

Expand

This project has:

An IRB protocol being written

A submitted IRB protocol

An approved IRB protocol

No need for an IRB-approved protocol or the project is exempt

reset

~~~ The following table asks which services you are requesting. ~~~

**Please note:** Requests for data from the Clinical Research Data Warehouse (electronic health records) typically take 4-6 weeks to complete and are prioritized by date submitted, funding source, IRB status, etc.

| Service Requested     | Short Description | Date Needed | Add Another Service                                                  |
|-----------------------|-------------------|-------------|----------------------------------------------------------------------|
|                       |                   |             | <input type="button" value="Yes"/> <input type="button" value="No"/> |
| <a href="#">reset</a> |                   |             |                                                                      |

Do you have an existing BBMC contact person for this request?

Yes

No

reset

~~~ Please answer the following questions. ~~~

Your answers will help the BBMC team and governance board to (1) prioritize your project, (2) justify the funding to provide these services, and (3) describe our impact on campus research.

This project is currently funded.

\* must provide value

Yes

No

reset

The BBMC must report to our funding sources on the kinds of projects we have supported. The availability of our services depends on your answers. Please choose all categories that fit your project. Underlined phrases have pop-up balloons with definitions.

This project involves ...

|   |                                    |  |                       |
|---|------------------------------------|--|-----------------------|
| Quality improvement                             | <input type="button" value="Yes"/> | <input checked="" type="button" value="No"/> | <a href="#">reset</a> |
| Scientific research                             | <input type="button" value="Yes"/> | <input checked="" type="button" value="No"/> | <a href="#">reset</a> |
| Other scholarly activity for future publication | <input type="button" value="Yes"/> | <input checked="" type="button" value="No"/> | <a href="#">reset</a> |
| Program evaluation                              | <input type="button" value="Yes"/> | <input checked="" type="button" value="No"/> | <a href="#">reset</a> |
| Academic activities                             | <input type="button" value="Yes"/> | <input checked="" type="button" value="No"/> | <a href="#">reset</a> |
| Business analytics                              | <input type="button" value="Yes"/> | <input checked="" type="button" value="No"/> | <a href="#">reset</a> |
| Health economics                                | <input type="button" value="Yes"/> | <input checked="" type="button" value="No"/> | <a href="#">reset</a> |
| Health systems                                  | <input type="button" value="Yes"/> | <input checked="" type="button" value="No"/> | <a href="#">reset</a> |
| Dissemination/implementation science            | <input type="button" value="Yes"/> | <input checked="" type="button" value="No"/> | <a href="#">reset</a> |
| Outcomes research                               | <input type="button" value="Yes"/> | <input checked="" type="button" value="No"/> | <a href="#">reset</a> |
| Feasibility assessment                          | <input type="button" value="Yes"/> | <input checked="" type="button" value="No"/> | <a href="#">reset</a> |
| Preparatory to research                         | <input type="button" value="Yes"/> | <input checked="" type="button" value="No"/> | <a href="#">reset</a> |
| Data extraction for recruitment or analysis     | <input type="button" value="Yes"/> | <input checked="" type="button" value="No"/> | <a href="#">reset</a> |
| National registry contribution                  | <input type="button" value="Yes"/> | <input checked="" type="button" value="No"/> | <a href="#">reset</a> |
| Retrospective chart review                      | <input type="button" value="Yes"/> | <input checked="" type="button" value="No"/> | <a href="#">reset</a> |

Please explain how you would categorize your project that may be

Then “CRDW”  
Service  
Reuquested

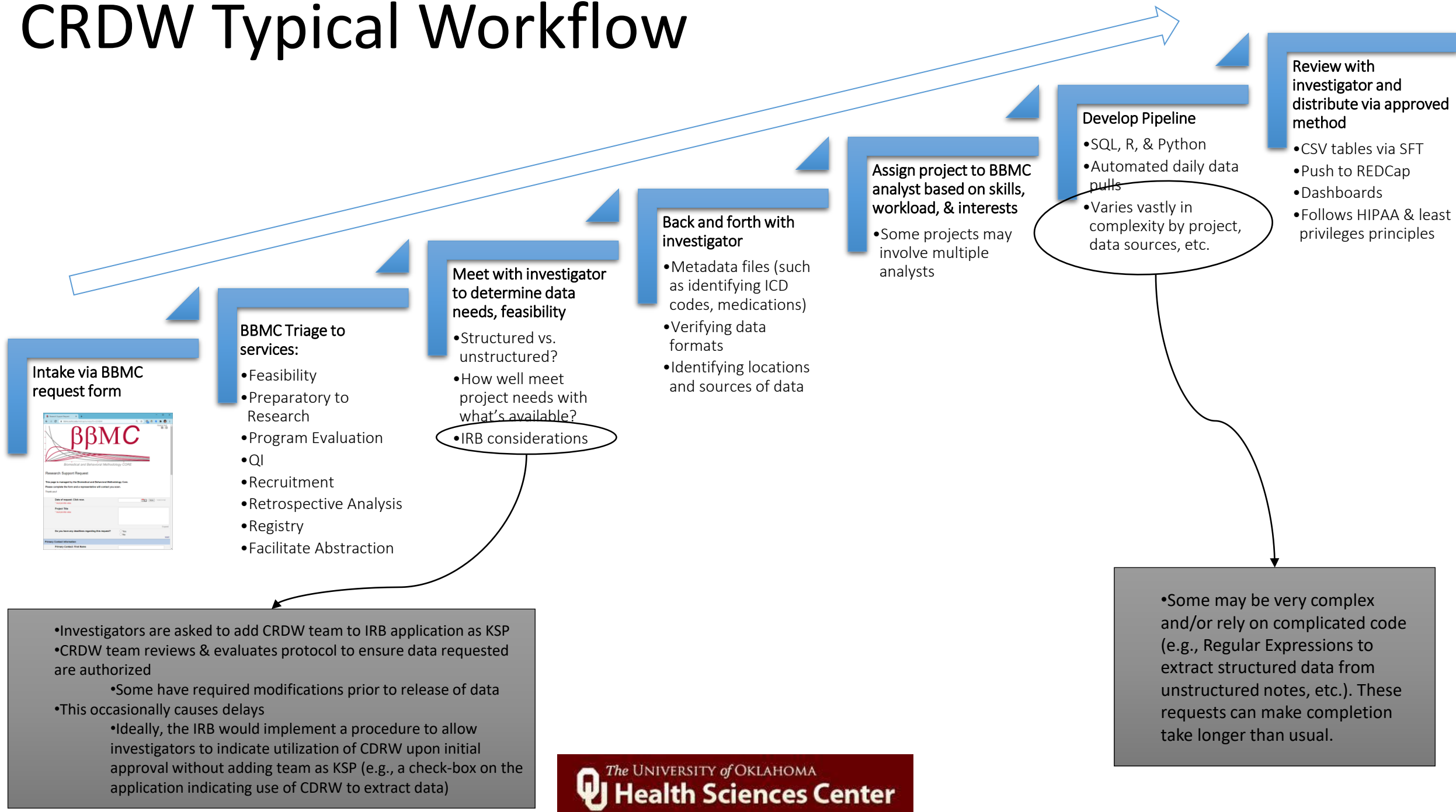
# *Timeline for Basic Requests*

We strongly recommend that you submit your request to CRDW before the IRB.

1. We can help with the IRB language and avoid some of the common reasons the IRB rejects your initial application
2. We need 6+ weeks for basic requests. It doesn't take us 6 weeks, but we have a lot of people asking for data. Please don't initially approach us a week before your research month begins.

There are a few cycles of communication between you and us (such as metadata files that specify the inclusion criteria meds and dxs).

# CRDW Typical Workflow



# Data Formats

## Structured (easier)

- Patient demographics
- Problem list or billed diagnoses (ICD-10)
- Visits/encounters
- Medications (GPI, RxNorm, NDC)
- Most lab results (LOINC), but some are like this:

```
demo-for-presentation.md
1 Patient: TEST A PATIENT
2 ID: HCA_MIC E123456789
3 Note: All result statuses are Final unless otherwise noted.
4
5 Tests: (1) SARS-CoV-2 PCR (NASAL)
6 | SARS-CoV-2 PCR | See Below | *1
7 | SARS-CoV-2 PCR(F) | Coll Date/Time: 08/30/2021 10:05
8 | | | Ver Date/Time: 08/31/2021 04:55
9 | SOURCE: NASAL
10 | SPEC DESC: (NOT SPECIFIED)
11
12 | VIROLOGY PCR
13 | Not Detected
14
15 Tests: (2) METHOD PCR: (NASAL)
16 | METHOD PCR: See Below | *2
17
```

**Saved to the flowsheet**

**Has to be parsed out with regexes and programming (and funding)**

## Unstructured (harder)

- Diagnoses entered in the past medical history
- Symptoms in HPI
- Histories
- Full notes
- Some lab results
- Radiology & pathology reports

Meditech's History & Physical Note  
(concatenated if a visit has multiple hpppd notes by "----- new hpppd note -----").

OU MEDICAL CENTER (COCN)

History Physical

REPORT#

DATE Time:

PATIENT: UNIT No.

ACCOUNT# ROOM:

REPORT AUTHOR:

\*\*See Addendum\*\*

Ped Standard H&P

History And Physical

Primary Care Physician

Primary Team: Red

History and Physical

Chief Complaint: increased work of breathing

History Of Present Illness:

## *Encouraging Secure Data Practices*

Our goal is to deliver the data extracts to researchers in a way that makes it easy for them to follow best practices.

Delivery of PHI, depending on the dataset and researcher

- SFT for one-time transfers
- OU file servers for recurring transfers
- REDCap for recruiting projects (users manually enter data as we refresh info daily)
- Never email

Common mitigations include

- Withholding PHI fields
- Obfuscating PHI fields (*e.g.*, birth year instead of birth date)
- Pre-calculating fields to avoid PHI (*e.g.*, we calculate the age at visit, instead of sending visit & birth dates)

# Using Metadata to Transfer your Clinical Knowledge into the Workflow

The CRDW team requests specific codes (eg, ICDs). The typical steps are

1. You send us some keywords (eg, “ventricular” and “heart”)
2. We *sweep* the code list and send you ~100 possibilities.
3. You *specify* the ~30 exact codes that reflect the inclusion criteria
4. Some projects also use a “category” variable (eg, “acute” vs “chronic” failure)

| 1  | concept_id | vocabulary_id | icd_code | icd_description                                      | desired | category | comments |
|----|------------|---------------|----------|--|---------|----------|----------|
| 2  | [35207792] | ICD10CM       | [I50.1]  | Left ventricular failure, unspecified                | TRUE    | cardiac  |          |
| 3  | [1569179]  | ICD10CM       | [I50.2]  | Systolic (congestive) heart failure                  | TRUE    | cardiac  |          |
| 4  | [45586587] | ICD10CM       | [I50.20] | Unspecified systolic (congestive) heart failure      | TRUE    | cardiac  |          |
| 5  | [45543182] | ICD10CM       | [I50.21] | Acute systolic (congestive) heart failure            | TRUE    | cardiac  |          |
| 6  | [45576878] | ICD10CM       | [I50.22] | Chronic systolic (congestive) heart failure          | TRUE    | cardiac  |          |
| 7  | [45567180] | ICD10CM       | [I50.23] | Acute on chronic systolic (congestive) heart failure | TRUE    | cardiac  |          |
| 8  | [1569180]  | ICD10CM       | [I50.3]  | Diastolic (congestive) heart failure                 | TRUE    | cardiac  |          |
| 9  | [45601038] | ICD10CM       | [I50.30] | Unspecified diastolic (congestive) heart failure     | TRUE    | cardiac  |          |
| 10 | [45548022] | ICD10CM       | [I50.31] | Acute diastolic (congestive) heart failure           | TRUE    | cardiac  |          |



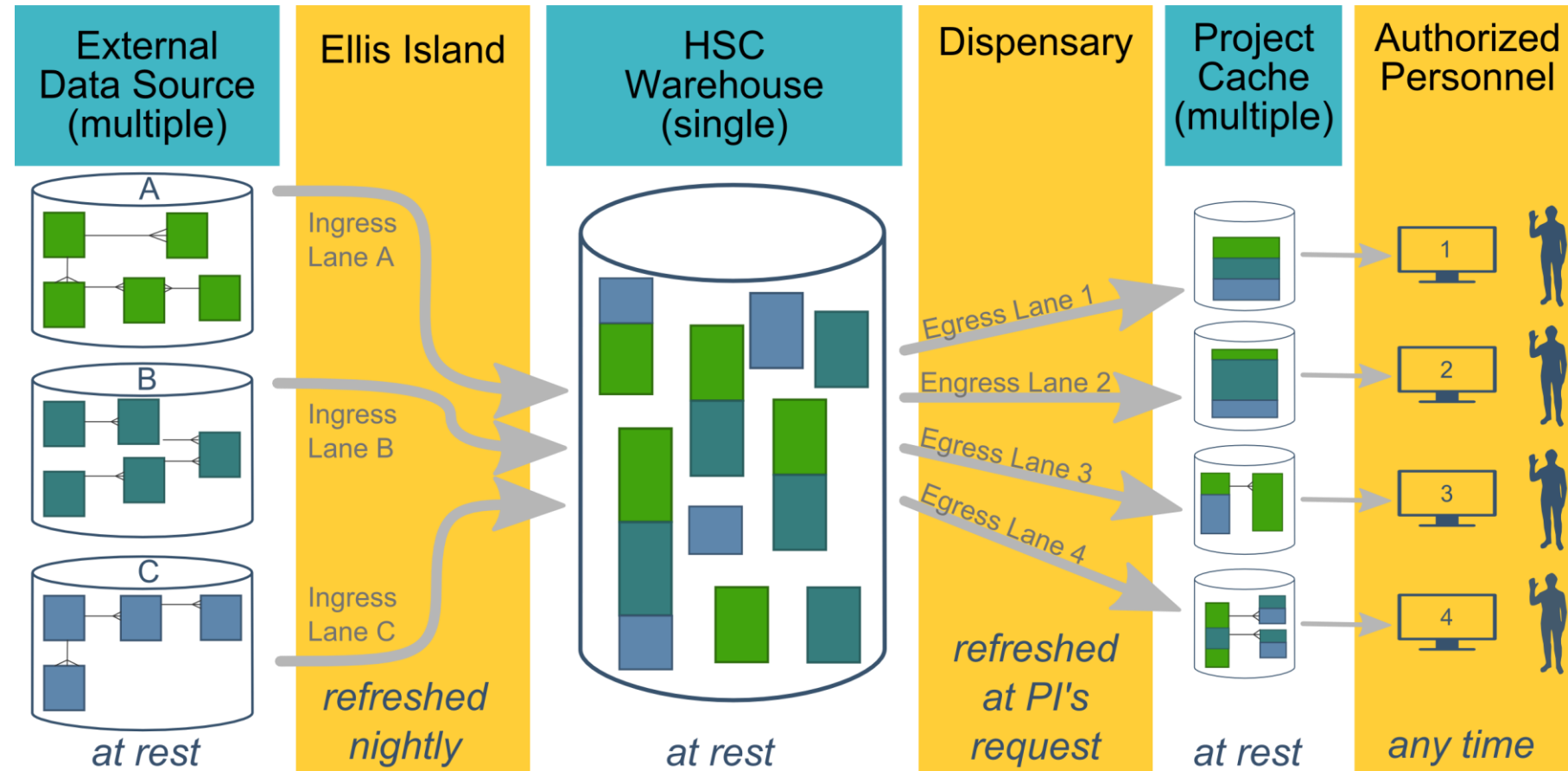
## *N3C: National COVID Cohort Collaborative*

- One of several examples of OU contributing EHR to a national investigation
- 80+ US institutions from 20+ states contribute EHR data in an OMOP model
- Datasets are accessible only through a browser to NIH's cluster
  - Spark, Python, R
  - Lots of governance steps, but not as many as you'd think
- We believe this type of collaboration will be important in the future
- Daily contributions during the pandemic
- Patients connected across sites safely
  - Each site tokenized PII via [PPRL](#) (privacy preserving record linkage)

# CRDW (Clinical Research Data Warehouse)

<https://github.com/OuhscBbmc/prairie-outpost-public>

## Ecosystem Architecture



- **Data Source** (column 1): contains unique info
- **Warehouse** (column 3): contains copy after manipulation
- **Project Cache** (column 5): transformed to facilitate analyses of a specific research project



**ECHO**  
Environmental influences  
on Child Health Outcomes  
A program supported by the NIH

**IdEA States  
Pediatric Network**



# Thank you

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