FHIR: What's New and What's Next

What is CDIS in REDCap

Clinical Data Interoperability Services are a set of tools used in REDCap to exchange data with EHR systems via the “**Smart on FHIR**”, an open, free and standards-based API.

2 types of projects:

- 🔥 Clinical Data Pull (CDP)
- 🛒 Clinical Data Mart (CDM)

Tools:

Mapping Helper

- Break the glass (epic only)

FHIR R4 compatibility

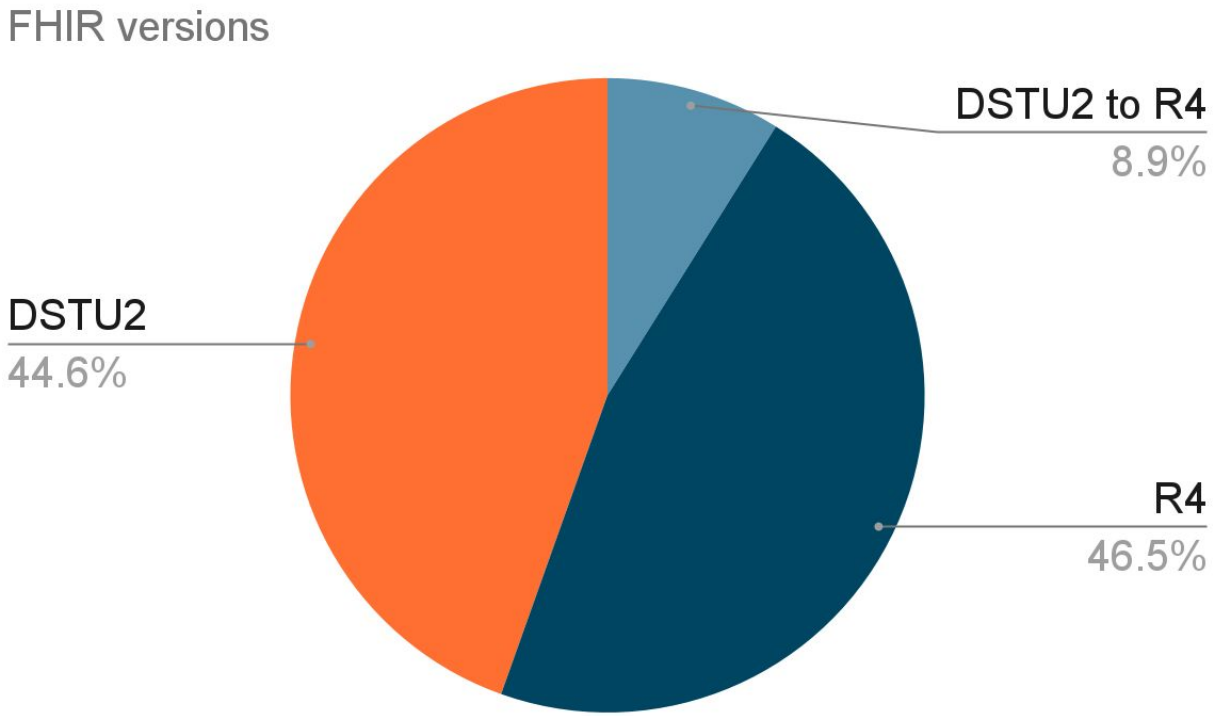
FHIR is an evolving standard and new versions are released periodically.

Starting from June 2021, REDCap is compatible with the version 2 (DSTU2) and version 4 (R4).

FHIR Endpoints	DSTU2	R4
Patient	✅	✅
Medication	✅	✅
Observation (labs and vital signs)	✅	✅
Condition	✅	✅
AllergyIntolerance	✅	✅
Encounter		✅
Immunization		✅
Observation (core characteristics)		✅
AdverseEvent		✅
Social History		✅

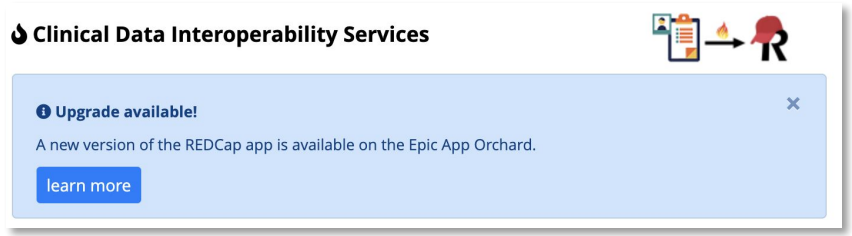
Current FHIR versions usage across institutions

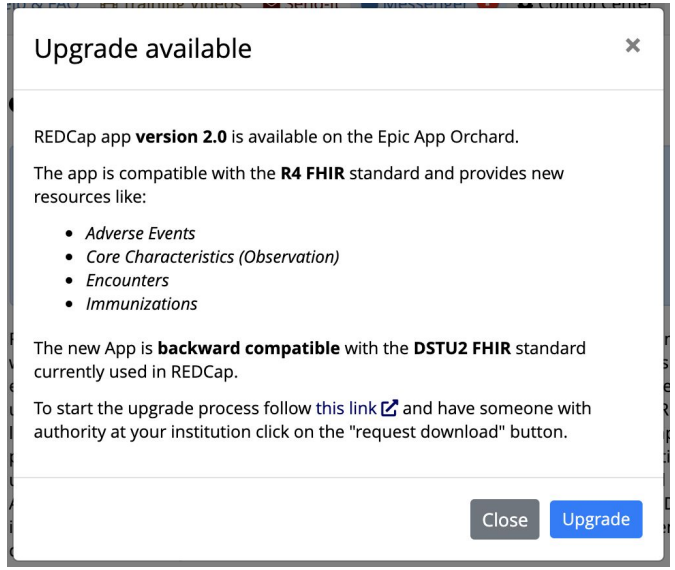
91 institutions (Epic)
45 on DSTU2
56 onR4

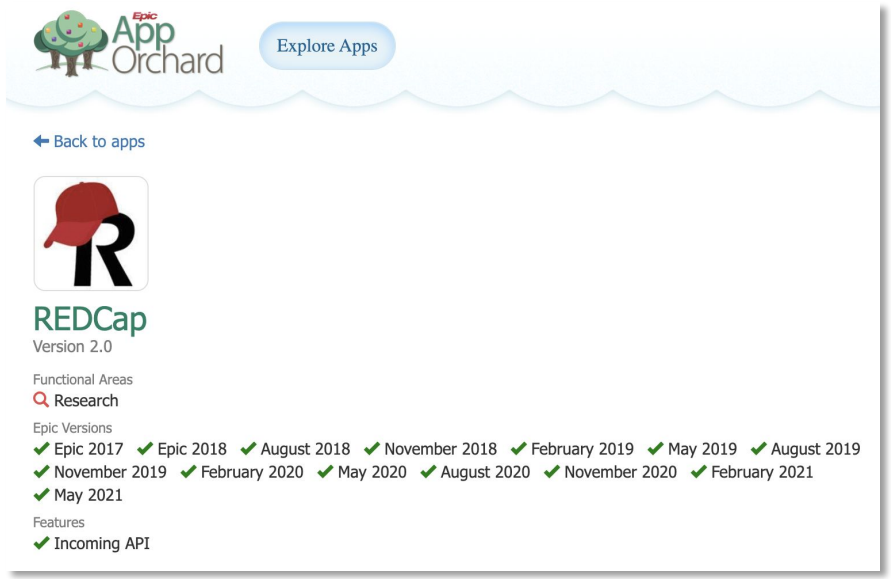


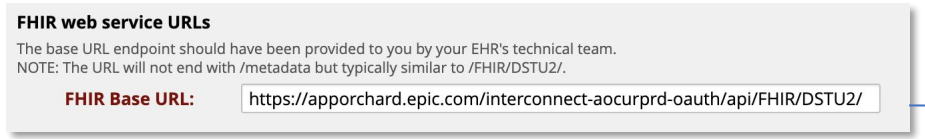
54 institutions were using DSTU2 before june 2021
9 switched from DSTU2 to R4

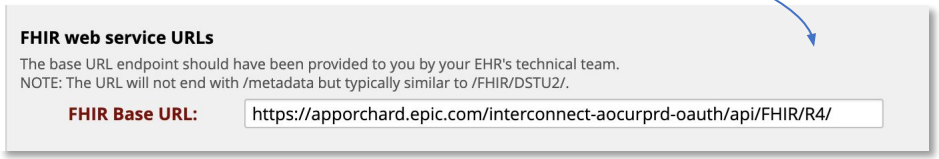
Switch from DSTU2 to R4 (Epic)



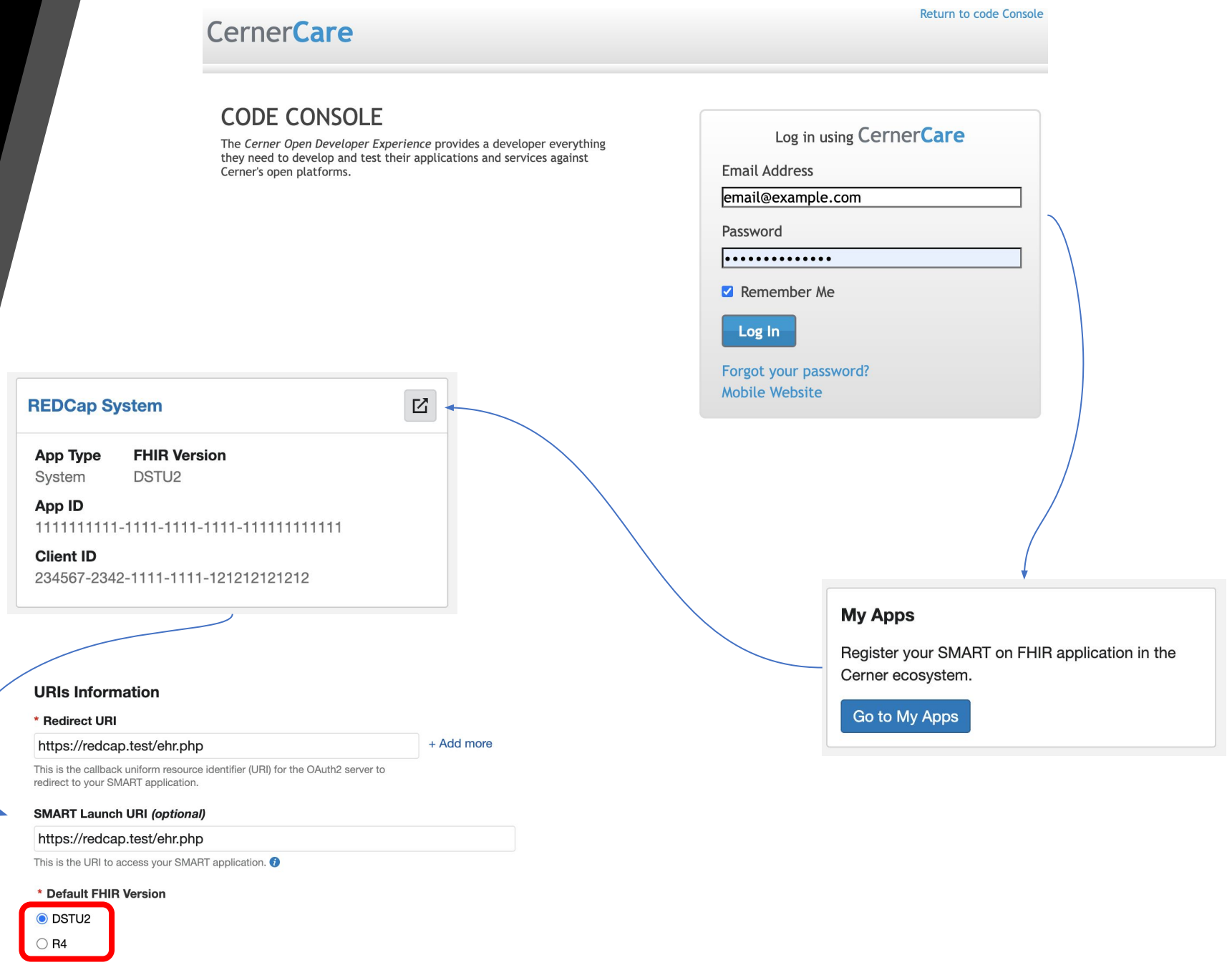






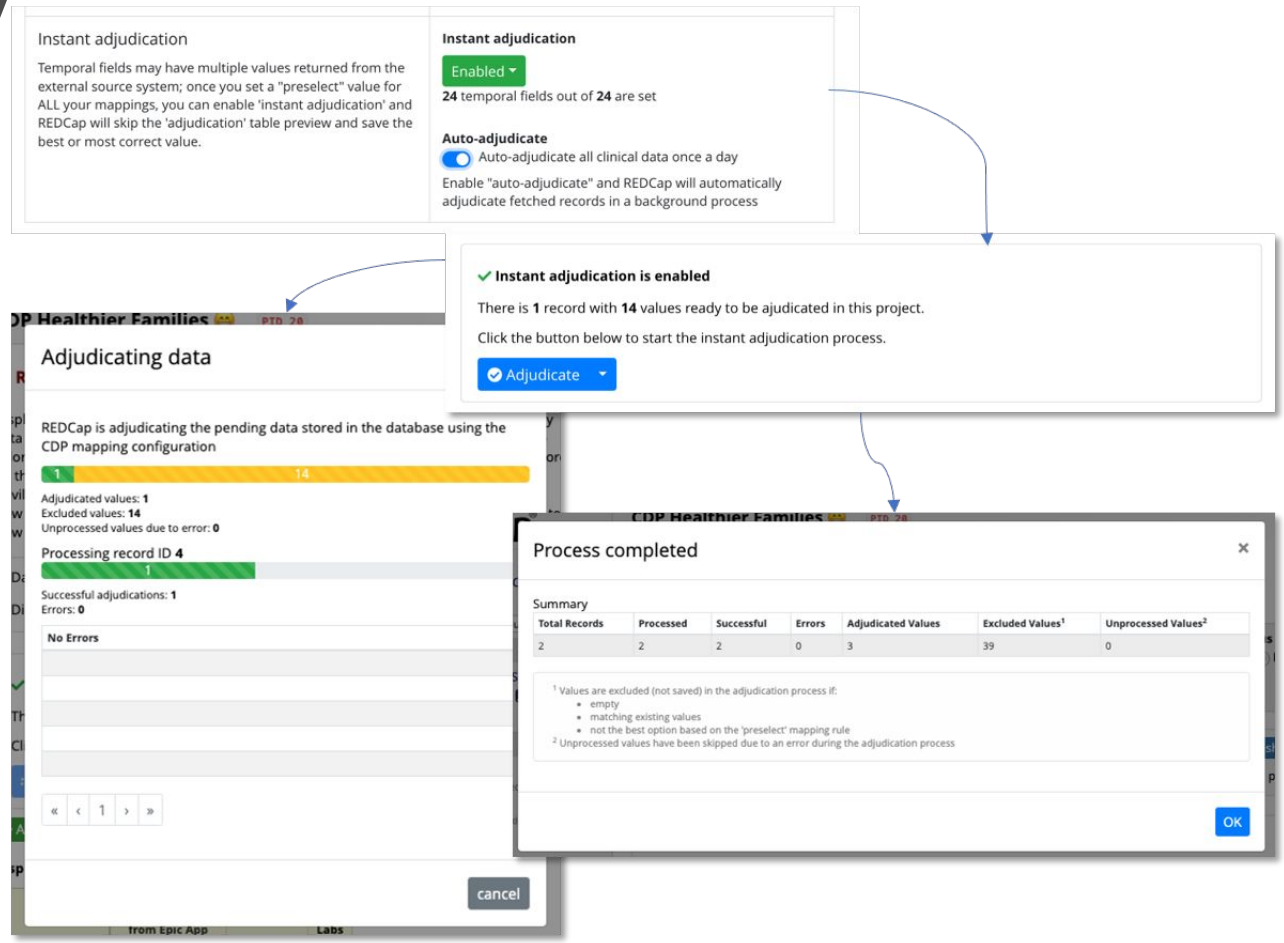


Switch from DSTU2 to R4 (Cerner)



What's New

Better performance in auto-adjudication

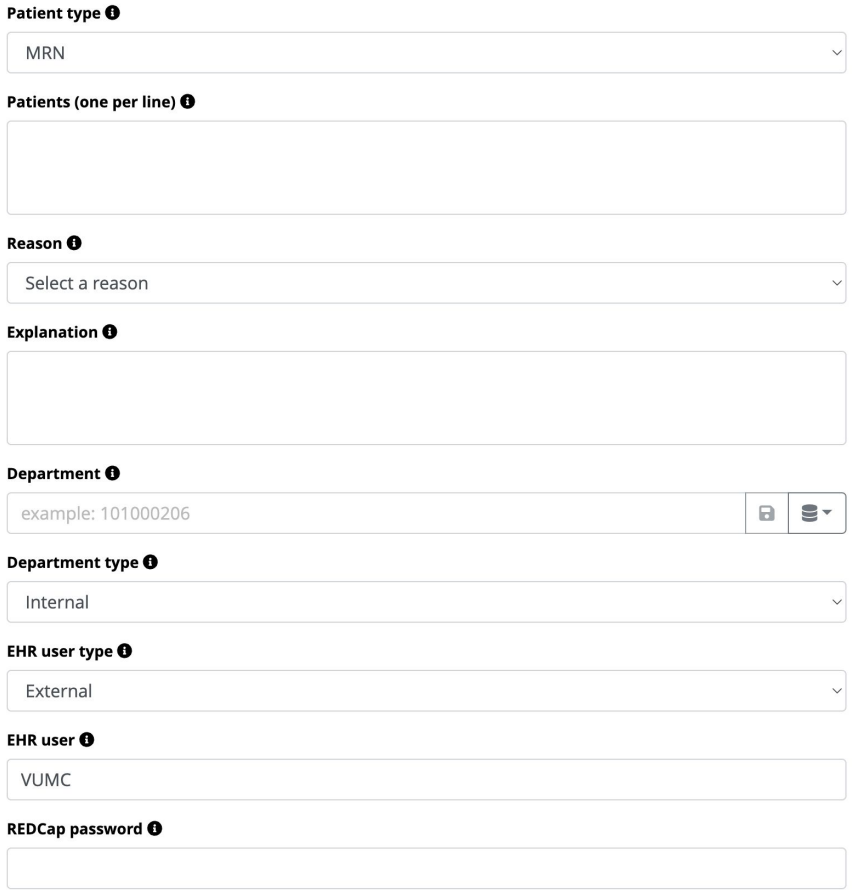


Background process times from hours to seconds

Updated logic for “break the glass”

What is “break the glass”?

Break-the-Glass (BTG) is an Epic functionality that allows a health organization to control user access to patient data. Each organization can customize their logic to determine whether a user’s access to a patient’s data is appropriate, inappropriate, or cannot be determined without user intervention

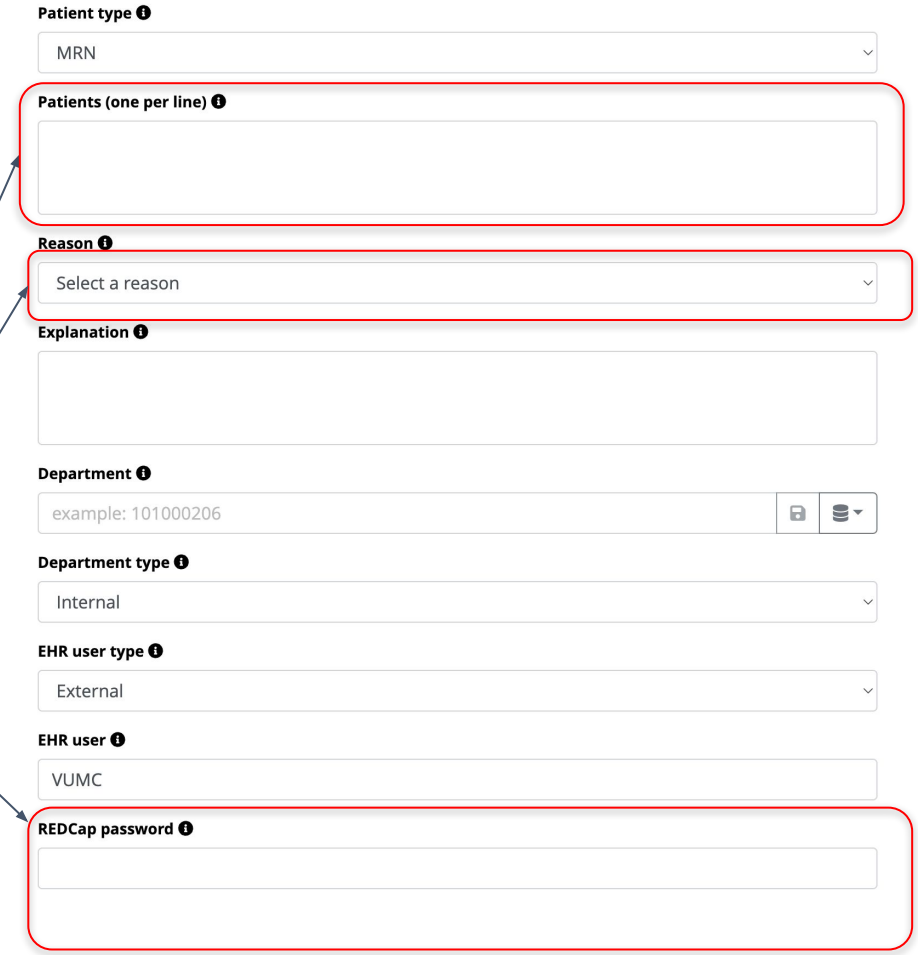


Updated logic for “break the glass”

New endpoint AcceptBreakTheGlass (2021)

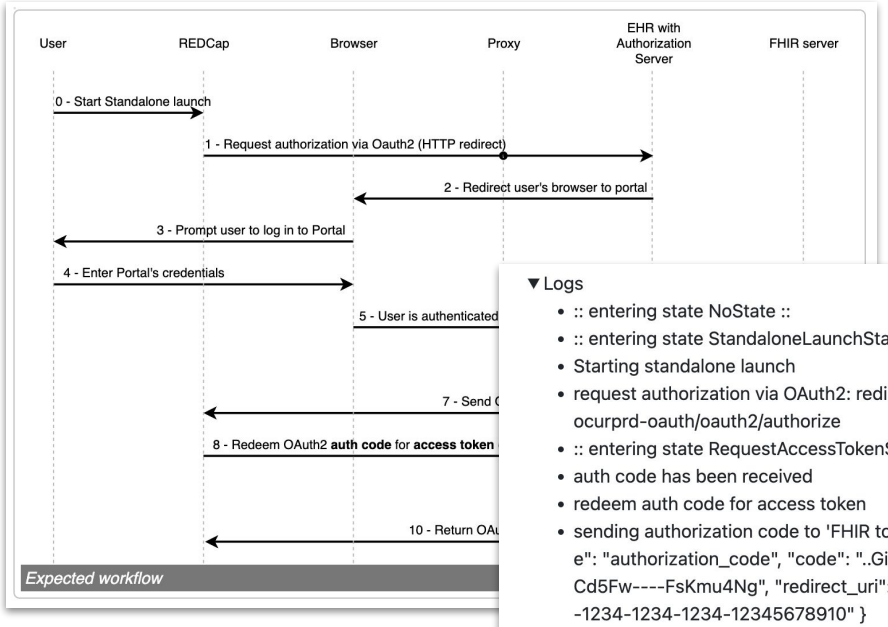
This version of AcceptBreakTheGlass adds a **FhirBTGToken** element which is intended for use when breaking the glass for FHIR-related workflows

Required fields with new endpoint:



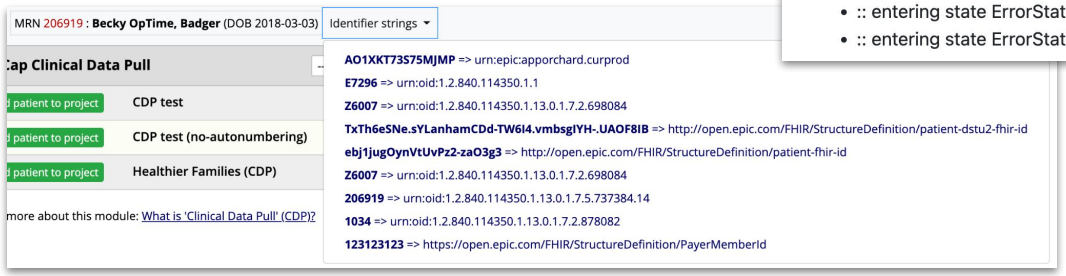
New OAuth2 authentication workflow

- REDCap authentication step is now required after the access token is acquired for compatibility with Cerner institutions
- New institutions running into errors have detailed logs to identify configuration issues
- Patient identifiers are always available when in patient context (EHR launch)
- EHR to REDCap user mapping available in both EHR and Standalone launch



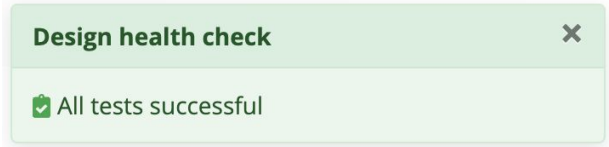
▼Logs

- :: entering state NoState ::
- :: entering state StandaloneLaunchState ::
- Starting standalone launch
- request authorization via OAuth2: redirect to https://apporchard.epic.com/interconnect-aocurprd-oauth/oauth2/authorize
- :: entering state RequestAccessTokenState ::
- auth code has been received
- redeem auth code for access token
- sending authorization code to 'FHIR token URL' (https://wrong.fhir.token.url): { "grant_type": "authorization_code", "code": "..GiXEtFwHc6HBqXxSqyUEzJD01G0G5u7nvBuZi15LxZCd5Fw----FsKmu4Ng", "redirect_uri": "https:\/\/redcap.test\/ehr.php", "client_id": "12345-1234-1234-1234-12345678910" }
- cURL error 6: Could not resolve host: wrong.fhir.token.url (see https://curl.haxx.se/libcurl/c/libcurl-errors.html) for https://wrong.fhir.token.url
- :: entering state ErrorState ::
- :: entering state ErrorState ::



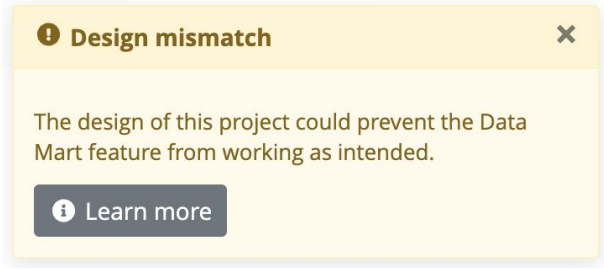
DataMart Design Checker

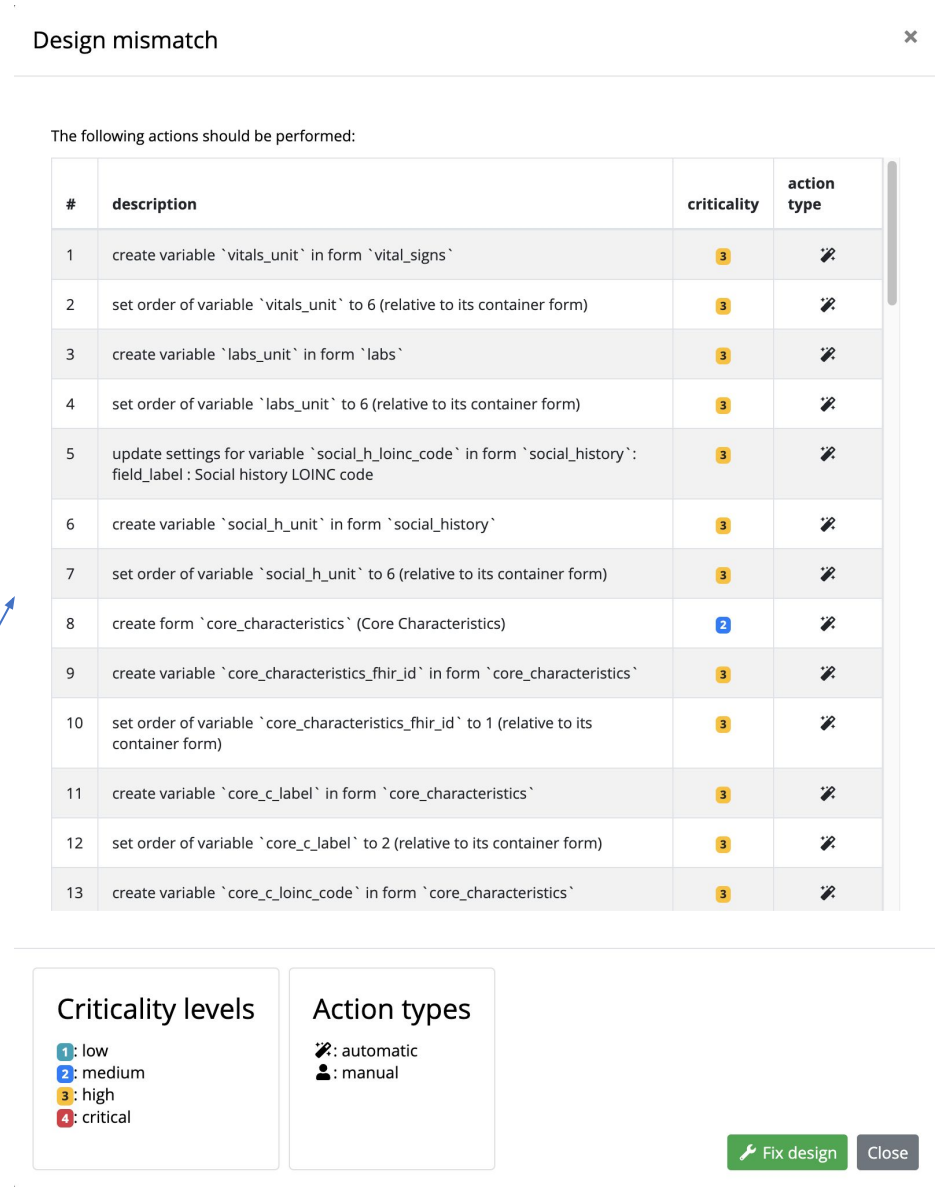
Checks the design of a Data Mart project



If problems are detected

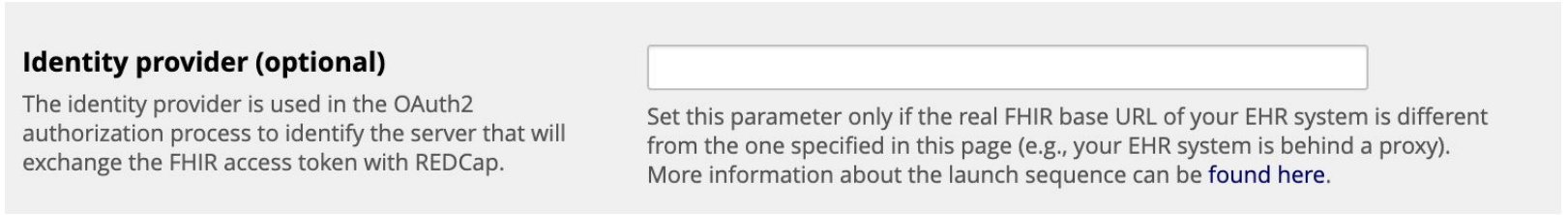
- Display a list of available fixes
- Can fix the design automatically





CDIS settings

Option to specify the identity provider for the FHIR authentication



Improved management of certificate authority bundle used in SSL requests

What's Next

What's next

- New endpoints
- QuestionnaireResponse?

Expected workflow

- A questionnaire is created or identified by an operator in Hyperspace
- The metadata of the questionnaire is obtained using *Questionnaire.search* or *Questionnaire.read*.
  The metadata contains:
  - Questionnaire FHIR ID
  - List of questions with specific ID
  - List of answers to each question (in case of multiple option kind of questions)
- A REDCap project is created as a survey using the questionnaire's metadata
- A record is created containing the answers and the patient ID
- The record is translated into a *QuestionnaireResponse* payload and sent to Epic using the *QuestionnaireResponse*.create endpoint

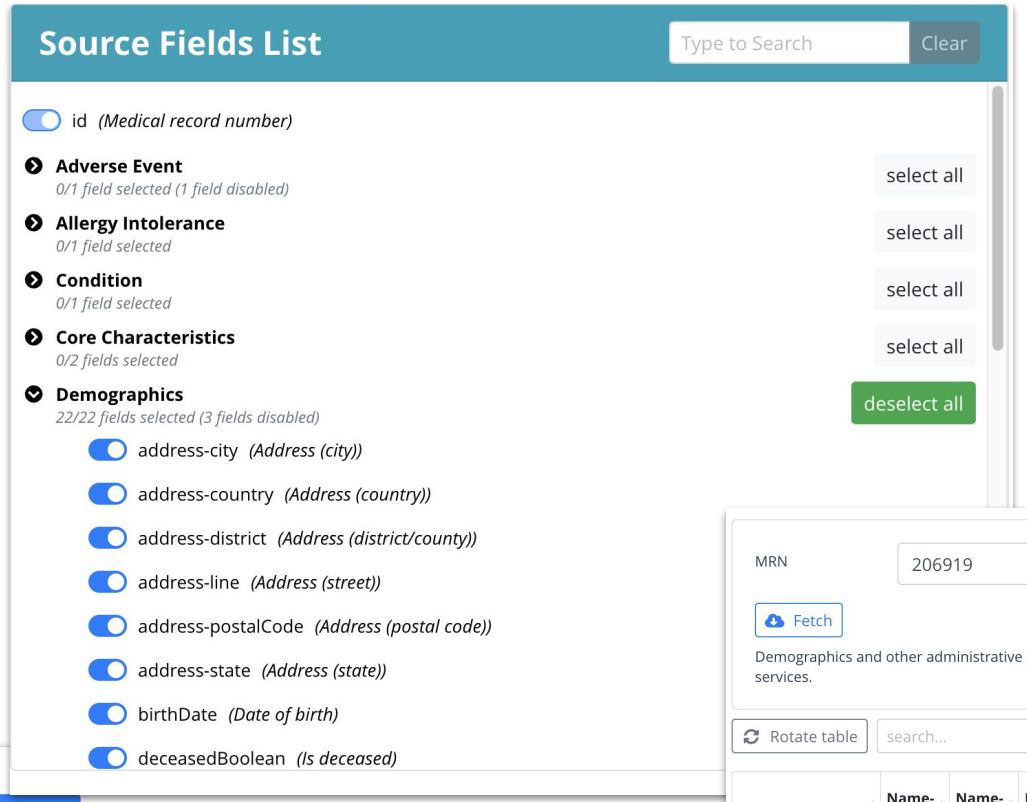
Issues

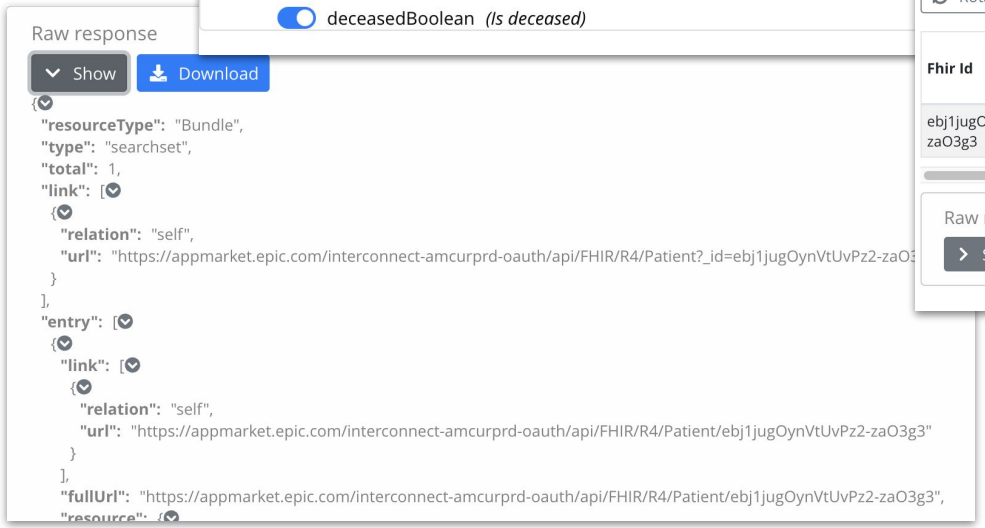
We cannot get the Questionnaire metadata from Epic because the *Questionnaire.search* endpoint has not been fully implemented (Cerner works).

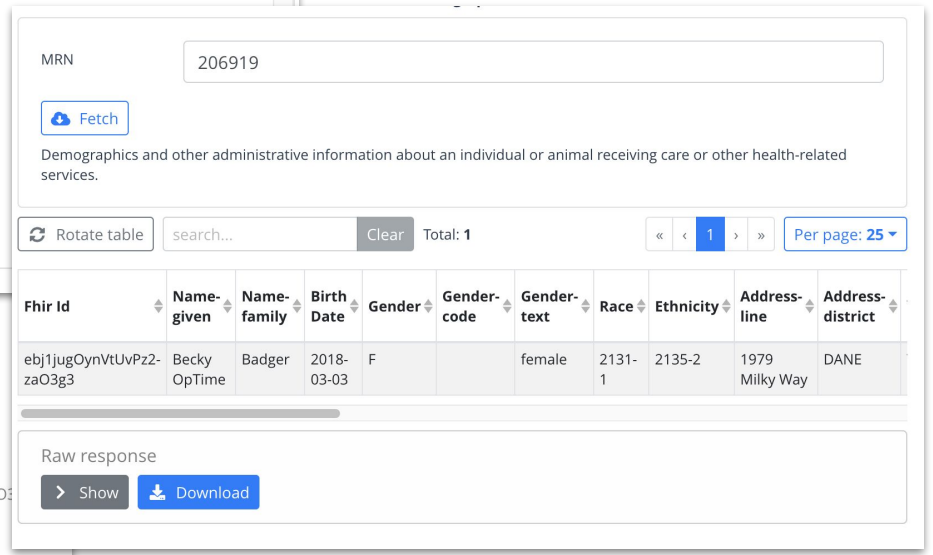
The *Questionnaire.search* endpoint, as implemented by Epic, behaves just like *Questionnaire.read,* so a questionnaire FHIR ID is necessary to get any payload. Unfortunately, we have no way (so far) to figure out the questionnaire FHIR ID.

What’s next

Custom mapping







What's next

- Faster JSON parser
- Action Tags for custom mappings (for advanced users)

@FHIR(Patient:maritalStatus.text)


```
@FHIR(
        Patient:contact:where(relationship.coding.code=14)
        .telecom:where(system=phone)
        .value
)
```

CDIS use @ VUMC

CDP Stats	
Current Data Values adjudicated by users	505,184
Current Records with Adjudication	46,193
Current Projects with values adjudicated	115
CDM Stats	
Current Data Values Imported via Data Mart	12,167,928
Current Records with Imported Data	77,321
Current Projects with Data Values Imported	47

Who’s using CDIS?

Epic (36)

Atrium Health
BJC HealthCare & Washington University
Cedars-Sinai Health System
Children's Healthcare of Atlanta
Children's Hospital Colorado
Connecticut Children's
Denver Health
Hackensack Meridian Health
Houston Methodist
Institute for Family Health
Johns Hopkins Medicine
Kids Health Alliance
Mass General Brigham
Memorial Healthcare System (FL)
Mount Sinai Health System
New York Consortium
Norton Healthcare
NYU Langone Health
Oregon Health & Science University
Parkville EMR
Saint Luke's Health System (MO)
St Joseph's Healthcare Hamilton
Stanford Children's Health
The Children's Hospital of Philadelphia
UNC Health Care System
Univ of Texas MD Anderson Cancer Center
University of Arkansas for Medical Sciences
University of Chicago Hospitals
University of Miami Health System
University of Pennsylvania Health System
University of Texas Southwestern Medical Center
UT Health San Antonio
UW Medicine (WA)
Vanderbilt University Medical Center
Wake Forest Baptist Health
Yale New Haven Health System and Yale School of Medicine

Cerner (4)

Intermountain Healtcare
Medstar
Stony Brook Medicine
USC

6.5M invocations of Epic FHIR API by REDCap in 2021

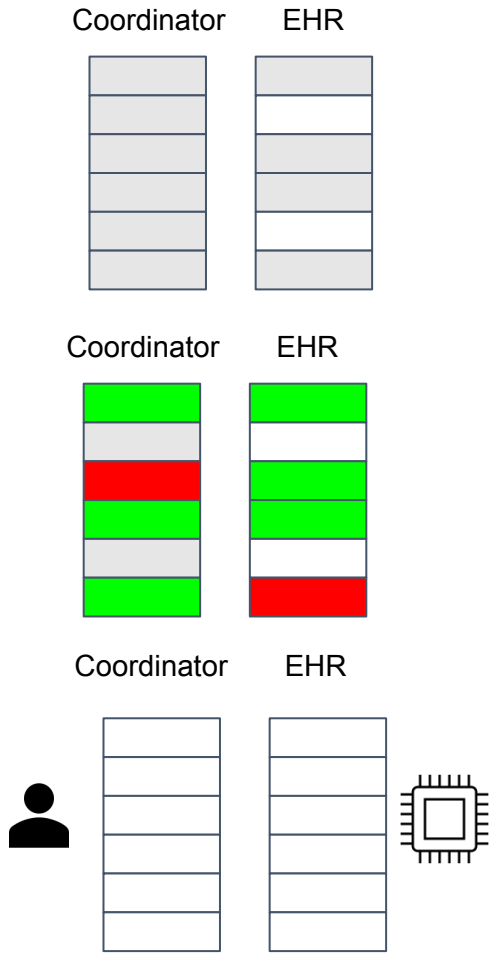
Does it work?

NECTAR
Novel Experimental COVID Therapies Affecting Host Response
CONNECTS

1. COVERAGE: How many CRF fields can be completed with EHR data?

2. CONCORDANCE: How much agreement is there between EHR and coordinator entered data?

3. COORDINATOR TIME: How much time was spent filling out fields that could be pulled from EHR data?

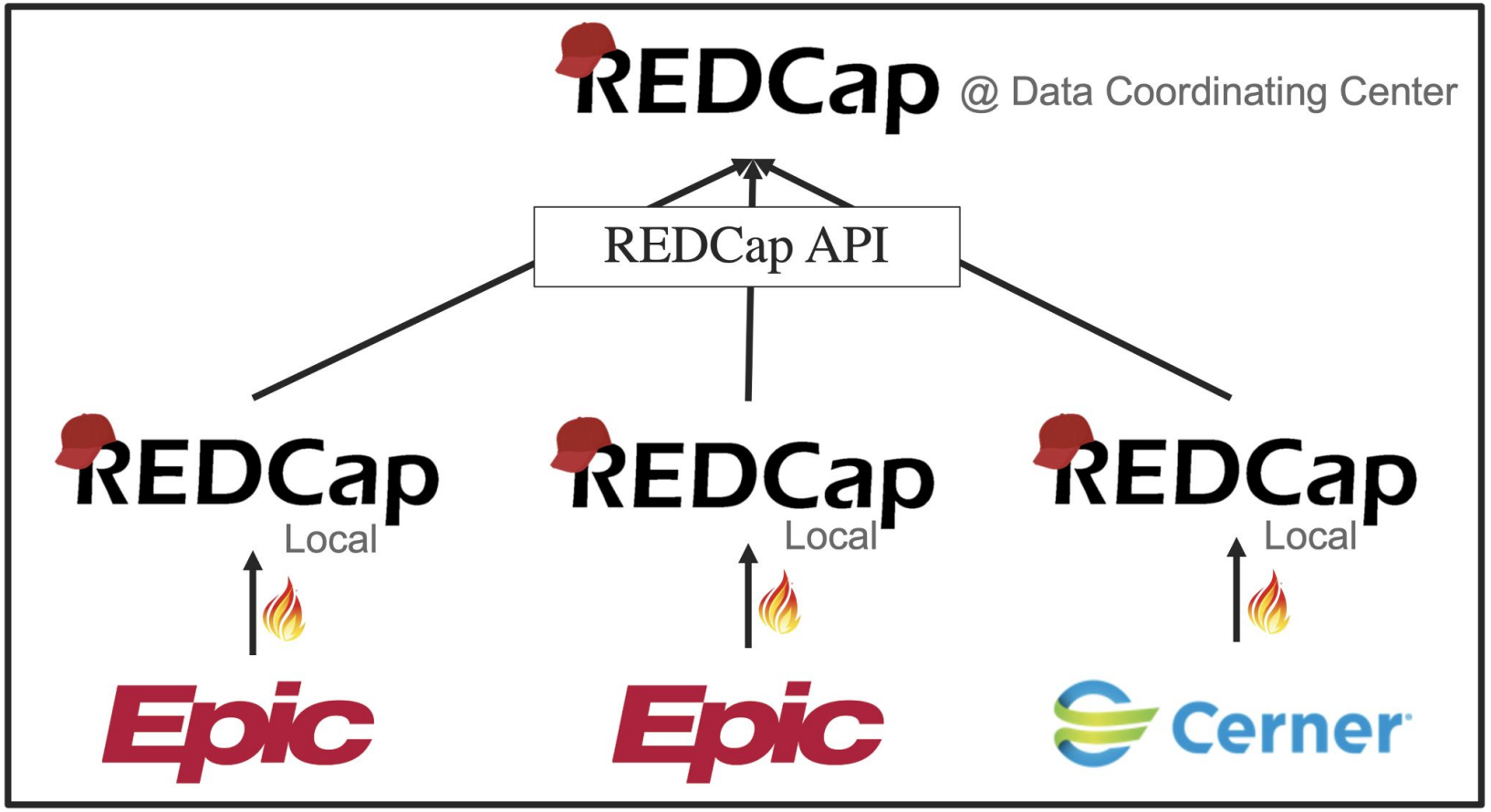


Evaluation with real clinical trial data

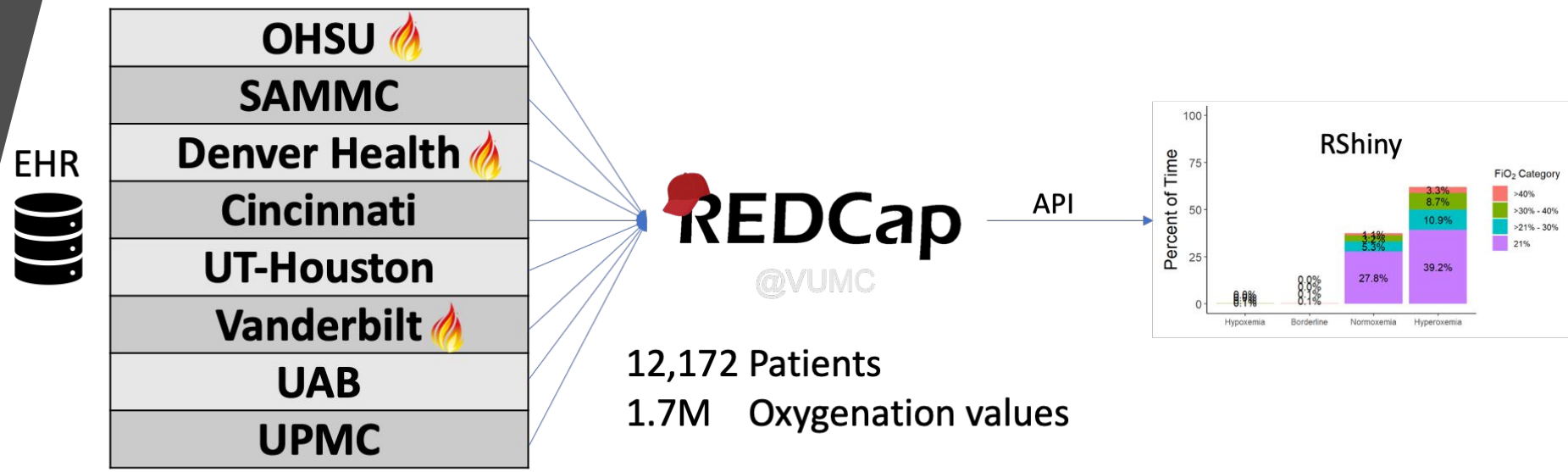
NECTAR
Novel Experimental COVID Therapies Affecting Host Response
CONNECTS

Data Collection Instrument	CDM Pull (1)	Logs/Events (2)	Baseline and Randomization (3)	Day 1 (4)	Day 2 (5)	Day 3 (6)	Day 4 (7)	Day 5 (8)	Day 6 (9)	Day 7 (10)	Day 8 (11)	Day 9 (12)	Day 10 (13)	Day 11 (14)	Day 12 (15)	Day 13 (16)	Day 14 (17)	Day 15 (18)	Day 16 (19)	Day 17 (20)	Day 18 (21)	Day 19 (22)	Day 20 (23)	Day 21 (24)	Day 22 (25)	Day 23 (26)	Day 24 (27)	Day 25 (28)	Day 26 (29)	Day 27 (30)	Day 28 (31)
Eligibility Criteria			✓																												
Randomization (Blinded)			✓																												
Randomization (Unblinded/Pharmacist)	✓																														
Demographics			✓																												
Medical History			✓																												
Covid19 Testingvaccination			✓																												
Concomitant Medications Bd4719		✓																													
Study Drugplacebo Log		✓																													
Study Drugplacebo Stoppage Log		✓																													
Visit Information				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Daily Inpatient Form			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Clinical Labs			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Vital Signs			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Outpatient Form				✓		✓				✓														✓							✓
Hospital Discharge		✓																													
Vital Statusstudy Completion		✓																													
Participant Status		✓																													
Psese Log		✓																													
Adverse Event Form		✓																			✓										

Multicenter Trials

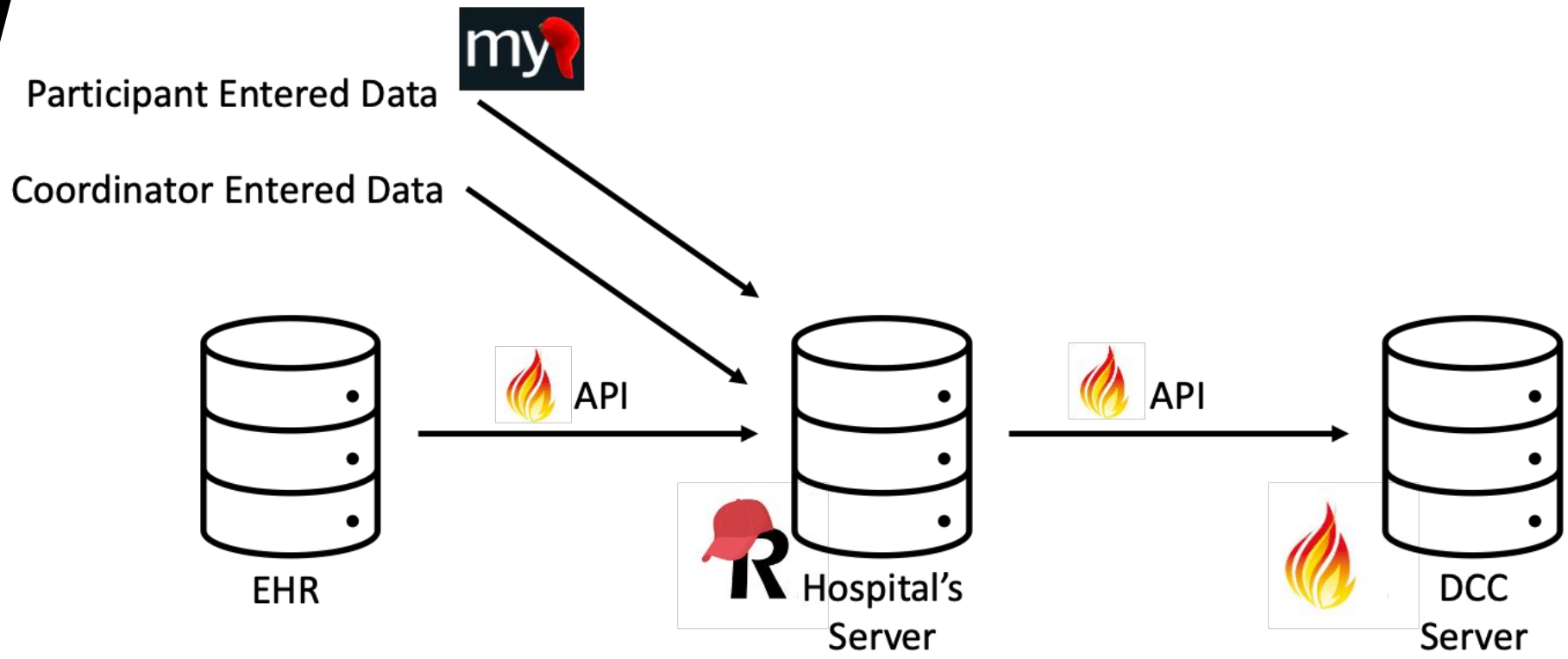


Multicenter Trials



Dylla, L., Douin, D.J., Anderson, E.L. et al. A multicenter cluster randomized, stepped wedge implementation trial for targeted normoxia in critically ill trauma patients: study protocol and statistical analysis plan for the Strategy to Avoid Excessive Oxygen (SAVE-O2) trial. Trials 22, 784 (2021). https://doi.org/10.1186/s13063-021-05688-6

Multicenter Trials



Take the next step

CDIS End User Training Video

CDIS FAQ @ Vanderbilt

Community CDIS Thread

Fridays Office Hours Registration