



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.

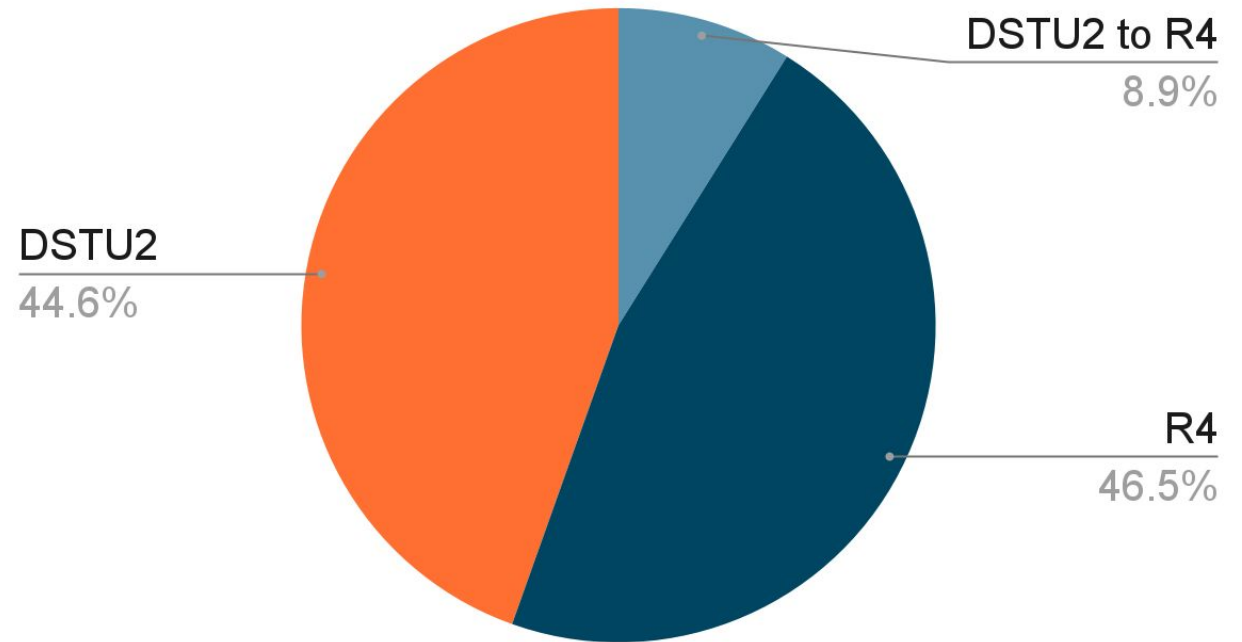
Starting from June 2021, REDCap is compatible with the version 2 (DSTU2) and version 4 (R4).

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 on R4

FHIR versions



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

Switch from DSTU2 to R4 (Epic)

Clinical Data Interoperability Services



Upgrade available!

A new version of the REDCap app is available on the Epic App Orchard.

[learn more](#)



[Explore Apps](#)

[← Back to apps](#)



REDCap

Version 2.0

Functional Areas

[Research](#)

Epic Versions

✓ Epic 2017 ✓ Epic 2018 ✓ August 2018 ✓ November 2018 ✓ February 2019 ✓ May 2019 ✓ August 2019
✓ November 2019 ✓ February 2020 ✓ May 2020 ✓ August 2020 ✓ November 2020 ✓ February 2021
✓ May 2021

Features

✓ Incoming API

FHIR web service URLs

The base URL endpoint should have been provided to you by your EHR's technical team.
NOTE: The URL will not end with /metadata but typically similar to /FHIR/DSTU2/.

FHIR Base URL:

FHIR web service URLs

The base URL endpoint should have been provided to you by your EHR's technical team.
NOTE: The URL will not end with /metadata but typically similar to /FHIR/DSTU2/.

FHIR Base URL:

Upgrade available

REDCap app **version 2.0** is available on the Epic App Orchard.

The app is compatible with the **R4 FHIR** standard and provides new resources like:

- *Adverse Events*
- *Core Characteristics (Observation)*
- *Encounters*
- *Immunizations*

The new App is **backward compatible** with the **DSTU2 FHIR** standard currently used in REDCap.

To start the upgrade process follow [this link](#) and have someone with authority at your institution click on the "request download" button.

[Close](#)

[Upgrade](#)

Switch from DSTU2 to R4 (Cerner)

CODE CONSOLE

The *Cerner Open Developer Experience* provides a developer everything they need to develop and test their applications and services against Cerner's open platforms.


Log in using CernerCare

Email Address

Password

Remember Me

[Forgot your password?](#)
[Mobile Website](#)

REDCap System 

App Type	FHIR Version
System	DSTU2
App ID	
1111111111-1111-1111-1111-111111111111	
Client ID	
234567-2342-1111-1111-121212121212	

My Apps

Register your SMART on FHIR application in the Cerner ecosystem.


URIs Information

* **Redirect URI**

[+ Add more](#)

This is the callback uniform resource identifier (URI) for the OAuth2 server to redirect to your SMART application.

SMART Launch URI (optional)

This is the URI to access your SMART application. 

* **Default FHIR Version**

DSTU2

R4



What's New



Better performance in auto-adjudication

Instant adjudication
Temporal fields may have multiple values returned from the external source system; once you set a "preselect" value for ALL your mappings, you can enable 'instant adjudication' and REDCap will skip the 'adjudication' table preview and save the best or most correct value.

Instant adjudication
Enabled ▾
24 temporal fields out of 24 are set

Auto-adjudicate
 Auto-adjudicate all clinical data once a day
Enable "auto-adjudicate" and REDCap will automatically adjudicate fetched records in a background process

✓ Instant adjudication is enabled
There is 1 record with 14 values ready to be adjudicated in this project.
Click the button below to start the instant adjudication process.

Adjudicating data
REDCap is adjudicating the pending data stored in the database using the CDP mapping configuration

1 / 14

Adjudicated values: 1
Excluded values: 14
Unprocessed values due to error: 0

Processing record ID 4
1

Successful adjudications: 1
Errors: 0

No Errors

cancel

Process completed

Summary

Total Records	Processed	Successful	Errors	Adjudicated Values	Excluded Values ¹	Unprocessed Values ²
2	2	2	0	3	39	0

¹ Values are excluded (not saved) in the adjudication process if:
• empty
• matching existing values
• not the best option based on the 'preselect' mapping rule

² Unprocessed values have been skipped due to an error during the adjudication process

OK

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

Patient type ⓘ
MRN

Patients (one per line) ⓘ

Reason ⓘ
Select a reason

Explanation ⓘ

Department ⓘ
example: 101000206

Department type ⓘ
Internal

EHR user type ⓘ
External

EHR user ⓘ
VUMC

REDCap password ⓘ

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

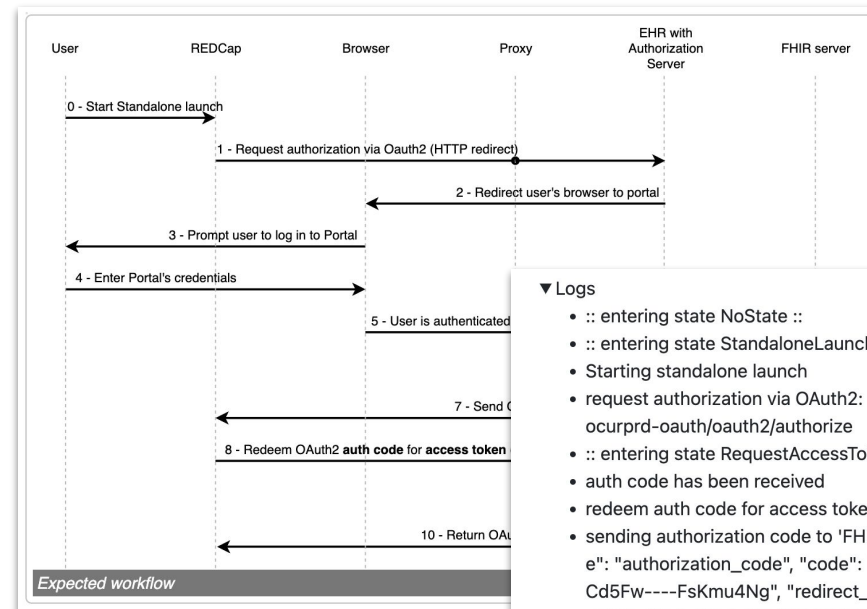
Required fields with new endpoint:

The screenshot shows a web form for the 'AcceptBreakTheGlass' endpoint. The form contains several fields, with four of them highlighted by red rectangular boxes. Arrows from a text box on the left point to these highlighted fields. The highlighted fields are: 'Patients (one per line)', 'Reason', 'REDCap password', and 'Department type'. The other fields are: 'Patient type' (set to 'MRN'), 'Explanation' (empty text area), 'Department' (set to 'example: 101000206'), 'EHR user type' (set to 'External'), and 'EHR user' (set to 'VUMC').

Patient type ⓘ	MRN
Patients (one per line) ⓘ	
Reason ⓘ	Select a reason
Explanation ⓘ	
Department ⓘ	example: 101000206
Department type ⓘ	Internal
EHR user type ⓘ	External
EHR user ⓘ	VUMC
REDCap password ⓘ	

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-a-ocurprd-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 ::

MRN 206919 : **Becky OpTime, Badger** (DOB 2018-03-03) Identifier strings ▾

Identifier	String
cap Clinical Data Pull	AO1XKT73S75MJMP => urn:epic:apporchard.curprd
	E7296 => urn:oid:1.2.840.114350.1.1
	Z6007 => urn:oid:1.2.840.114350.1.13.0.1.7.2.698084
	TxTh6e5Ne.sYlanhamCDD-TW614.vmbsgIYH-UAOF81B => http://open.epic.com/FHIR/StructureDefinition/patient-dstu2-fhir-id
	ebj1jugOynVtUvPz2-zaO3g3 => http://open.epic.com/FHIR/StructureDefinition/patient-fhir-id
	Z6007 => urn:oid:1.2.840.114350.1.13.0.1.7.2.698084
	206919 => urn:oid:1.2.840.114350.1.13.0.1.7.5.737384.14
	1034 => urn:oid:1.2.840.114350.1.13.0.1.7.2.878082
	123123123 => https://open.epic.com/FHIR/StructureDefinition/PayerMemberid

more about this module: [What is 'Clinical Data Pull' \(CDP\)?](#)

DataMart Design Checker

Checks the design of a Data Mart project

Design health check ✕

✔ All tests successful

If problems are detected

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

Design mismatch ✕

The design of this project could prevent the Data Mart feature from working as intended.

[Learn more](#)

Design mismatch ✕

The following actions should be performed:

#	description	criticality	action type
1	create variable `vitals_unit` in form `vital_signs`	3	✎
2	set order of variable `vitals_unit` to 6 (relative to its container form)	3	✎
3	create variable `labs_unit` in form `labs`	3	✎
4	set order of variable `labs_unit` to 6 (relative to its container form)	3	✎
5	update settings for variable `social_h_loinc_code` in form `social_history`: field_label : Social history LOINC code	3	✎
6	create variable `social_h_unit` in form `social_history`	3	✎
7	set order of variable `social_h_unit` to 6 (relative to its container form)	3	✎
8	create form `core_characteristics` (Core Characteristics)	2	✎
9	create variable `core_characteristics_fhir_id` in form `core_characteristics`	3	✎
10	set order of variable `core_characteristics_fhir_id` to 1 (relative to its container form)	3	✎
11	create variable `core_c_label` in form `core_characteristics`	3	✎
12	set order of variable `core_c_label` to 2 (relative to its container form)	3	✎
13	create variable `core_c_loinc_code` in form `core_characteristics`	3	✎

Criticality levels

- 1: low
- 2: medium
- 3: high
- 4: critical

Action types

- ✎: automatic
- 👤: manual

[Fix design](#) [Close](#)

CDIS settings

Option to specify the identity provider for the FHIR authentication

Identity provider (optional)

The identity provider is used in the OAuth2 authorization process to identify the server that will exchange the FHIR access token with REDCap.

Set this parameter only if the real FHIR base URL of your EHR system is different from the one specified in this page (e.g., your EHR system is behind a proxy). More information about the launch sequence can be [found here](#).

Improved management of certificate authority bundle used in SSL requests

CA certificates

To interact with FHIR resources, REDCap must be able to verify the identity of the EHR system using a bundle of CA (certificate authority) certificates. A digital certificate certifies the ownership of a public key by the named subject of the certificate. You can choose whether to use the bundle of CA certificates included in REDCap or use the system provided by your webserver.

- Use the bundle of CA included in REDCap
- ✓ Use the verification provided by your webserver

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

Source Fields List

Type to Search

- id (Medical record number)
- Adverse Event
0/1 field selected (1 field disabled)
- Allergy Intolerance
0/1 field selected
- Condition
0/1 field selected
- Core Characteristics
0/2 fields selected
- Demographics
22/22 fields selected (3 fields disabled)

- address-city (Address (city))
- address-country (Address (country))
- address-district (Address (district/county))
- address-line (Address (street))
- address-postalCode (Address (postal code))
- address-state (Address (state))
- birthDate (Date of birth)
- deceasedBoolean (Is deceased)

Raw response

```
{
  "resourceType": "Bundle",
  "type": "searchset",
  "total": 1,
  "link": [
    {
      "relation": "self",
      "url": "https://appmarket.epic.com/interconnect-amcurprd-oauth/api/FHIR/R4/Patient?_id=ebj1jugOynVtUvPz2-zaO3g3"
    }
  ],
  "entry": [
    {
      "link": [
        {
          "relation": "self",
          "url": "https://appmarket.epic.com/interconnect-amcurprd-oauth/api/FHIR/R4/Patient/ebj1jugOynVtUvPz2-zaO3g3"
        }
      ],
      "fullUrl": "https://appmarket.epic.com/interconnect-amcurprd-oauth/api/FHIR/R4/Patient/ebj1jugOynVtUvPz2-zaO3g3",
      "resource": {

```

MRN

Demographics and other administrative information about an individual or animal receiving care or other health-related services.

Total: 1

« < 1 > »

Fhir Id	Name-given	Name-family	Birth Date	Gender	Gender-code	Gender-text	Race	Ethnicity	Address-line	Address-district
ebj1jugOynVtUvPz2-zaO3g3	Becky OpTime	Badger	2018-03-03	F		female	2131-1	2135-2	1979 Milky Way	DANE

Raw response

What's next

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

```
"postalCode": "53706",  
"country": "US"  
},  
"maritalStatus": {  
  "text": "Married"  
},  
"contact": [  
  {  
    "relationship": [  
      {  
        "coding": [  
          {  
            "system": "urn:oid:1.2.840.114350.1.13.0.1.7.4.827665.1000",  
            "code": "14",  
            "display": "Sister"  
          }  
        ],  
        "text": "Sister"  
      }  
    ],  
    "name": {  
      "use": "usual",  
      "text": "Sally Tonga"  
    },  
    "telecom": [  
      {  
        "system": "phone",  
        "value": "608-921-8342",  
        "use": "home"  
      }  
    ],  
    "relationship": [  
      {  
        "coding": [  
          {  
            "system": "http://terminology.hl7.org/CodeSystem/v2-0131",  
            "code": "E",  
            "display": "Employer"  
          }  
        ],  
        "organization": {  
          "display": "Ehs Generic Employer"  
        }  
      }  
    ],  
    "organization": {  
      "display": "Ehs Generic Employer"  
    }  
  }  
]
```

← @FHIR(Patient:maritalStatus.text)

```
"contact": [  
  {  
    "relationship": [  
      {  
        "coding": [  
          {  
            "system": "urn:oid:1.2.840.114350.1.13.0.1.7.4.827665.1000",  
            "code": "14",  
            "display": "Sister"  
          }  
        ],  
        "text": "Sister"  
      }  
    ],  
    "name": {  
      "use": "usual",  
      "text": "Sally Tonga"  
    },  
    "telecom": [  
      {  
        "system": "phone",  
        "value": "608-921-8342",  
        "use": "home"  
      }  
    ],  
    "relationship": [  
      {  
        "coding": [  
          {  
            "system": "http://terminology.hl7.org/CodeSystem/v2-0131",  
            "code": "E",  
            "display": "Employer"  
          }  
        ],  
        "organization": {  
          "display": "Ehs Generic Employer"  
        }  
      }  
    ],  
    "organization": {  
      "display": "Ehs Generic Employer"  
    }  
  }  
]
```

```
@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)

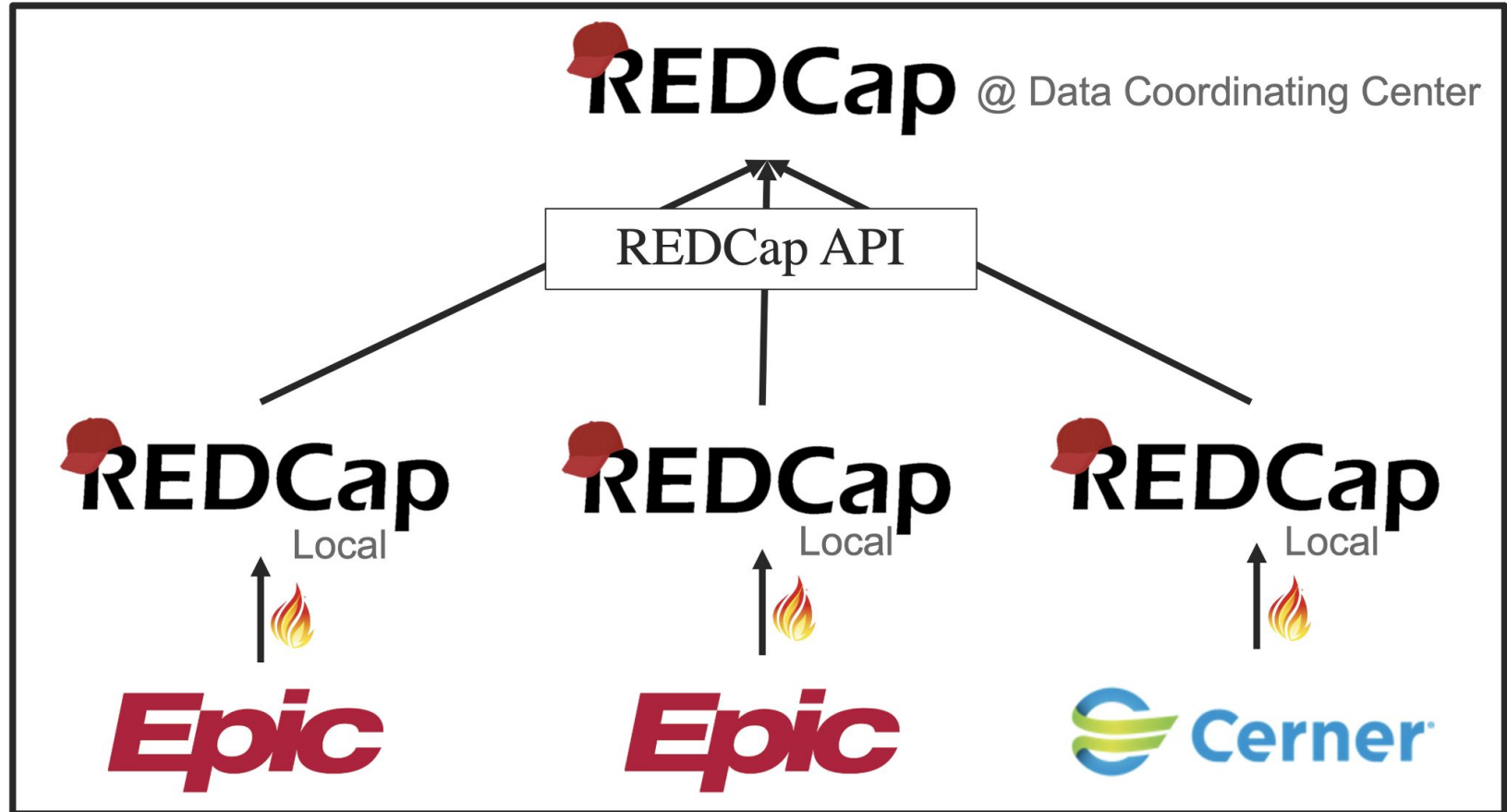
Atrium Health
BJC HealthCare & Washington University
Cedars-Sinai Health System
Children's Healthcare of Atlanta
Children's Hospital Colorado
Connecticut Children's
Denver Health
Hackensack Meridian Health
Houston Methodist
Institute for Family Health
Johns Hopkins Medicine
Kids Health Alliance
Mass 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)

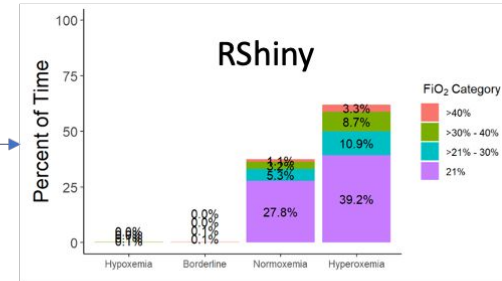
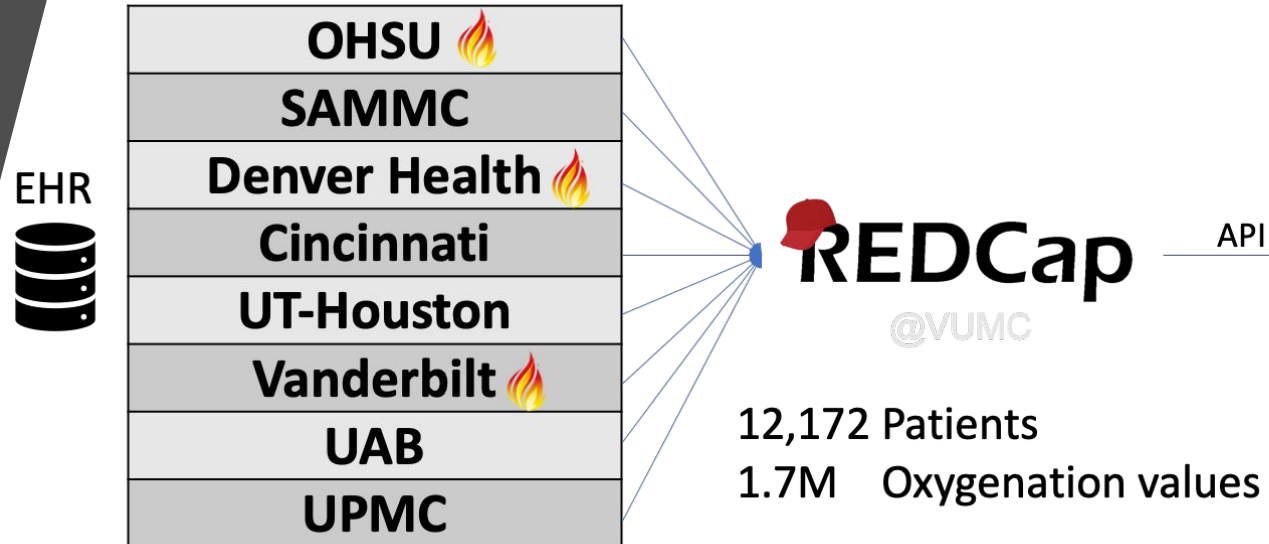
Intermountain Healthcare
Medstar
Stony Brook Medicine
USC

6.5M invocations of Epic FHIR API by REDCap in 2021

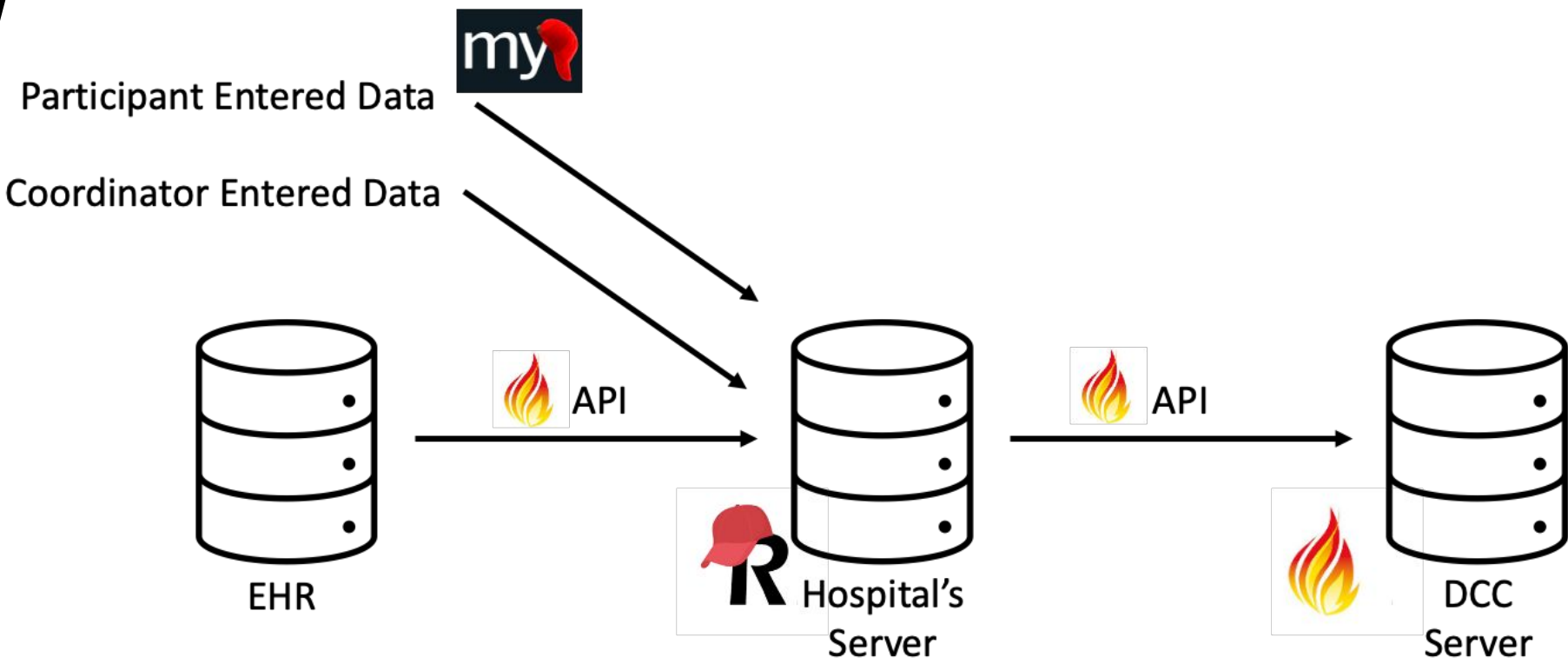
Multicenter Trials



Multicenter Trials



Multicenter Trials



Take the next
step

CDIS End User Training Video



CDIS FAQ @ Vanderbilt



Community CDIS Thread



Fridays Office Hours Registration

