University of CINCINNATI

TriNetX

From Cohort Identification to Enterprise Research Asset

Thursday, July 18th, 2024

OCR CRP First Friday August 2nd, 2024

The UC "Family" – Who We Are and How We Work Together.

UC, UCMC, UC Health, UCP, UCPC, West Chester, Drake – you hear these names and abbreviations on a daily basis, but do you know what they really mean? Are these all the same legal entity or are they separate organizations all together? Join Daniel Brummett, Executive Director of Finance and Operations for the College of Medicine and Chief Financial Officer for UC Physicians Inc. as he presents "The UC 'Family' – Who We Are and How We Work Together" . During the presentation you will learn about our various corporate entities, how they are structured from a legal and tax perspective, and the various and unique ways that we work together as part of the UC Family.

Today's Presentation:

TriNetX: From Cohort Identification to Enterprise Research Asset

TriNetX has been a popular research discovery tool at UC since 2016. There have been over 45,000 queries since it went live. Added functionality includes participation in the Research Network with scores of other institutions and a denominator of over 130 million subjects enabling Real World Evidence (RWE) studies. Features in development now include Privacy Protecting Record Linkage (PPRL), third-party claims data, death registry, Natural Language Processing (NLP), and OMOP data warehouse.

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UC College of Medicine | BHIDS

From Blood and Guts
To Bits and Bytes

TriNetX: From Cohort Identification to Enterprise Research Asset

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July 18, 2024

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I have no actual or potential conflict of interest in relation to content of this presentation.

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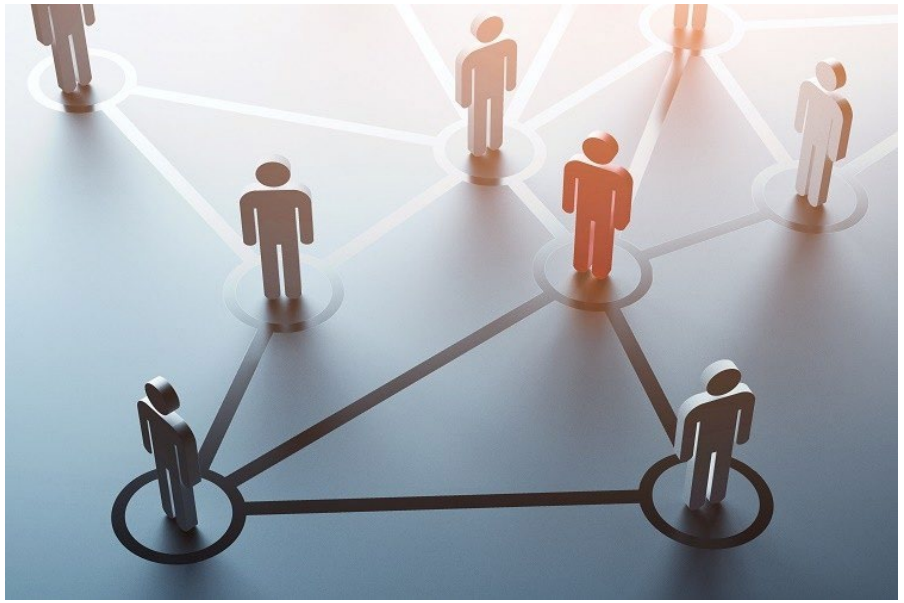
TriNetX



A network where HCOs supply de-identified patient data so pharmaceutical firms and CROs can identify sites with certain patient populations.
Also, the ability for researchers to use the same user interface to explore, analyze and publish.

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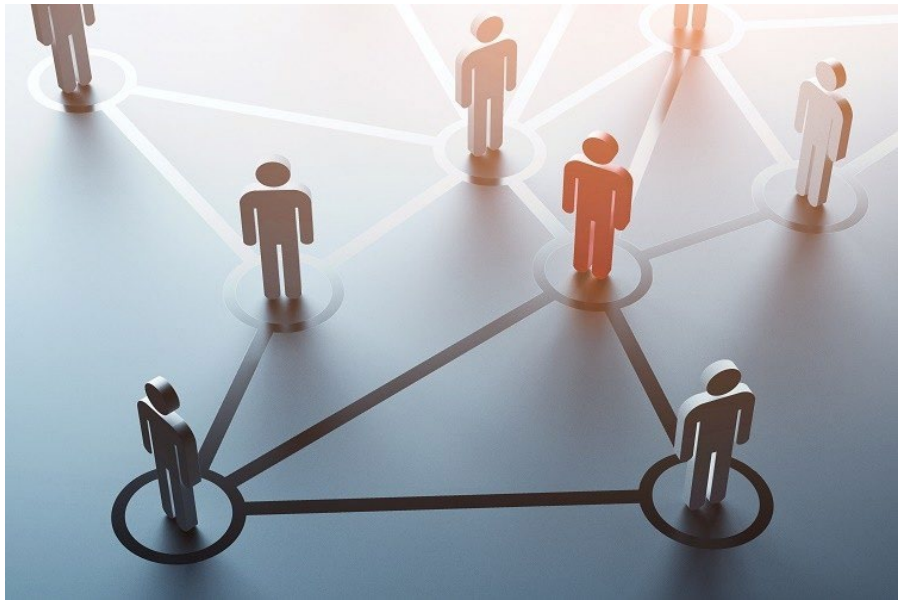
TriNetX



In 2023, we arranged with TriNetX for their platform and evolving tools to be a technical cornerstone of the UC/UC Health research architecture.

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Center for Health Informatics (CHI) portal

Study Feasibility using TriNetX

TriNetX can find patient cohort counts defined by clinical criteria such as diagnoses, demographics, clinical procedures, lab results and medications. These queries can be used for feasibility, subject recruitment, hypothesis generation, or defining a clinical data extract for analysis. The CHI can "reverse engineer" queries to provide identifiers for subject recruitment. If TriNetX does not have the detailed elements required, we will escalate the request to a search directly within Epic. (See 'Study Feasibility directly from Epic').

https://live.trinetx.com/

TriNetX is a free, self-service tool. The fees associated with this service is for the CHI to help you access data **should you need that.**

You can learn more about TriNetX and request user credentials on the CCTST website. You will first need to create a free CCTST membership if not already a member.

Join the CCTST
Request TriNetX User Credentials

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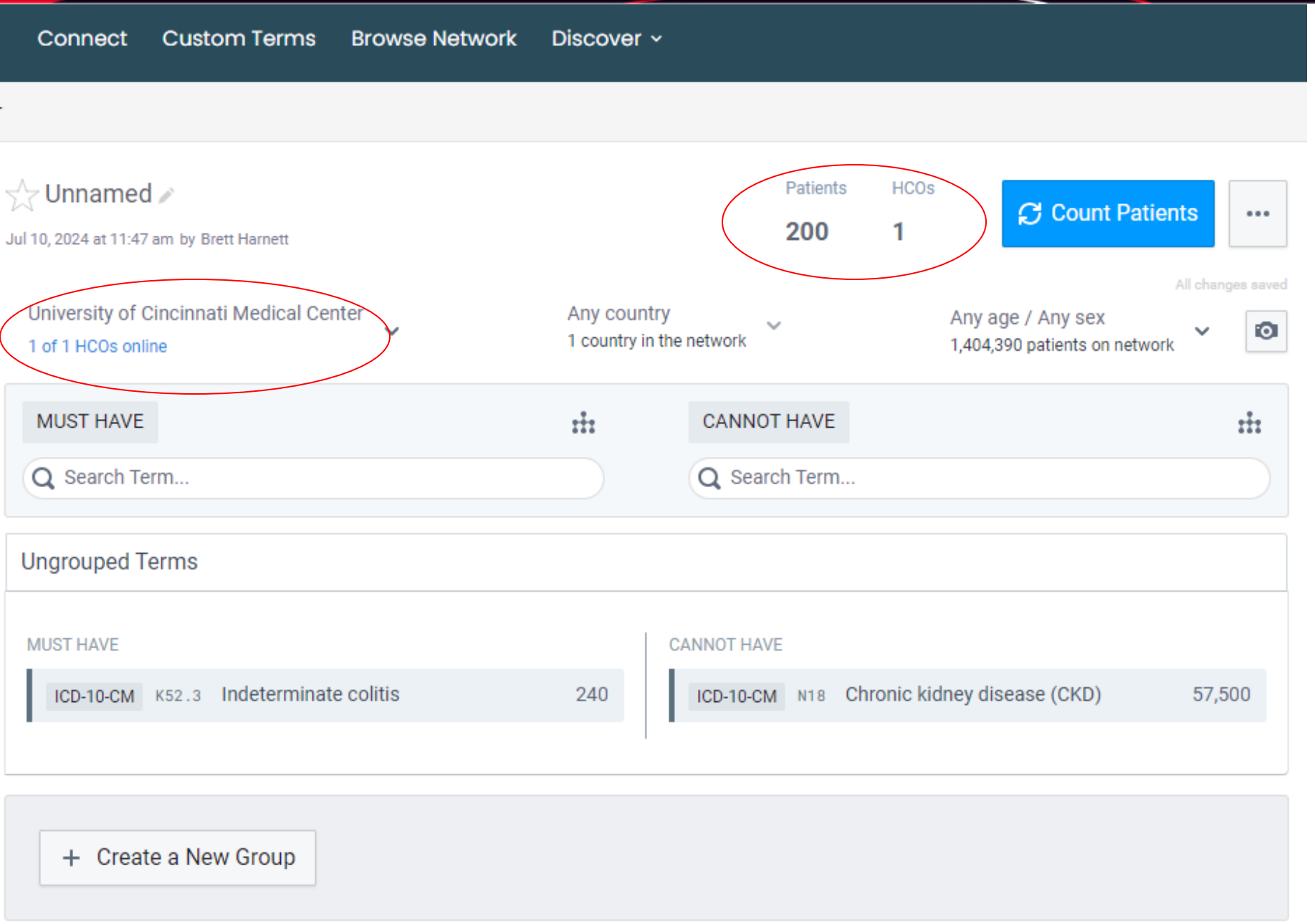

Most basic level -
Local cohort counts

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Unnamed

Jul 10, 2024 at 11:51 am by Brett Harnett

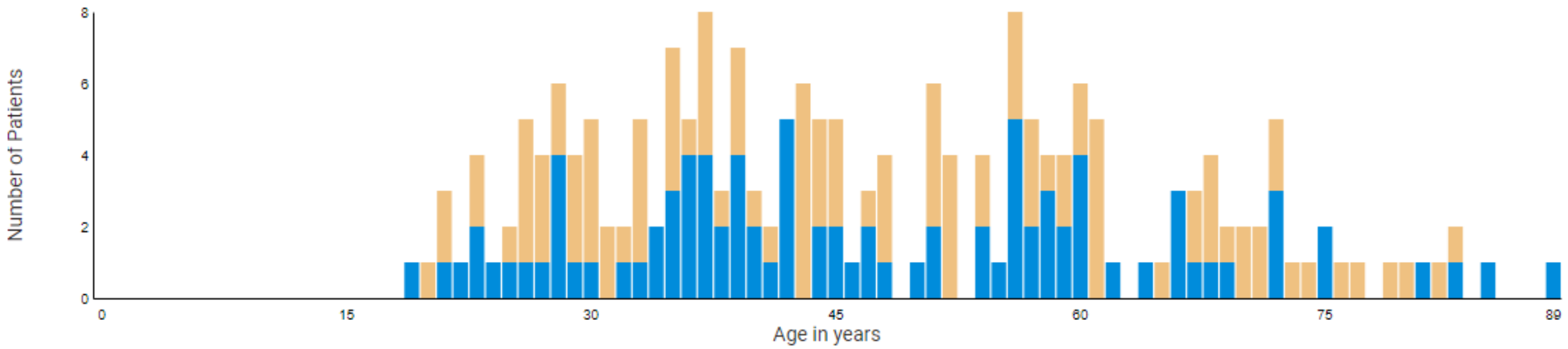
Patients	HCOs
200	1

Run

View History

Demographics

Grouped | Stacked | F | M | U



Patients 90 and Older: 2

Total Patients	Minimum Age	Maximum Age	Mean Age	Standard Deviation
200	19	90	48	17

Sex

Female	55.00%
Male	45.00%
Unknown	0.00%

Ethnicity

Not Hispanic or Latino	95.00%
Hispanic or Latino	5.00%
Unknown Ethnicity	5.00%

Race

White	80.00%
Black or African Americ...	20.00%
American Indian or Ala...	5.00%
Asian	5.00%
Other Race	5.00%
Unknown Race	5.00%
Native Hawaiian or Oth...	0.00%

Unnamed

Jul 10, 2024 at 11:51 am by Brett Harnett

Patients	HCOs
200	1

Run

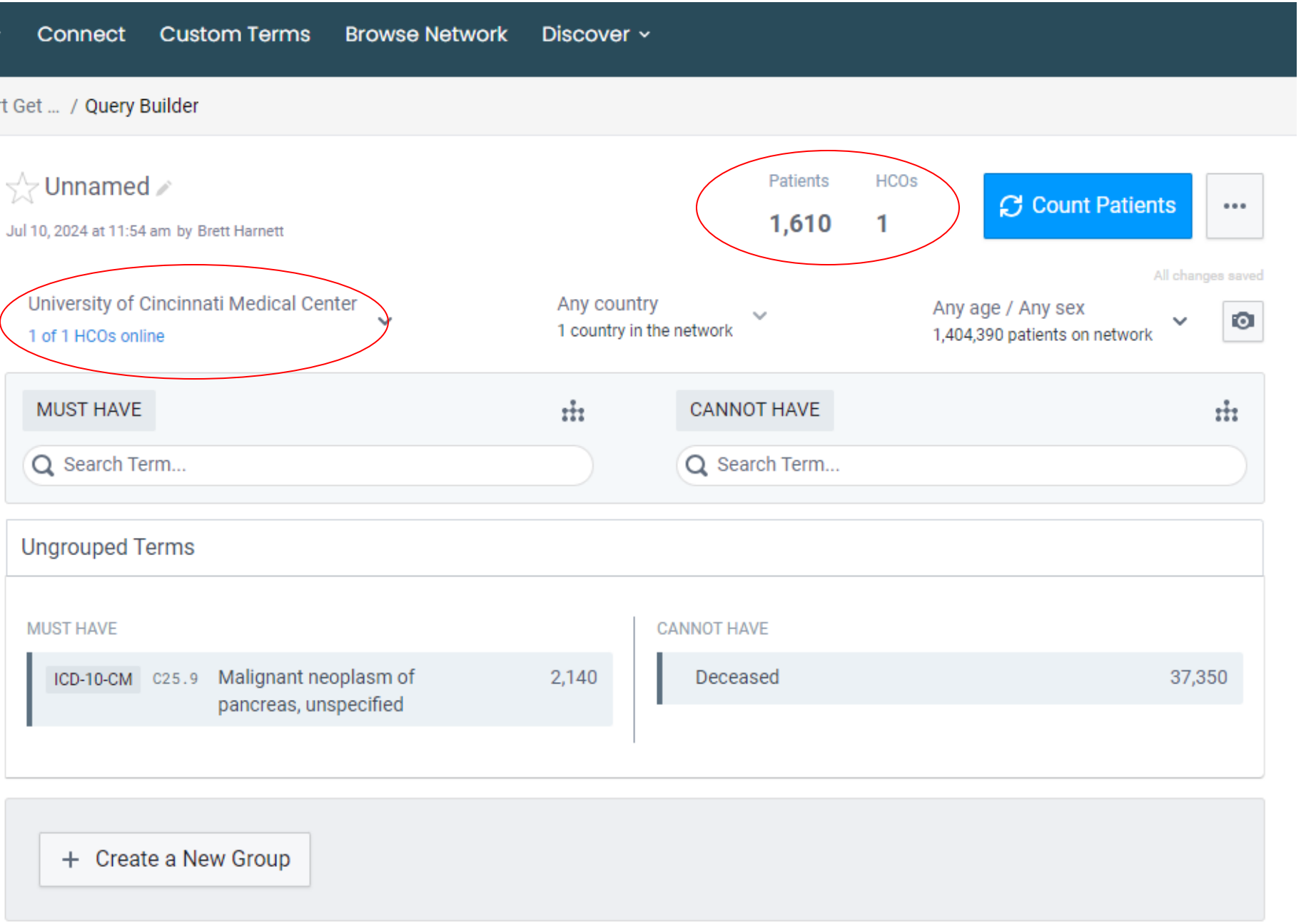
View History

Diagnoses

Diagnoses within: 3M | 6M | 12M | 24M | Anytime | All | Acute | Chronic

Search...

Diagnoses			Patients	% of Cohort
ICD-10-CM	K00-K95	Diseases of the digestive system	200	100%
ICD-10-CM	K50-K52	Noninfective enteritis and colitis	200	100%
ICD-10-CM	K55-K64	Other diseases of intestines	170	85%
ICD-10-CM	K20-K31	Diseases of esophagus, stomach and duodenum	130	65%
ICD-10-CM	K90-K95	Other diseases of the digestive system	110	55%
ICD-10-CM	K70-K77	Diseases of liver	60	30%
ICD-10-CM	K80-K87	Disorders of gallbladder, biliary tract and pancreas	60	30%
ICD-10-CM	K40-K46	Hernia	50	25%
ICD-10-CM	K65-K68	Diseases of peritoneum and retroperitoneum	40	20%
ICD-10-CM	K00-K14	Diseases of oral cavity and salivary glands	30	15%
ICD-10-CM	K35-K38	Diseases of appendix	10	5%
ICD-10-CM	Z00-Z99	Factors influencing health status and contact with health services	200	100%
ICD-10-CM	R00-R99	Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	190	95%
ICD-10-CM	E00-E89	Endocrine, nutritional and metabolic diseases	160	80%
ICD-10-CM	D50-D89	Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	140	70%
ICD-10-CM	F01-F99	Mental, Behavioral and Neurodevelopmental disorders	140	70%



Most Basic Level
Local cohort count
(with Cancer Staging)

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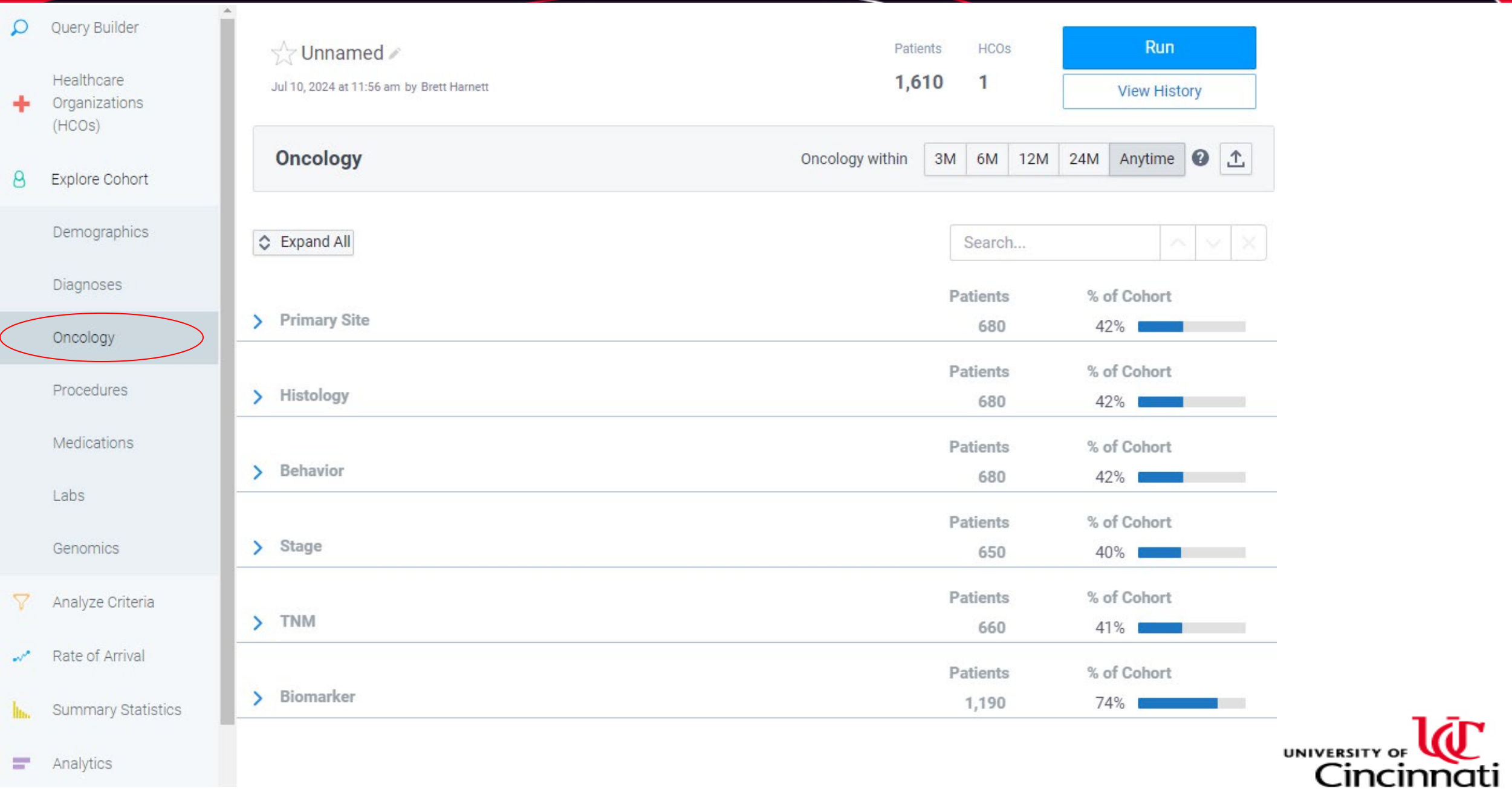

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Research Network: Increase the *n* from 1.3M to over 130M

Login

TriNetX

SOLUTIONS OUR NETWORK NEWS & EVENTS ABOUT

TriNetX Research™

Hypothesize and Answer Complex Research Questions About Patient Outcomes & Treatment Effectiveness

- Access longitudinal clinical and genomic data
- Explore and compare cohorts, review cohort characteristics and compare outcomes of interest
- License and download billions of up-to-date, de-identified clinical facts for analysis with your own analytic tools

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Comparative Study > Lancet Psychiatry. 2021 May;8(5):416-427.
doi: 10.1016/S2215-0366(21)00084-5. Epub 2021 Apr 6.

6-month neurological and psychiatric outcomes in 236 379 survivors of COVID-19: a retrospective cohort study using electronic health records

Maxime Taquet [1], John R Geddes [1], Masud Husain [2], Sierra Luciano [3], Paul J Harrison [4]

Affiliations + expand

PMID: 33836148 PMCID: PMC8023694 DOI: 10.1016/S2215-0366(21)00084-5
Free PMC article

Abstract

Background: Neurological and psychiatric sequelae of COVID-19 have been reported, but more data are needed to adequately assess the effects of COVID-19 on brain health. We aimed to provide robust estimates of incidence rates and relative risks of neurological and psychiatric diagnoses in patients in the 6 months following a COVID-19 diagnosis.

Methods: For this retrospective cohort study and time-to-event analysis, we used data obtained from the TriNetX electronic health records network (with over 81 million patients). Our primary cohort comprised patients who had a COVID-19 diagnosis; one matched control cohort included patients diagnosed with influenza, and the other matched control cohort included patients diagnosed with any respiratory tract infection including influenza in the same period. Patients with a diagnosis of COVID-19 or a positive test for SARS-CoV-2 were excluded from the control cohorts. All cohorts included patients older than 10 years who had an index event on or after Jan 20, 2020, and who were still alive on Dec 13, 2020. We estimated the incidence of 14 neurological and psychiatric outcomes in the 6 months after a confirmed diagnosis of COVID-19: intracranial haemorrhage; ischaemic stroke; parkinsonism; Guillain-Barré syndrome; nerve, nerve root, and plexus disorders; myoneural junction and muscle disease; encephalitis; dementia; psychotic, mood, and anxiety disorders (grouped and separately); substance use disorder; and insomnia. Using a Cox model, we compared incidences with those in propensity score-matched cohorts of patients with influenza or other respiratory tract infections. We investigated how these estimates were affected by COVID-19 severity, as proxied by hospitalisation, intensive therapy unit (ITU) admission, and encephalopathy (delirium and related disorders). We assessed the robustness of the differences in outcomes between cohorts by repeating

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Abstract
Conflict of interest statement
Figures
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Similar articles
Cited by
References
Publication types

Because UC contributes to the TriNetX platform, researchers can access not only for our local UC Health population, but also over data from scores of other HCOs currently130M patients across the global Research Network. At no cost.*

This is Real-World Evidence

* Except for CHI processing fees if data is needed

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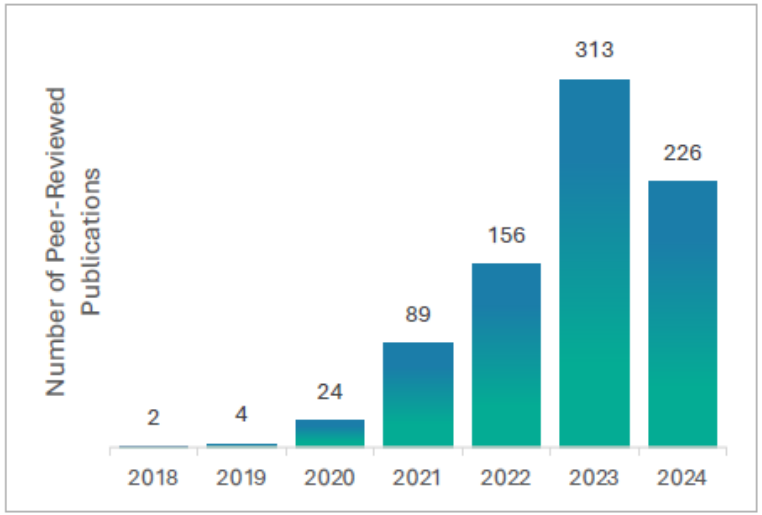
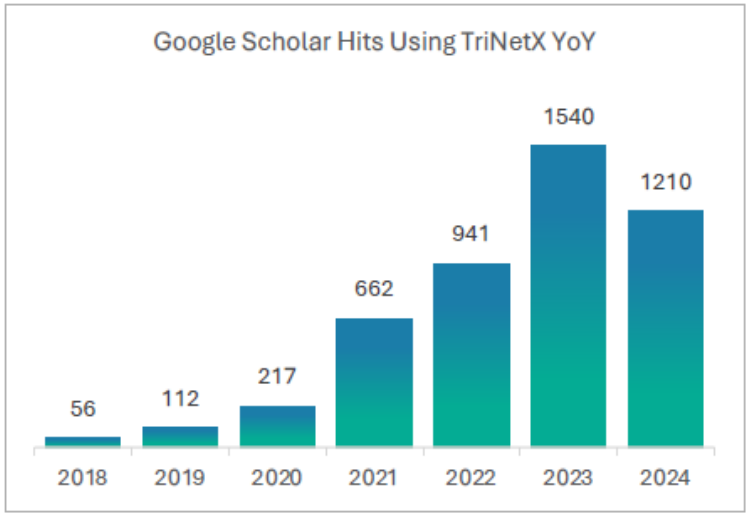
Publications using TriNetX (May 2024)

Peer-Reviewed Publications to Date: **814**

Google Scholar Hits to Date: **5,420**



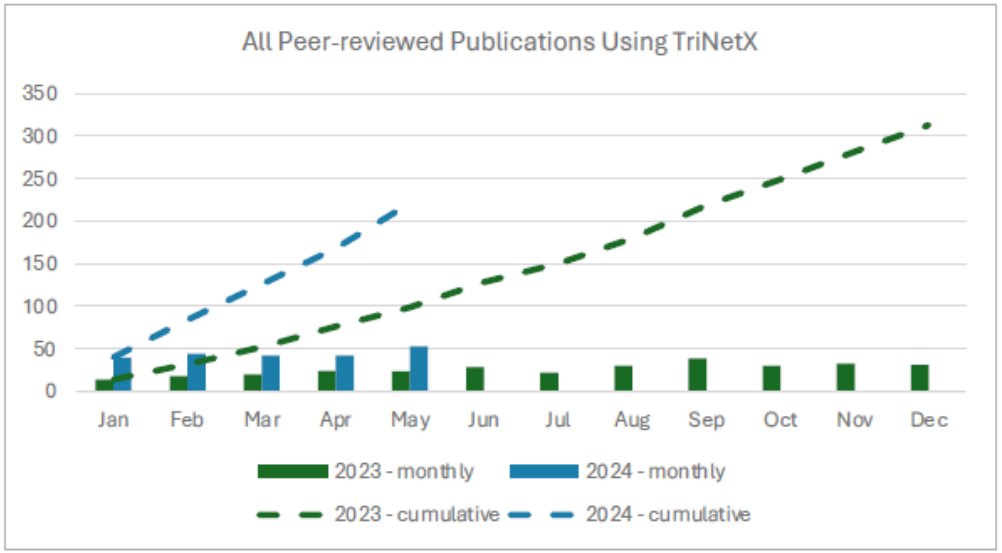


Past 3 Month Snapshot:

Peer-Reviewed Publications in March 2024: **42**

Peer-Reviewed Publications in April 2024: **42**

Peer-Reviewed Publications in May 2024: **53**



For full list of publications to date, visit https://www.trinetx.com/publications/

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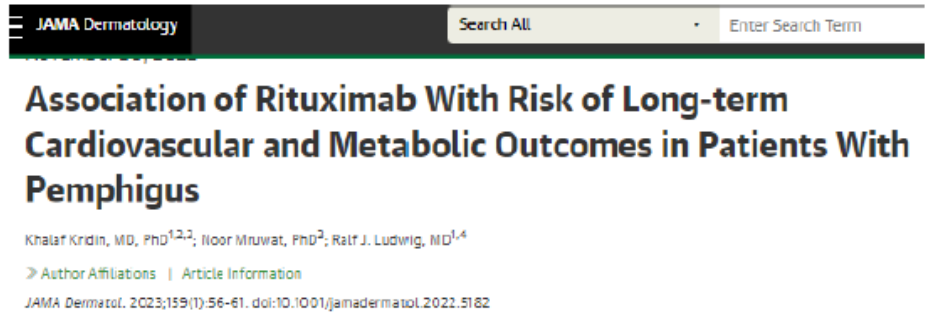
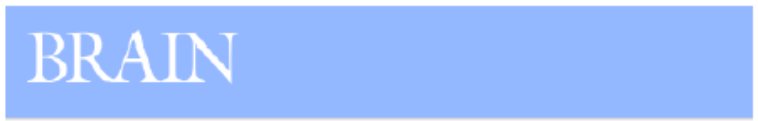
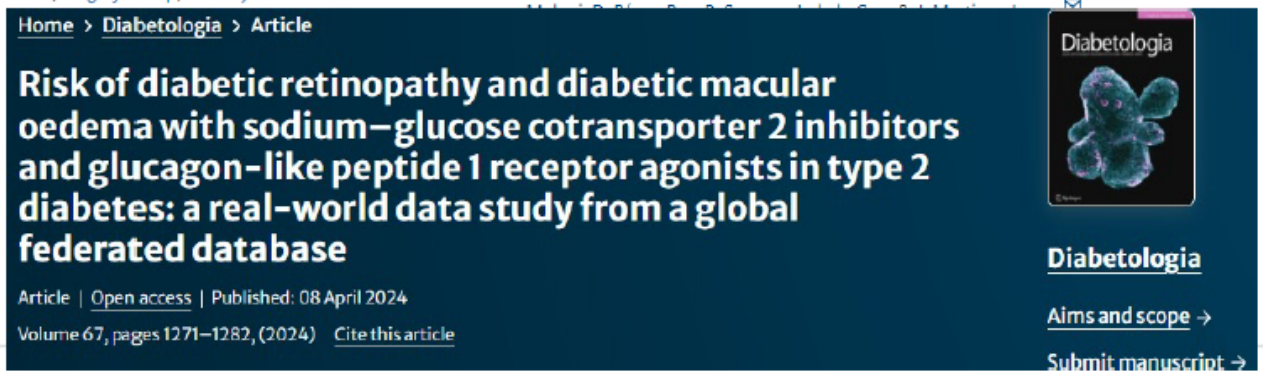
Publications using TriNetX (May 2024)







TriNetX

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Center for Health Informatics (CHI) portal

TriNetX Research Network (RWE Data)

There are two methods to analyze data using TriNetX: Online analytics are built-in the TriNetX application and can be done entirely within the interface, usually within hours or less, if you are really good. Various types of analyses can be done such as Compare Cohorts, Analyze Outcomes, Incidence and Prevalence, and Treatment Pathways. You can also build queries and then request data from the TRN. Thousands of RWE papers have been published just in the past few years. Data is classified as de-identified per the Privacy Rule using the Expert Determination Method, thus, no IRB approval is needed for accessing this data. A Data Use Agreement with TriNetX is required but fairly expeditious (uses DocuSign).

Note: Before you submit a request for data through the TriNetX website, you must review the Policy and Procedures for accessing data and publishing. **If you do not submit a request below, the data you want from TriNetX cannot be approved.**

There is no cost for the data from TriNetX, but you must also use this page to submit the request to the CHI for processing after you request your data within the TriNetX tool. There is a small fee.

You can learn more about TriNetX and request user credentials on the CCTST website. You will first need to create a free CCTST membership if you are not already a member.

Join the CCTST
Request TriNetX User Credentials

Pricing

$194.00

See the CHI Terms of Service for more details. You will receive a Work Order with the final price before work is started. *We provide subsidies on many services to CCTST members.* Create your free CCTST account today!

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Accessing data from TriNetX and publishing guidelines

For security reasons, this access this document, users must be logged into the CHI Portal.

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Introduction

TriNetX is the global health research network enabling healthcare organizations, biopharma, and contract research organizations (CROs) to collaborate, enhance trial design, accelerate recruitment, and bring new therapies to market faster.

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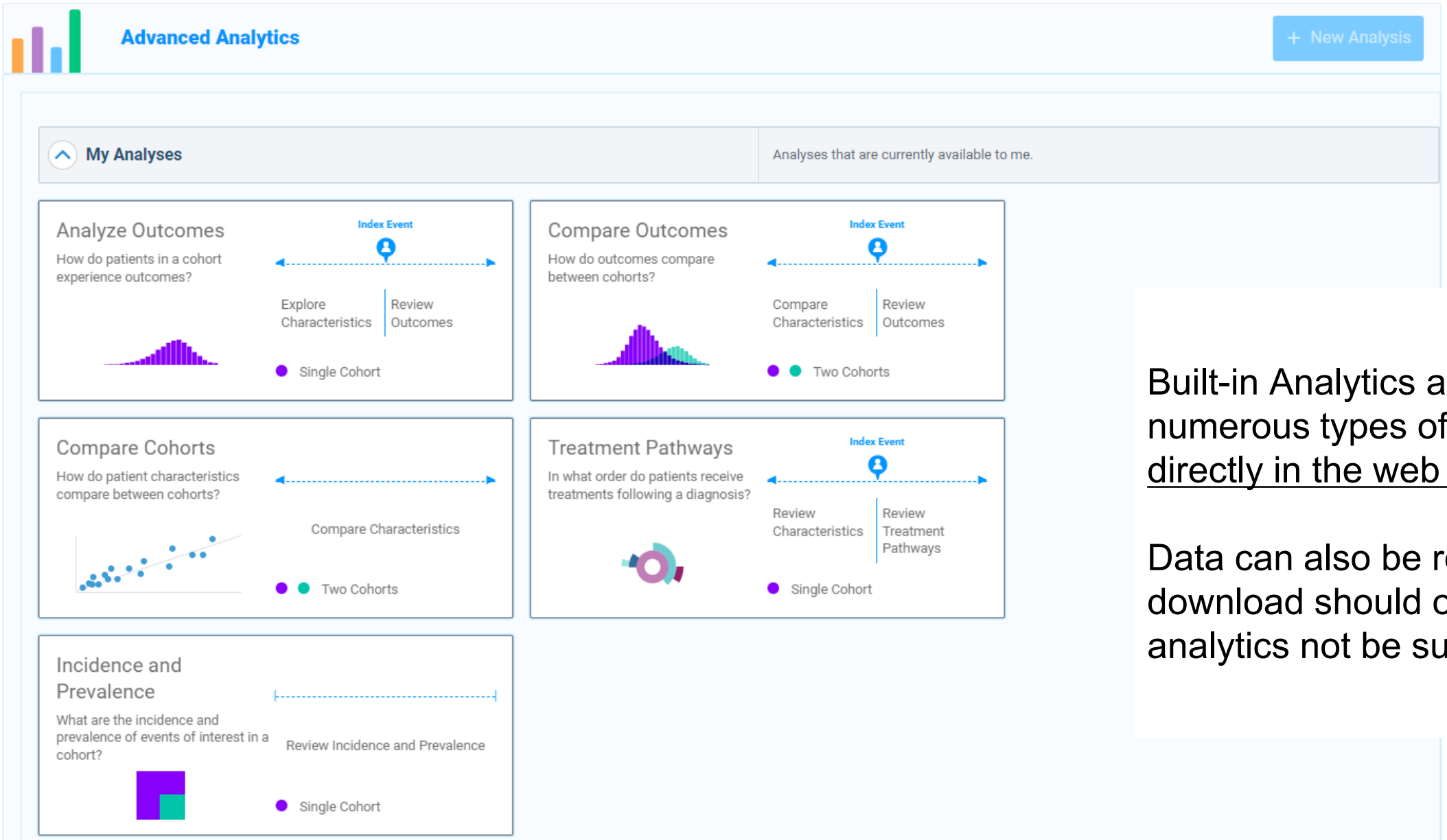

Built-in Analytics allow for numerous types of analyses directly in the web browser.

Data can also be requested for download should onboard analytics not be sufficient.

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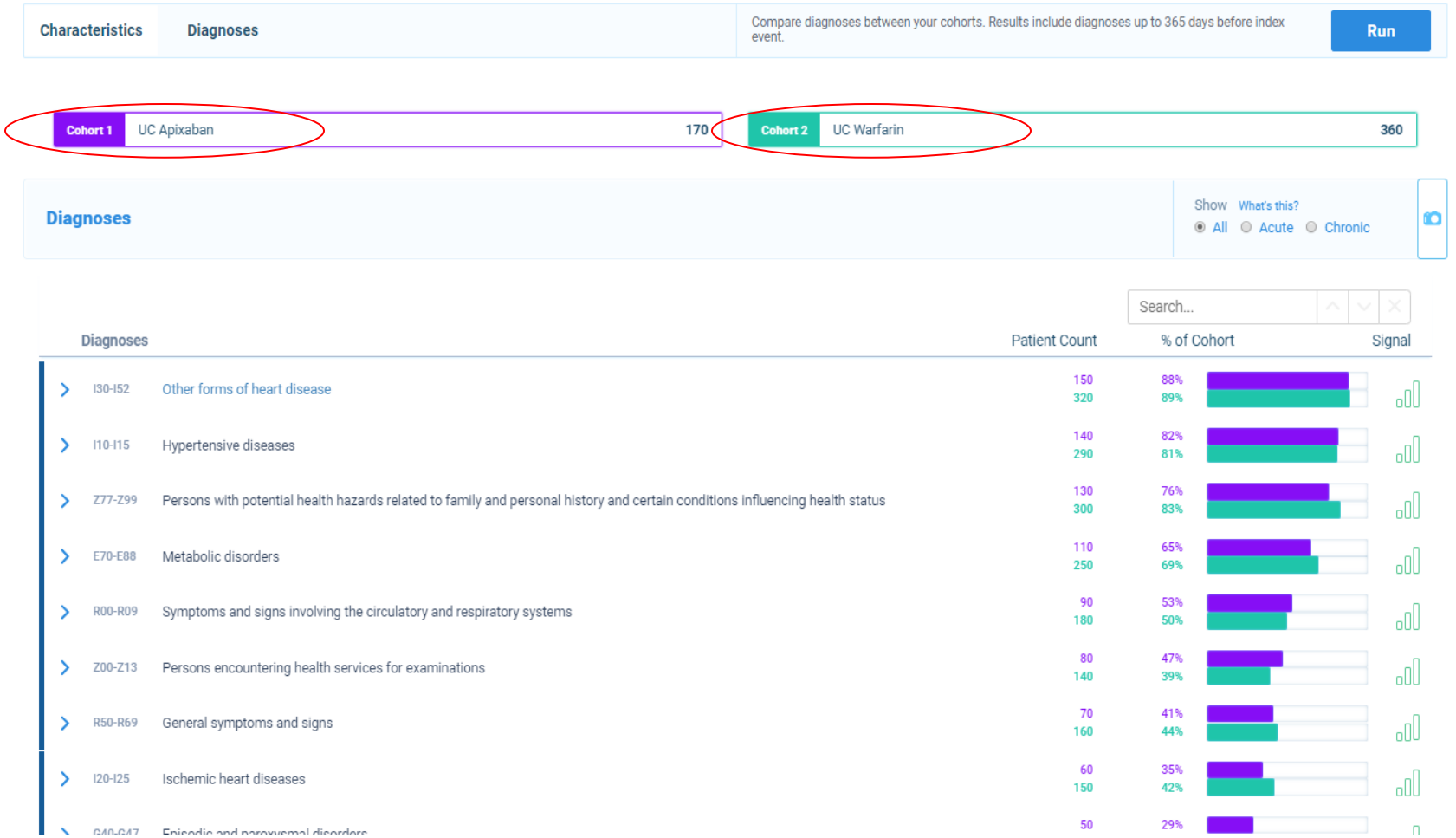
Built-in Compare Outcomes Analysis



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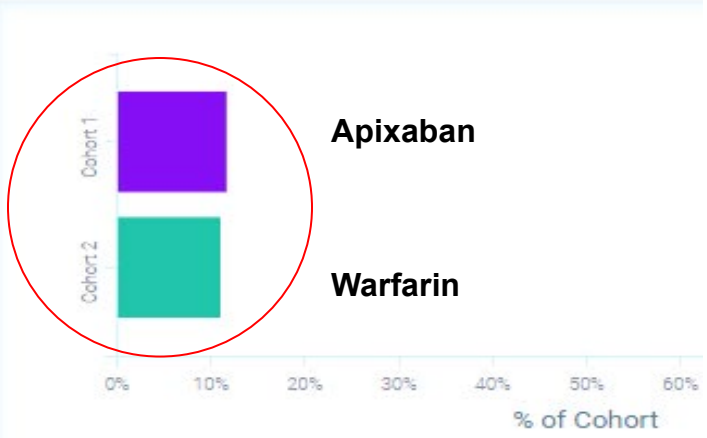
Unnamed Outcome

Must Have Nontraumatic subarachnoid hemorrhage OR Other and unspecified nontraumatic intracranial ... OR Cerebrovascular diseases OR Nontraumatic intracerebral hemorrhage

1a : Measures of Association

		Cohort Statistics		
	Cohort	Patients in Cohort	Patients with Outcome	Risk
1	UC Apixaban	170	20	11.765%
2	UC Warfarin	360	40	11.111%

Risk Difference				Risk Ratio		Odds Ratio	
Risk Difference	95 % CI	z	p	Risk Ratio	95 % CI	Odds Ratio	95 % CI
0.654%	(-5.177%,6.484%)	0.222	0.8246	1.059	(0.639,1.754)	1.067	(0.603,1.888)



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Accessing TriNetX

CCTST | Center for Clinical & Translational Science & Training

Search...

Home About Funding Research Resources Community Training Programs News Events Membership

TriNetX

ABOUT TRINETX

TriNetX is a self-service tool that allows researchers to determine approximately how many patients in the Clinical Research Enterprise Warehouse meet certain criteria. Researchers use an intuitive user interface for selecting query criteria from UC Health's clinical (Epic) repository.

https://www.cctst.org/trinetx

TO USE TRINETX

- Click: Access TriNetX.
- Read the User Agreement that is displayed and click "I Agree".
- A User account will be created and credentials emailed to you from the System Administrator.
- After you log in, click on the Help menu in the upper right and watch the short training videos (at least: Introduction to TriNetX, General Navigation and Terminology and Adding Terms).
- Begin using the TriNetX interface to create your queries. Queries time out after 5 minutes (very few should ever take that long).

Login

Authenticate with one of these to access or create your CCTST membership:

University of CINCINNATI

Cincinnati Children's
changing the outcome together

Community

Use your UC or Cincinnati Children's credentials to access or create your CCTST membership.

other authentication options

After you accept the User Agreement, you will be contacted by the CHI with a temporary login.

Note: Authentication is managed by TriNetX, not UC/CHI.

User Agreement

This User Agreement permits approved user's access to TriNetX. Your acceptance of this agreement certifies that you understand and agree to all applicable terms contained herein (you only need to agree once):

i. I understand that this system was not designed, nor is it intended, to support any aspect of patient care.

ii. I represent that I am an active, approved and registered user for UC Health clinical systems or am currently engaged in research or quality improvement activities at UC or UC Health.

iii. I understand that the creators of TriNetX have made efforts to provide accurate, timely data but that the data may not be accurate due to data inconsistencies or errors.

iv. I understand that due to HIPAA privacy concerns, the data is considered Protected Health Information (PHI) categorized as a Limited Data Set that includes specific dates. Query results are obfuscated (purposely clouded) where aggregate counts are small. (Exact numbers can be garnered through the Center for Health Informatics.)

v. I agree to restrict individual queries to legitimate research topics.

vi. I understand that all searches executed within the system are recorded and will be examined, as part of routine compliance audits. The identity of the user is recorded along with information related to each search executed.

vii. I understand that I may not share my login information with any other person for any reason.

viii. I have read, understood, and will comply with University of Cincinnati's computer use policy.

ix. I have completed training in human subjects' protection.

x. I understand that I may not use the data retrieved using TriNetX to identify or contact any individual or to attempt to learn the identity of any household, family, person, establishment or sampling unit included in these data.

xi. I acknowledge that I will only obtain the minimum necessary data to accomplish the goals of my research or quality improvement activity.

xii. I understand that any violation of this assurance may result in disciplinary action by UC and/or UC Health in consultation with the appropriate office(s) at these institutions.

Important Note:
TriNetX uses its own authentication. You will need to get credentials before using it for the first time.

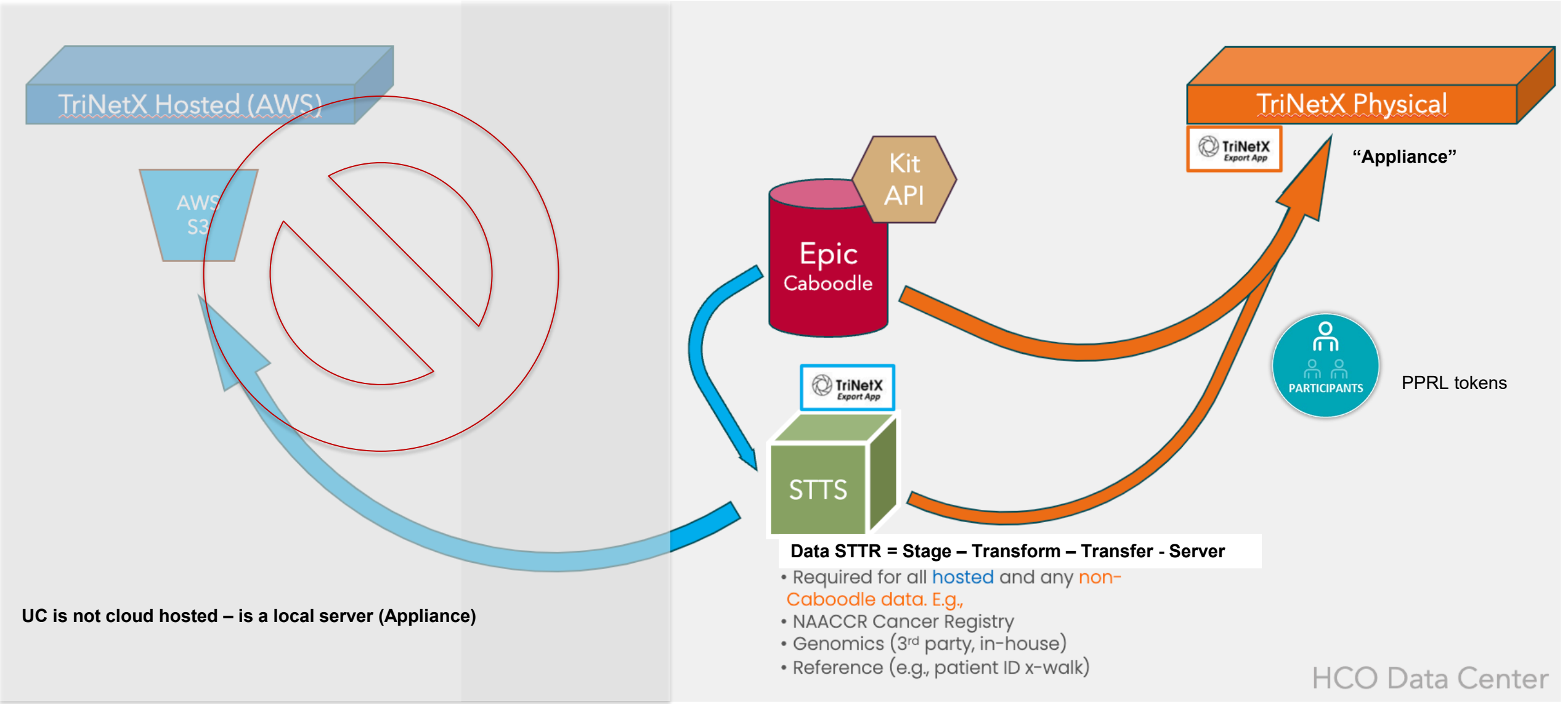
You agreed to this version of the User Agreement on 12/6/2016, 11:25:25 AM.

Continue

New Capabilities in process…

- Privacy Protecting Record Linkage (De-duplication)
- Third-party claims data (e.g. pharmacy claims)
- Death registry (confirming death – important for survival analyses)
- Natural Language Processing (coded concepts from notes)
- OMOP data warehouse (Observational Medical Outcomes Partnership) (harmonizing inter-institution research data warehouses)

Flexible Architecture (Hosted or Physical)



UC is not cloud hosted – is a local server (Appliance)

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Physical Appliance Architecture

Aids Recruitment!

Reverse engineer synthetic IDs to MRNs (CHI)

END USERS

e.g., Pharmas, CROs, Research Network

Aggregate Results

Browser (Chrome or IE)

Internet

VIRTUAL PRIVATE CLOUD

TriNetX — amazon web services

- Application Services
- Terminology Services
- Identity Services
- Workflow
- Ubuntu OS Patch Monitoring
- Aggregation Engine
- App Storage
- Query Builder
- Elastic Search
- Teleport Remote Access
- Pub / Sub Queue

No open ports on the firewall, all outbound communications

No PHI Anonymized Data Only

SSL (outbound)

SSH (outbound on-demand)

SSL (outbound)

HCO Firewall

UC Health

HCO DATA CENTER

TriNetX **PHYSICAL APPLIANCE**

- Query Processing
- System and Data Monitor
- High Performance Query Engine (In memory)
- TriNetX Database
- NLP Service
- File Archive
- Self-Updating Software
- Teleport Remote Access Agent
- Ingestion Services
- Secure File Drop-off

Identity Map

Re-Identify Patients

- Bit Defender Anti-Virus
- AWS CloudWatch System Monitoring
- Landscape Patch Management
- HP Insight

TriNetX classic cohort function

- Mortality data
- i2b2 or OMOP
- Extract Files Tumor Reg Genomics
- NLP Documents
- 3rd party claims data

In development

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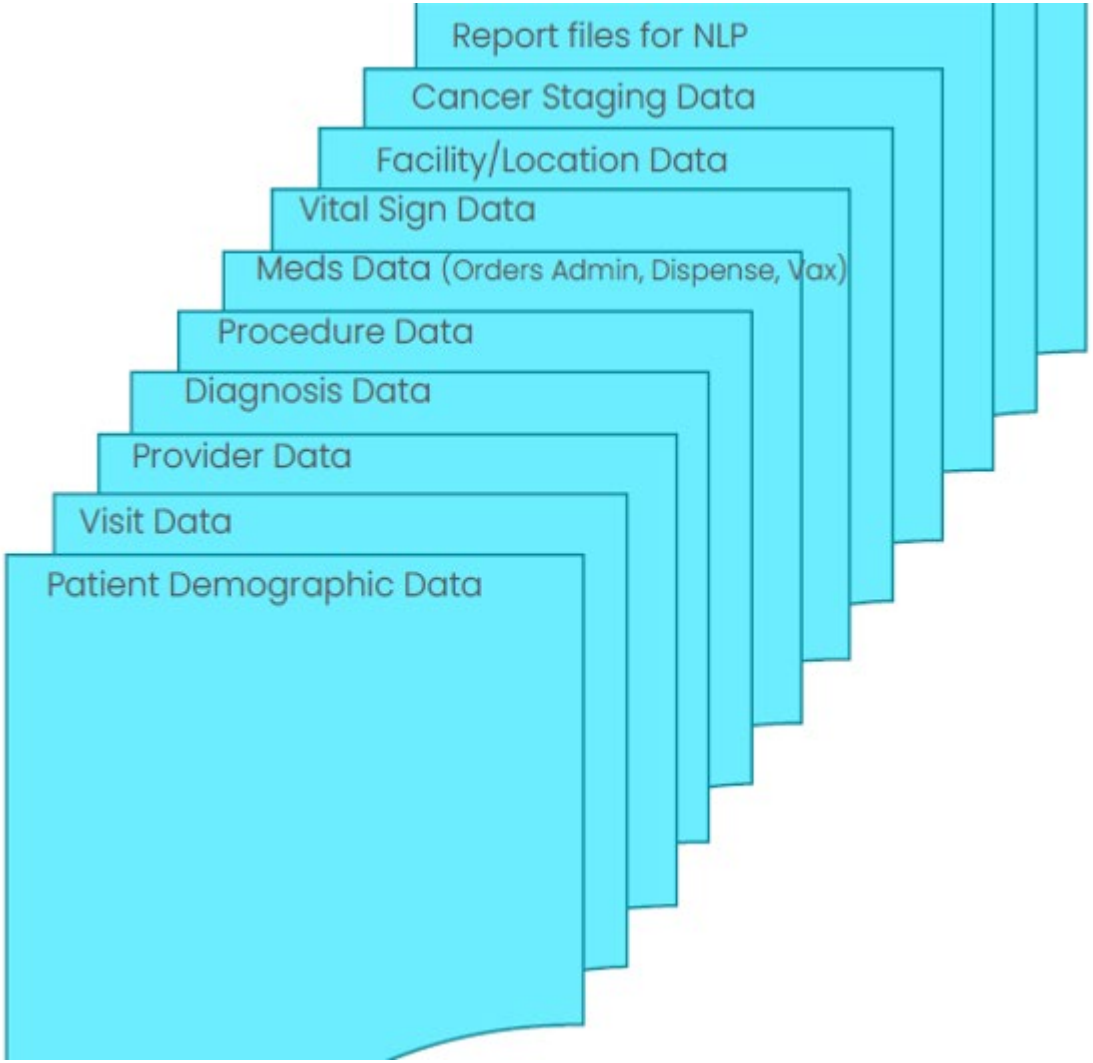
Layers of TriNetX ecosystem



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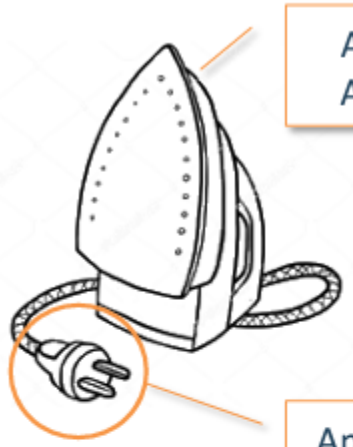
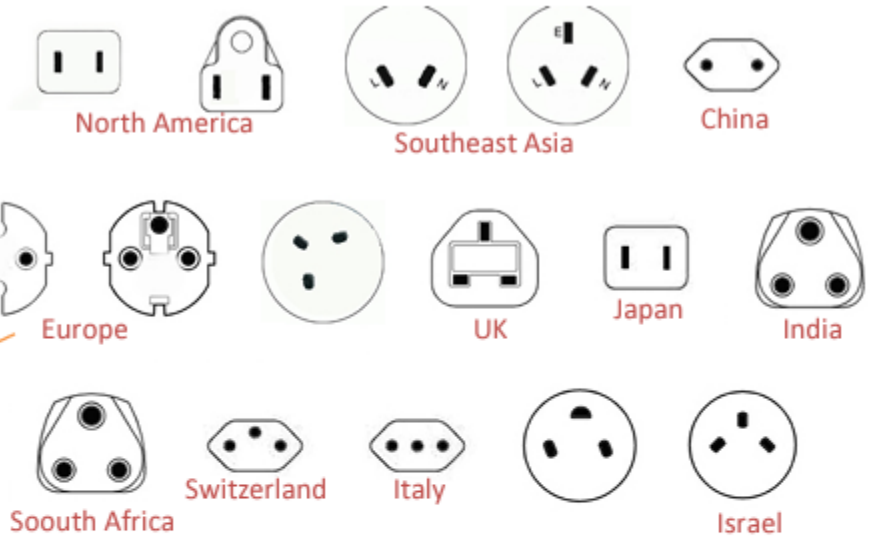
OMOP Solution:

"What's the adherence to my drug in the data assets I own?"



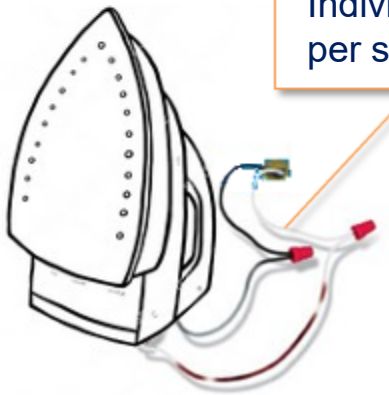
Analytical method: Adherence to Drug

Application to data

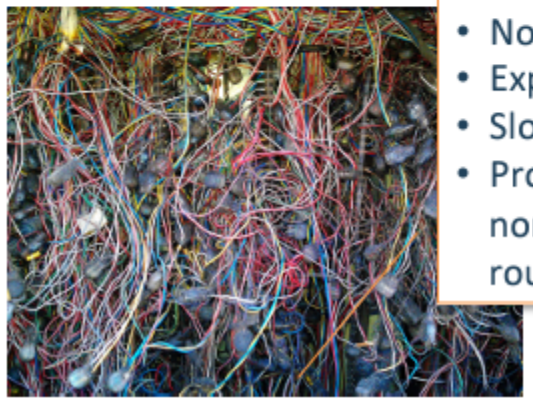


Data access is not standardized between sites. This is how we can query across the spectrum.

Current Solution:



Individual queries per site/study



- Not scalable
- Not transparent
- Expensive
- Slow
- Prohibitive to non-expert routine use

Credit: OHDSI

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Definition | Concept Sets | Generation | Reporting | Explore | Export

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Initial Event Cohort

People having any of the following:

- a drug exposure of Warfarin[2]
  - for the first time in the person's history
  - with age >= 65

with continuous observation of at least 180 days prior and 0 days after event index date, and limit initial events to: **earliest event per person.**

For people matching the Primary Events, include:
People having all of the following criteria:

- at least 1 occurrences of a condition occurrence of Atrial fibrillation[1]
  occurring between all days Before and 1 days Before event index date

Limit cohort of initial events to: **earliest event per person.**
Limit qualifying cohort to: **earliest event per person.**
No end date strategy selected. By default, the cohort end date will be the end of the observation period that contains the index event.

Appendi

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1. Atrial

Available CDM Sources

	Source Name	Generation Status	Distinct People
▶ Generate	OHDSI CDM V5 Database	COMPLETE	8207

2. Warfa

1310149	Warfarin	Drug	RxNorm	NO	YES	NO	

Credit: OHDSI

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Summary

An update on development efforts with TriNetX for the research infrastructure.

TriNetX has been a popular research discovery tool at UC since 2016. There have been over 45,000 queries since it went live.

Added functionality includes participation in the Research Network with scores of other institutions and a denominator of over 130 million subjects (and growing) enabling Real World Evidence (RWE) studies.

Features in development include Privacy Protecting Record Linkage (PPRL), third-party claims data, death registry, Natural Language Processing (NLP), and OMOP data warehouse.

The architecture is securely housed at UC Health with access to the CoM.

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Thank you - Questions

This is our Chief Information Officer. He's encrypted for security purposes.

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