TriNetX Clinical Query Tool

Patricia Kovatch, Dean
Sharon Nirenberg, MD, Lead Physician Informaticist
Naomi So MD, Physician Informaticist
Scientific Computing and Data
Icahn School of Medicine at Mount Sinai

October 18, 2023

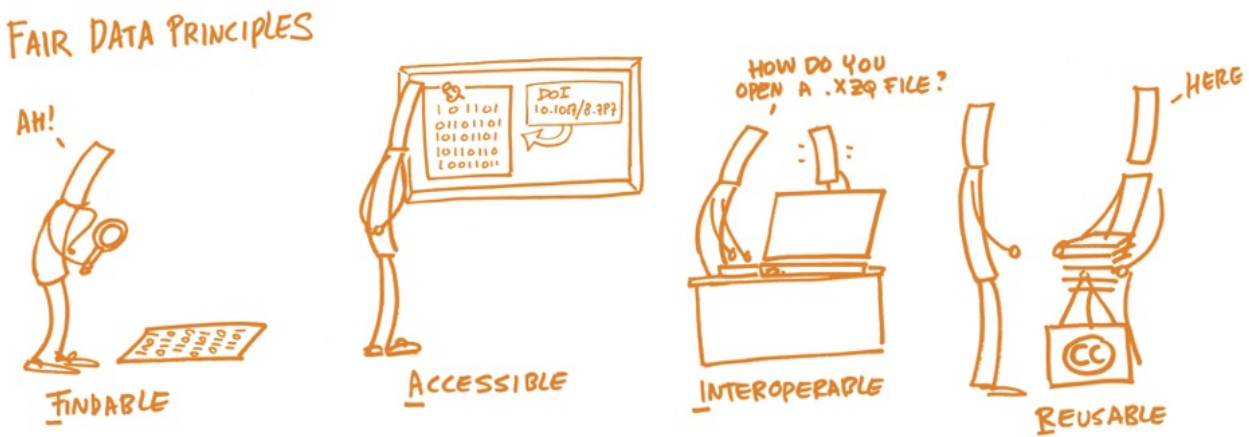
Agenda

1. The Mount Sinai Data Warehouse
2. Introduction to TriNetX Cohort Query Tool
3. Building a Query in TriNetX
4. MSDW Custom Data Set Request

Mount Sinai Data Warehouse

Scientific Computing FAIR Principles for Data

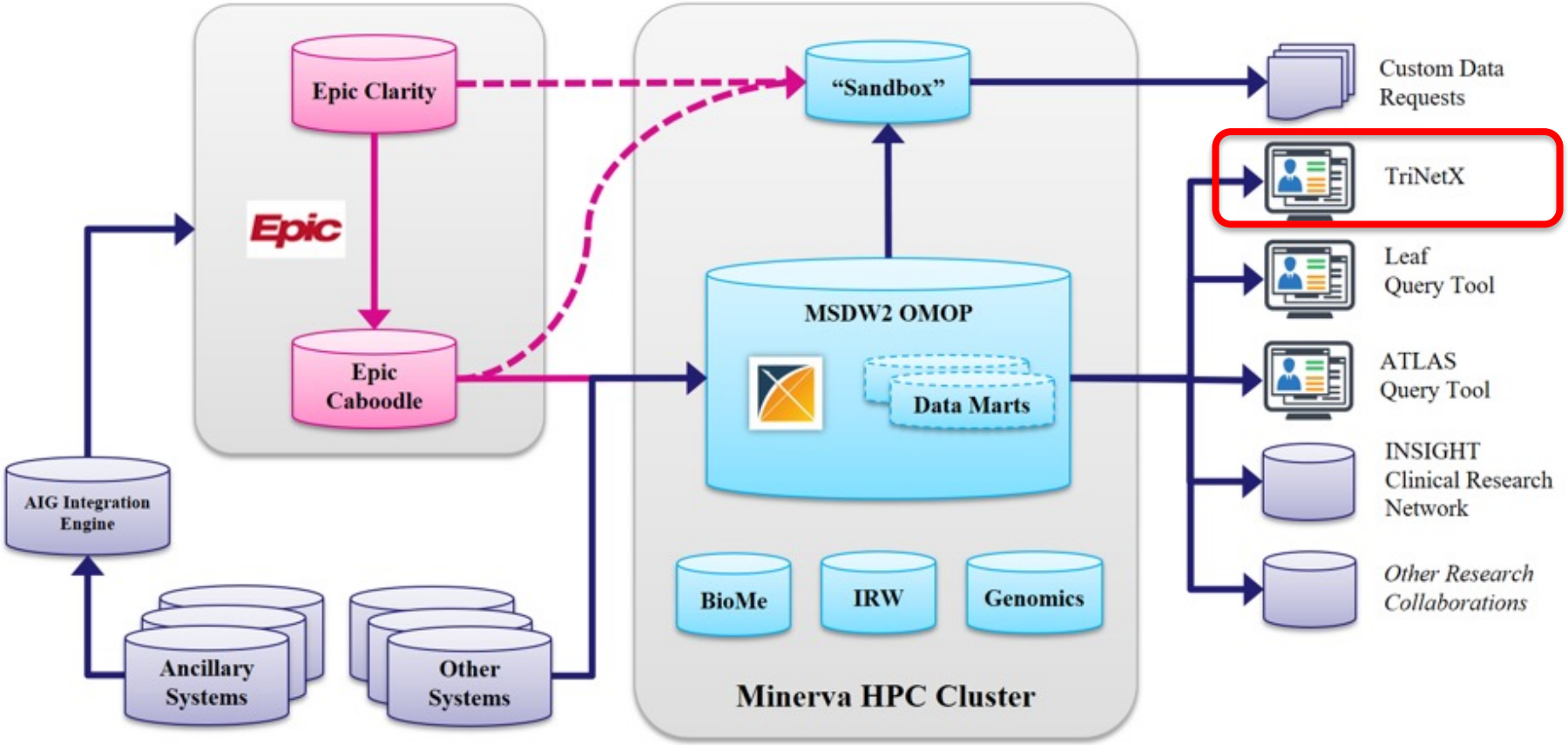
Findable | **A**ccessible | **I**nteroperable | **R**eusable / Reproducible



Source: NIH's Big Data to Knowledge (BD2K) Initiative (https://commonfund.nih.gov/bd2k)

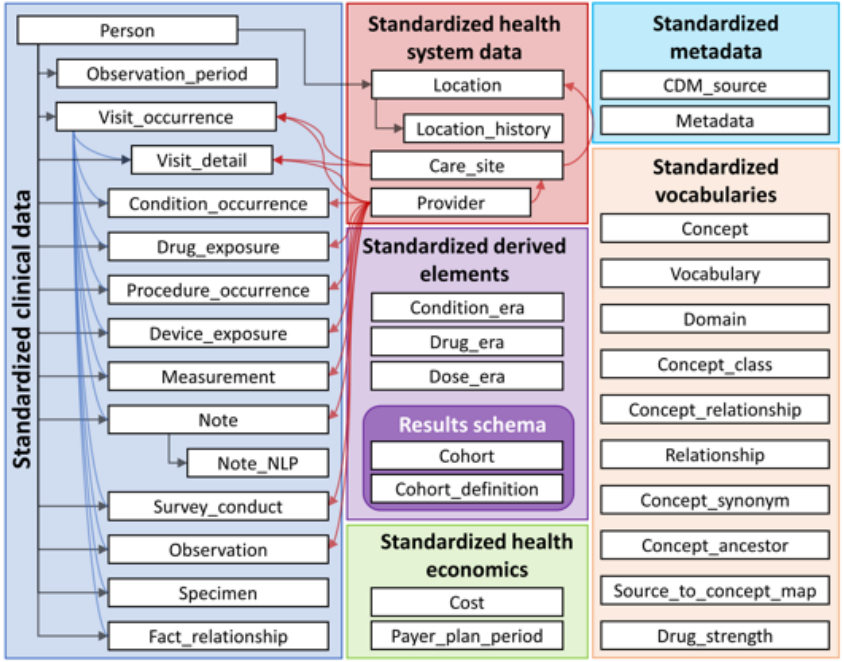
Image Source: https://book.fosteropenscience.eu/

Mount Sinai Data Warehouse Ecosystem



OMOP Common Data Model Requirements

1. Standardize **data structure** via common format



2. Standardize **data content** via mapping EHR codes to standard healthcare vocabularies

OMOP Domain	Standard Vocabularies	Non-standard Vocabularies
Condition	SNOMED-CT	ICD-10-CM, ICD-9-CM
Drug	RxNorm, CVX	ATC, NDC, Multum
Measurement	LOINC	SNOMED-CT, Nebraska Lexicon
Procedure	CPT4, HCPCS, ICD-10-PCS	ICD-9-Proc
Observation	SNOMED-CT, LOINC	ICD-10-CM, ICD-9-CM
Race, Ethnicity	OMOP Race, OMOP Ethnicity	SNOMED-CT, Nebraska Lexicon
Provider (Specialty)	NUCC, Medicare Specialty	SNOMED-CT, Nebraska Lexicon
Route	SNOMED-CT	Nebraska Lexicon
Unit	UCUM	SNOMED-CT, Nebraska Lexicon

https://ohdsi.github.io/CommonDataModel/cdm60.html#Clinical_Data_Tables

MSDW Data Contents (*examples as of May 2023*)

OMOP Table	Record Type	Distinct Patients	Record Count
person	Patient Demographics	11,359,705	11,359,705
death	Patient Date of Death	45,954	45,957
visit_occurrence	Mobile Unit Encounter	68,743	111,327
visit_occurrence	Inpatient Hospitalization from ED Visit	277,736	525,105
visit_occurrence	Hospital Outpatient Visit	894,661	2,472,103
visit_occurrence	Urgent Care Visit	190	296
visit_occurrence	ED Visit	1,131,817	2,732,247
visit_occurrence	Inpatient Hospitalization	609,075	919,758
visit_occurrence	Outpatient Visit	4,061,760	73,545,946
visit_occurrence	Telehealth Visit	660,939	2,706,066
visit_occurrence	Chart Documentation Event	5,434,697	87,301,399
condition_occurrence	Hospital Problem	847,633	3,136,818
condition_occurrence	Encounter Diagnosis	3,856,726	103,437,716
condition_occurrence	Billing Diagnosis	2,204,779	44,863,750
condition_occurrence	Problem List	2,258,485	11,899,865
measurement	Vital Signs	3,424,374	566,300,804
measurement	Flowsheet Measurement	1,631,208	181,917,868
measurement	Lab Component Result	3,848,811	954,973,027

See MSDW website for the complete list: https://labs.icahn.mssm.edu/msdw/data-sources/

Introduction: TriNetX Cohort Query Tool

Clinical Query Tools - Overview

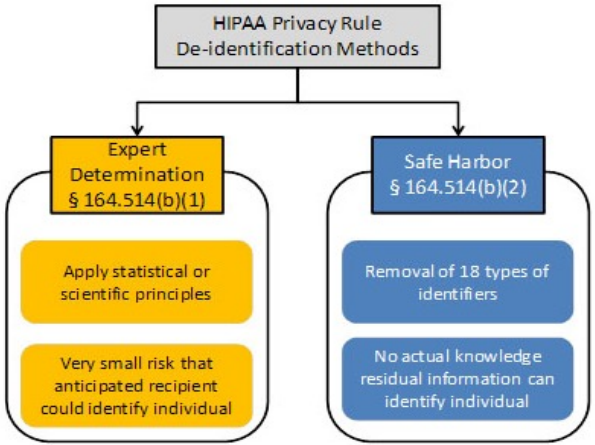
	Leaf	ATLAS	TriNetX
Description	Web-based, lightweight drag-and-drop cohort query tool that quickly analyzes population demographics	A web-based cohort query tool for database exploration, standardized vocabulary browsing, cohort definition, and patient cohort-level analysis	A web-based cohort query tool
Access	Use your Mount Sinai network username/password to login.	Use your Mount Sinai network username/password to login	Request access here. Log in to the TriNetX system using your email address and password.
Training	Written Tutorial; PEAK Tutorial	Written Tutorial; PEAK Tutorial; Videos	PEAK Tutorial
Data Types	Patient demographics, diagnoses, procedures, medications, labs, orders, vitals, institutional patient cohorts (BioMe, IRW, etc.)	Patient demographics, diagnoses, procedures, medications, labs, orders, vitals	Patient demographics, diagnoses, procedures, medications, labs, orders, vitals
PHI	No	Yes, if IRB Approved	De-identified data only
Cost	No charge	No charge	No charge
Advantages	Can visualize demographic details of cohorts, drag-and-drop query feature; download de-identified patient cohort list	Utilizes common data model and queries	Offers a polished, commercially developed user interface

See more details at https://labs.icahn.mssm.edu/msdw/services/

What is PHI? What is De-identification?

"PHI (Protected Health Information) is information (demographic, financial, social, clinical) relating to an individual's past, present, or future health history, treatment, or payment for health care services that is held or transmitted by a CE or its BA that identifies the individual or ***for which there is a reason to believe it can be used to identify the individual***."

De-identification is the process by which PHI is rendered not individually identifiable. The HIPAA Privacy Rule establishes two methods to de-identify PHI:



Types of Identifiers

- Name
- Street Address, city, county, zip code (the first three digits of the zip code may be used if there are more than 20,000 people in the zip code)
- All element of dates (except year), including dates of birth, admission, discharge or death
- All ages over 89
- All telephone/fax numbers
- Fax number
- E-mail addresses
- Social Security Number (SSN)
- Medical Record Number (MRN)
- Health plan beneficiary number
- Account numbers (health plan IDs, credit card, bank, invoice #s)
- Certificate/License numbers
- Vehicle identifiers, including license plate numbers
- Device identification and/or serial number
- Uniform Resource Locator (URL)
- Internet Protocol (IP) address
- Biometric identifiers (finger, voiceprints, etc)
- Full face photographic images and other comparable images
- Any other unique identifying number, characteristic, or code

TriNetX Query Tool

TriNetX

- QI and Research users can use **TriNetX** to query the MSDW

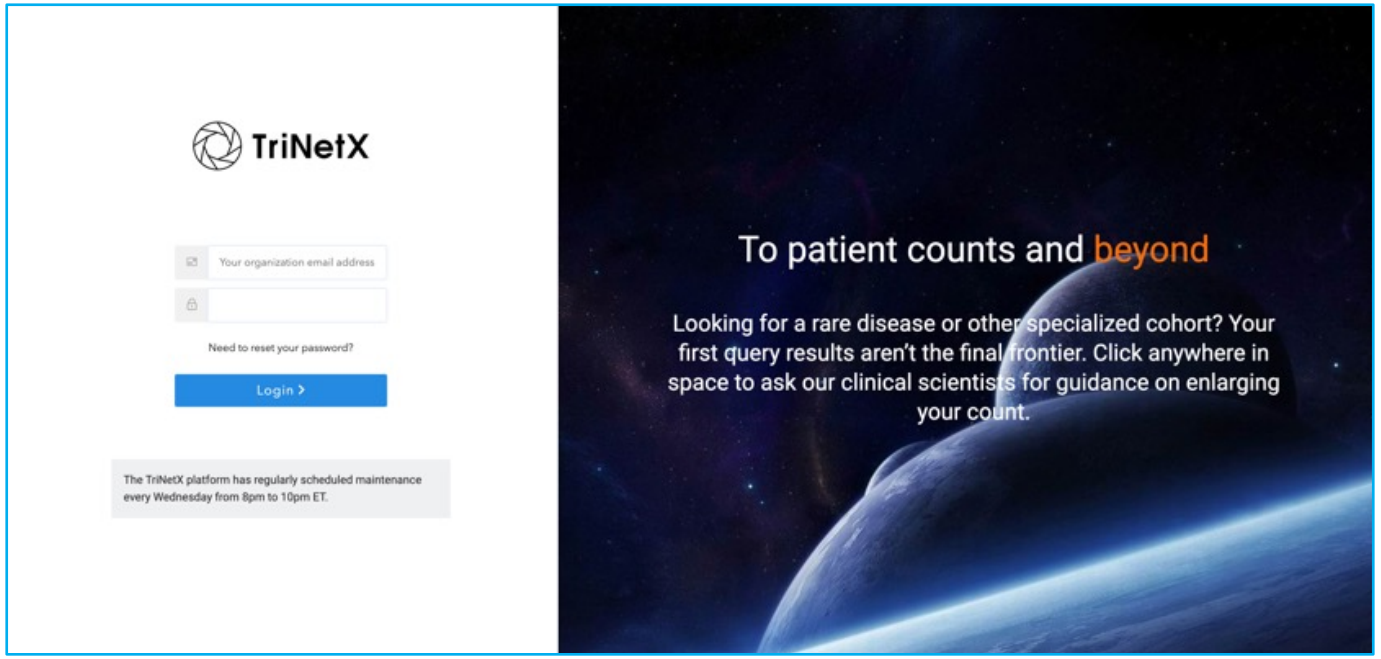
- Access **De-identified** data across the following domains:
  - Diagnoses using ICD-10-CM
  - Visit (encounter) locations
  - Lab results using LOINC
  - Medications using ATC
  - Procedures using CPT4
  - Demographics
  - Vitals

- Additional Features:
  - Simulate patient populations based on inclusion and exclusion criteria
  - Explore patient cohort to learn about any comorbid conditions, etc.
  - Predict number of newly eligible patients for your study

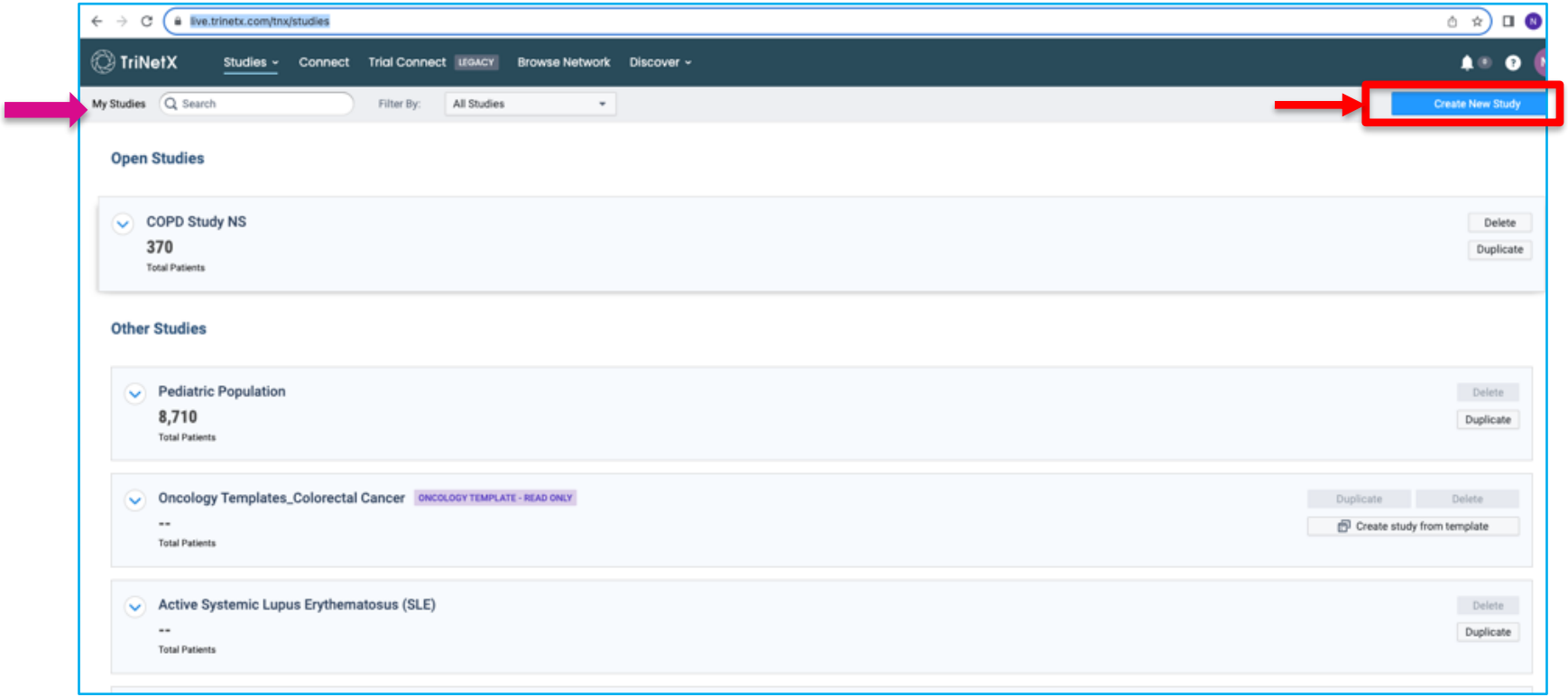
- Maintained by a third party private company

Accessing TriNetX

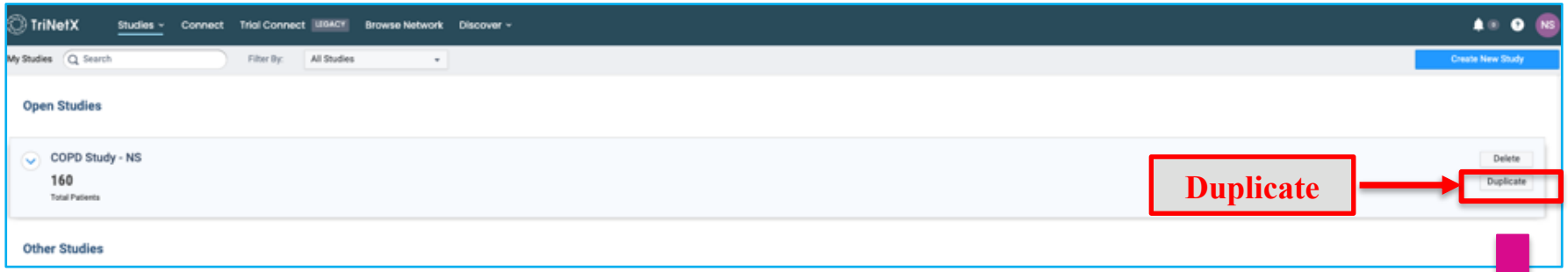
- All Mount Sinai Faculty, staff or student can access TriNetX at https://live.trinetx.com
- Google Chrome is the preferred browser
- Requires VPN access and use of your Mount Sinai Login credentials



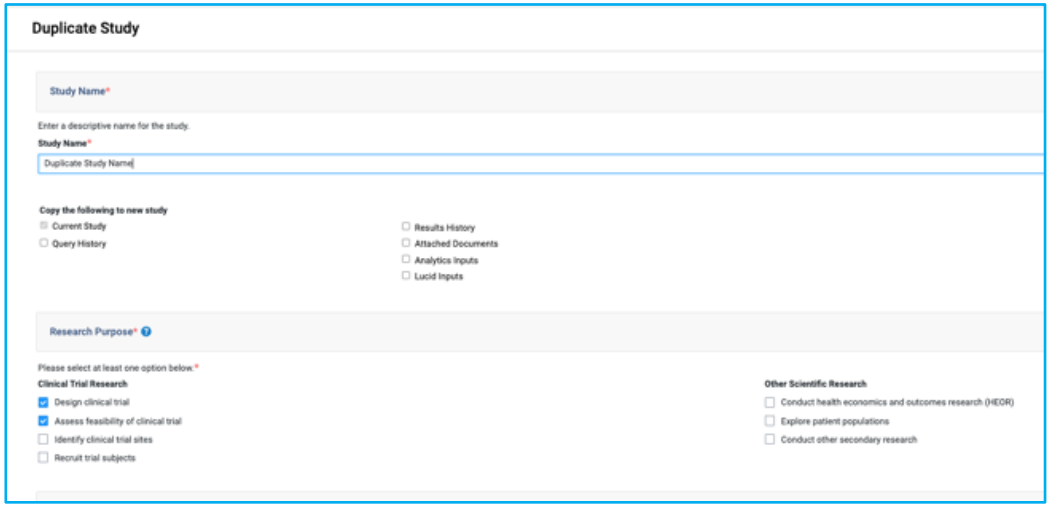
TriNetX Interface



Duplicate a Study from My Studies



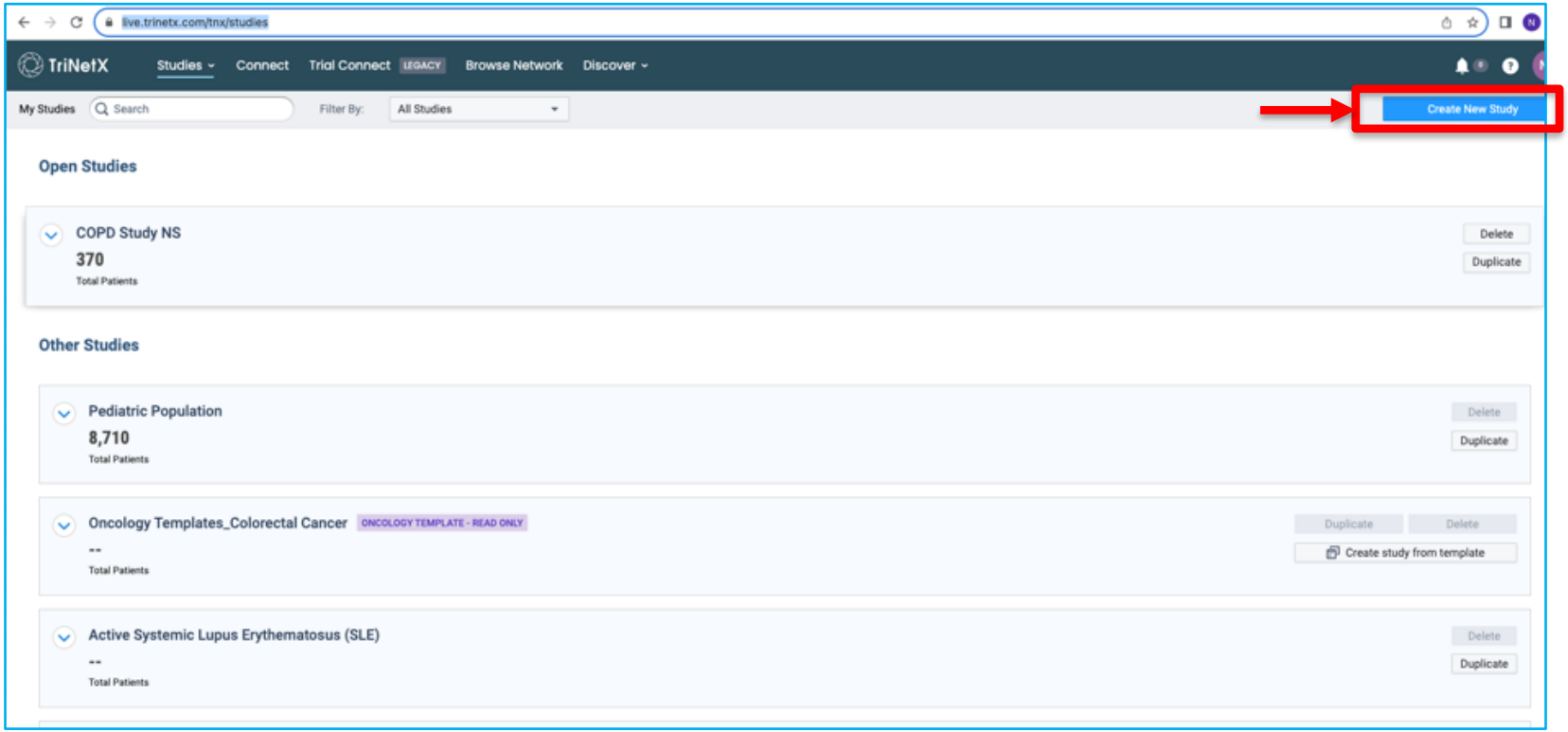
Duplicate



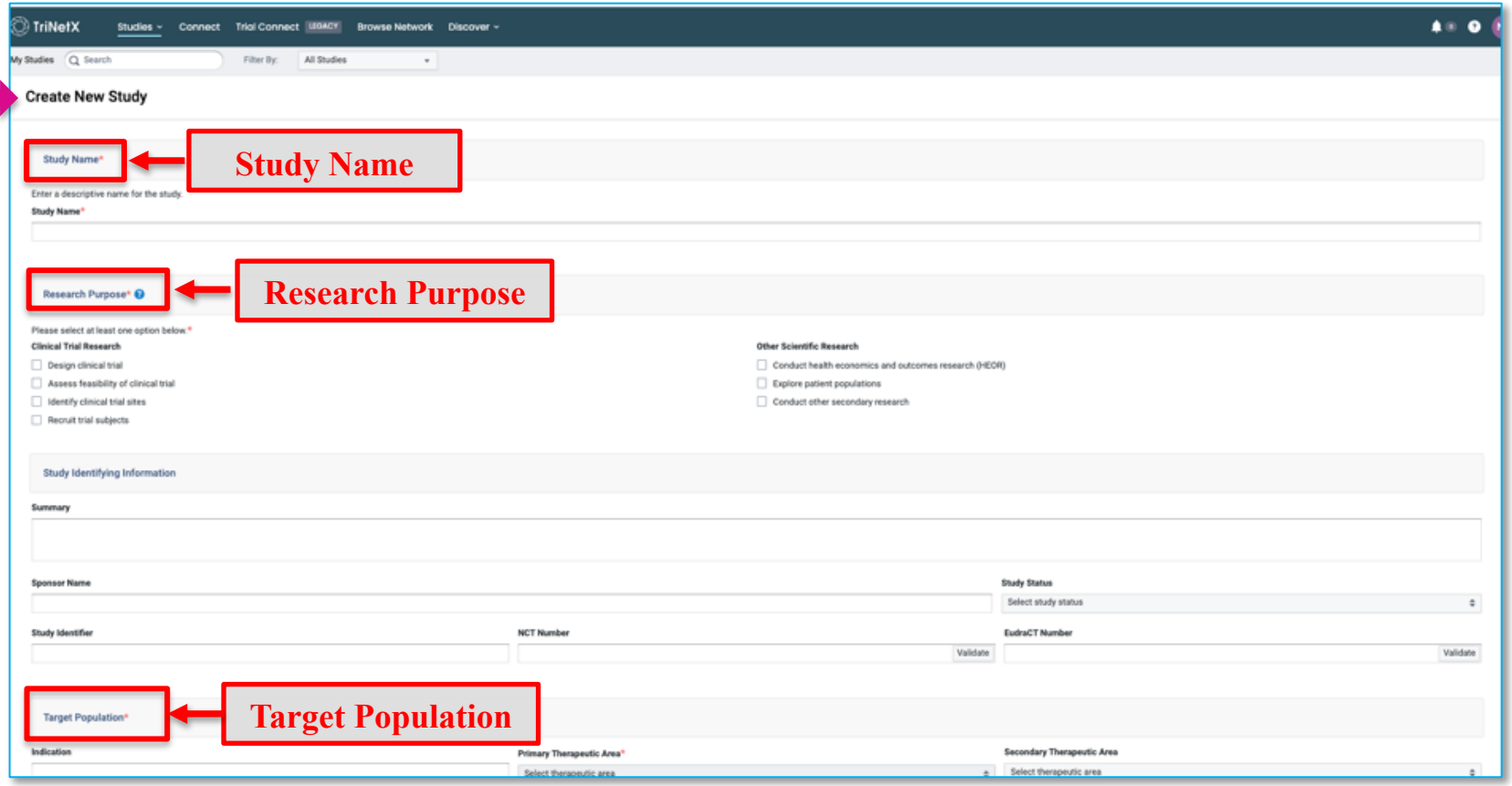
Sample Study:

How many adult patients with a diagnosis of COPD and on triple therapy for fluticasone + umeclidinium + vilanterol, had an ED or Inpatient visit at least once in the last year?

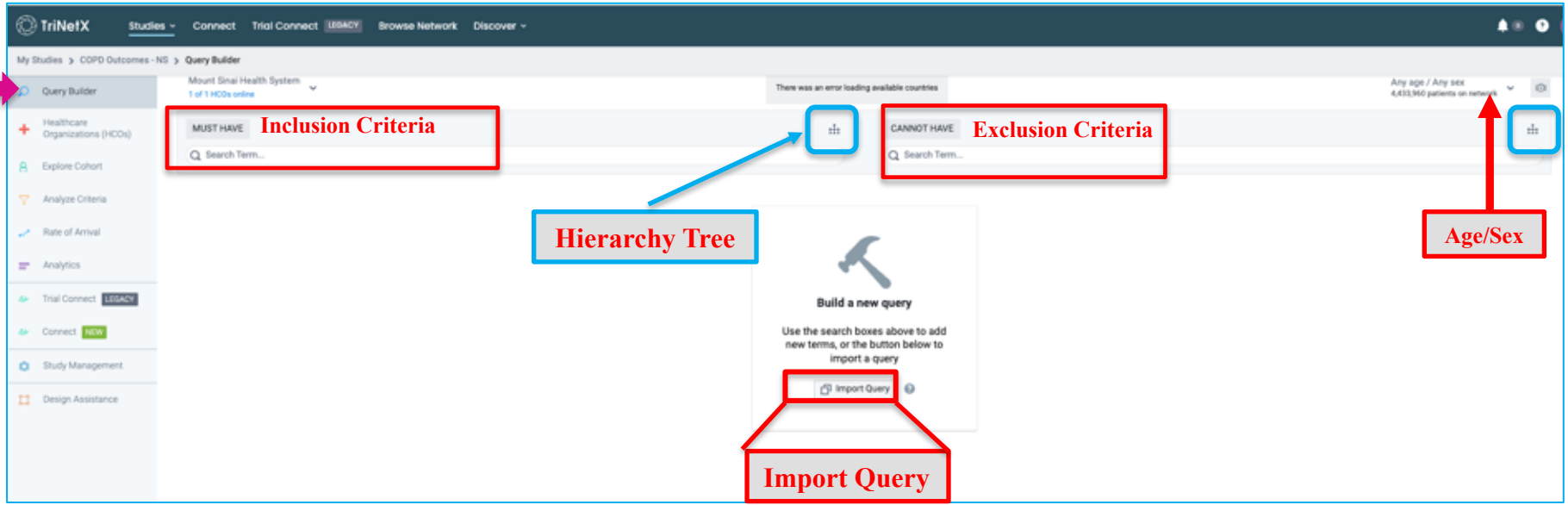
TriNetX – Create New Study



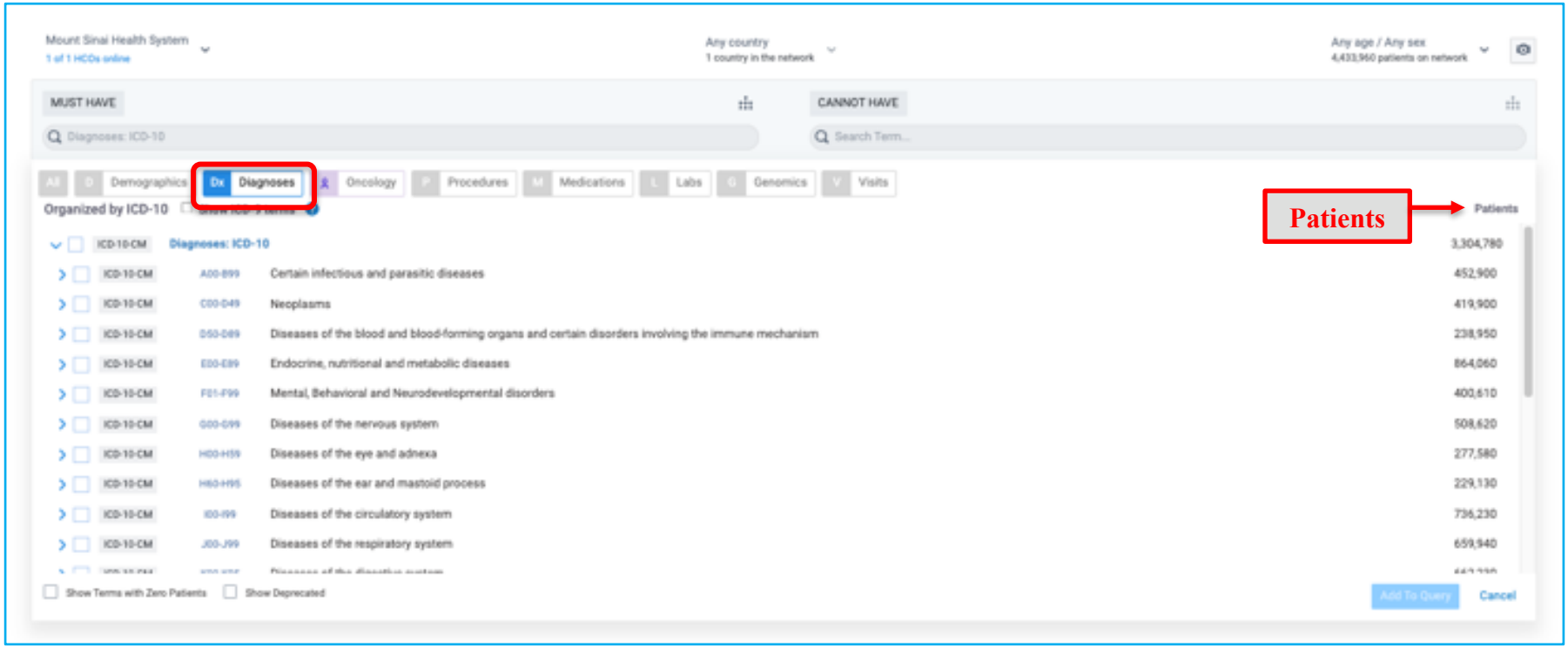
TriNetX – Create New Study



Create New Study – Query Builder

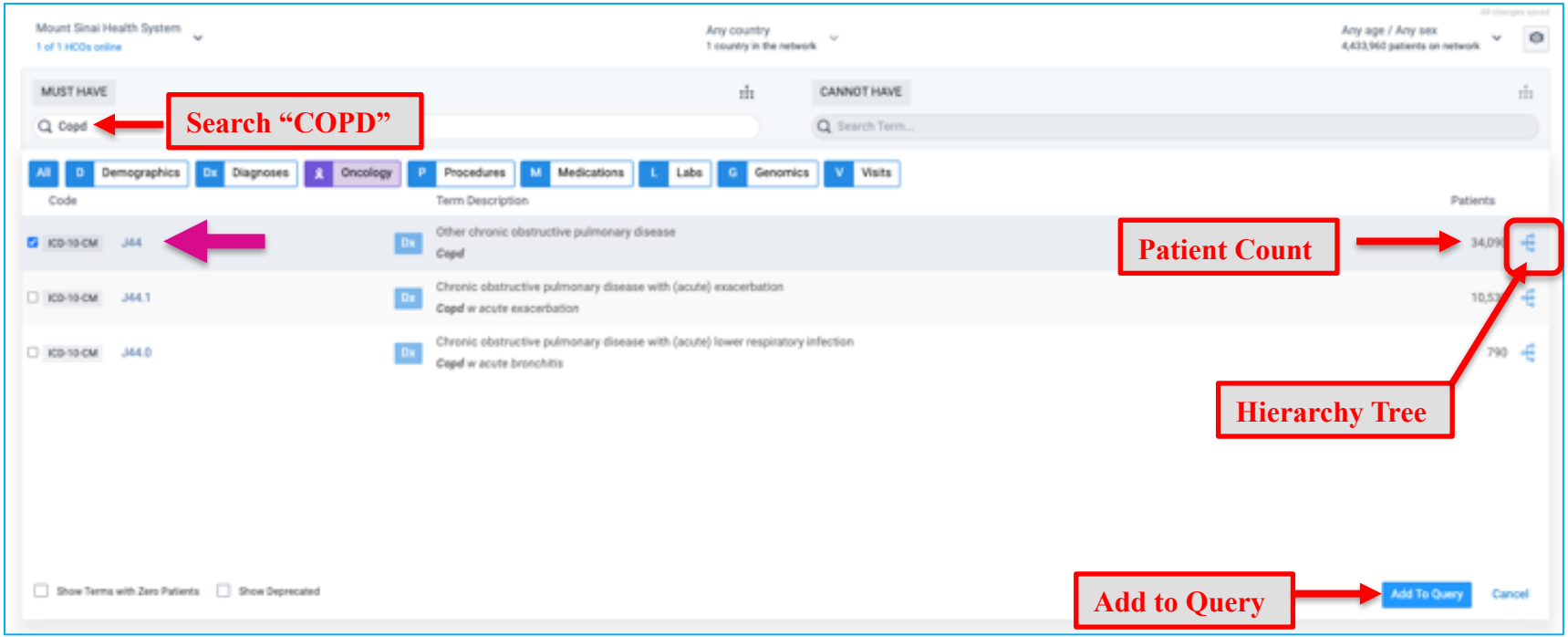


Hierarchy Tree – Search from Clinical Domains



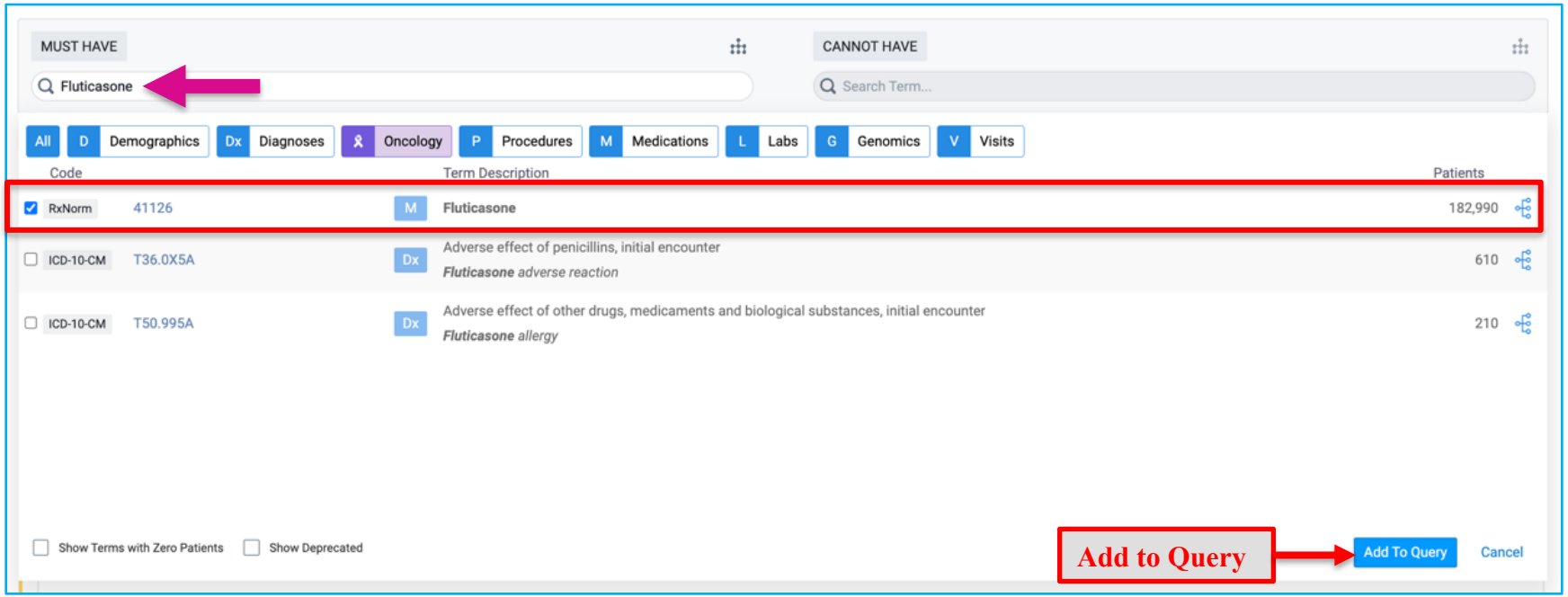
Adding a term to the Query Builder:

Search for terms using the search box. For a given search result, click on the hierarchy tree to view parent and child terms



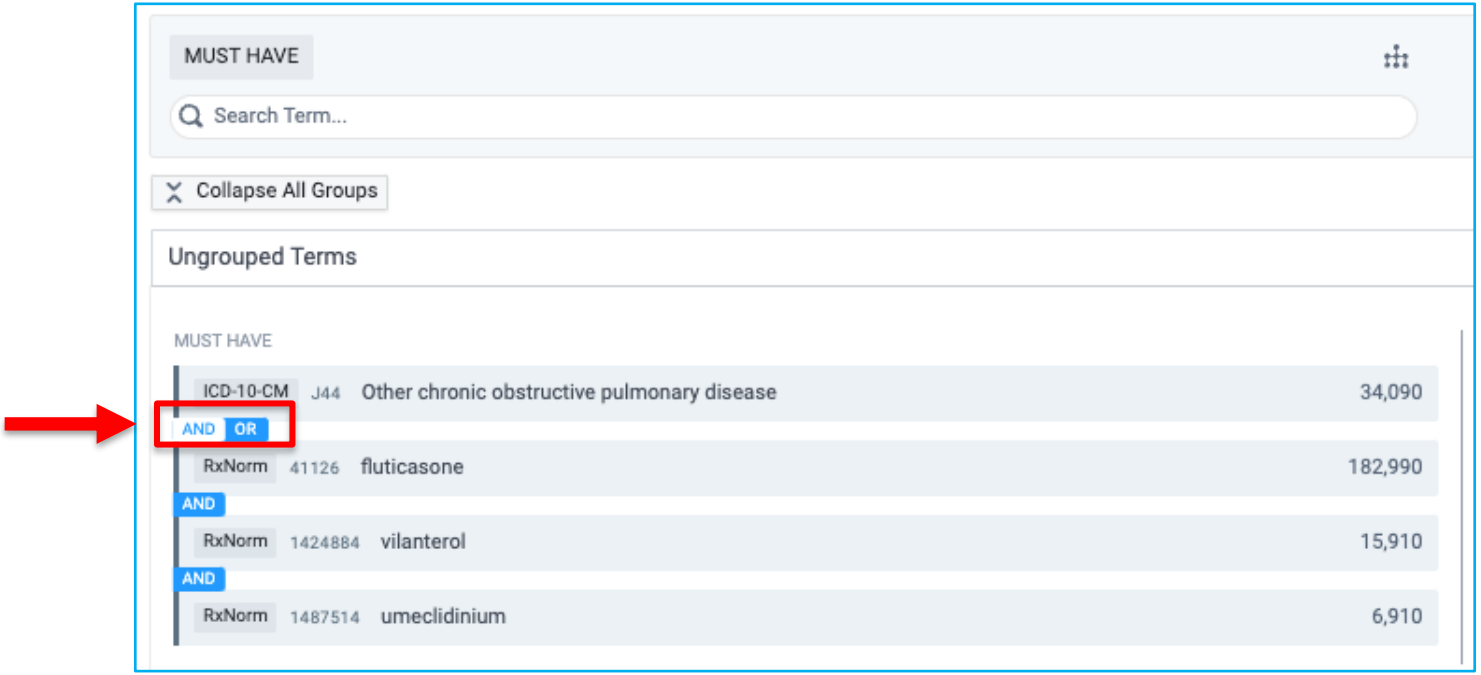
Adding Additional Terms

Next search for medications under **MUST HAVE** and add all three meds to Query



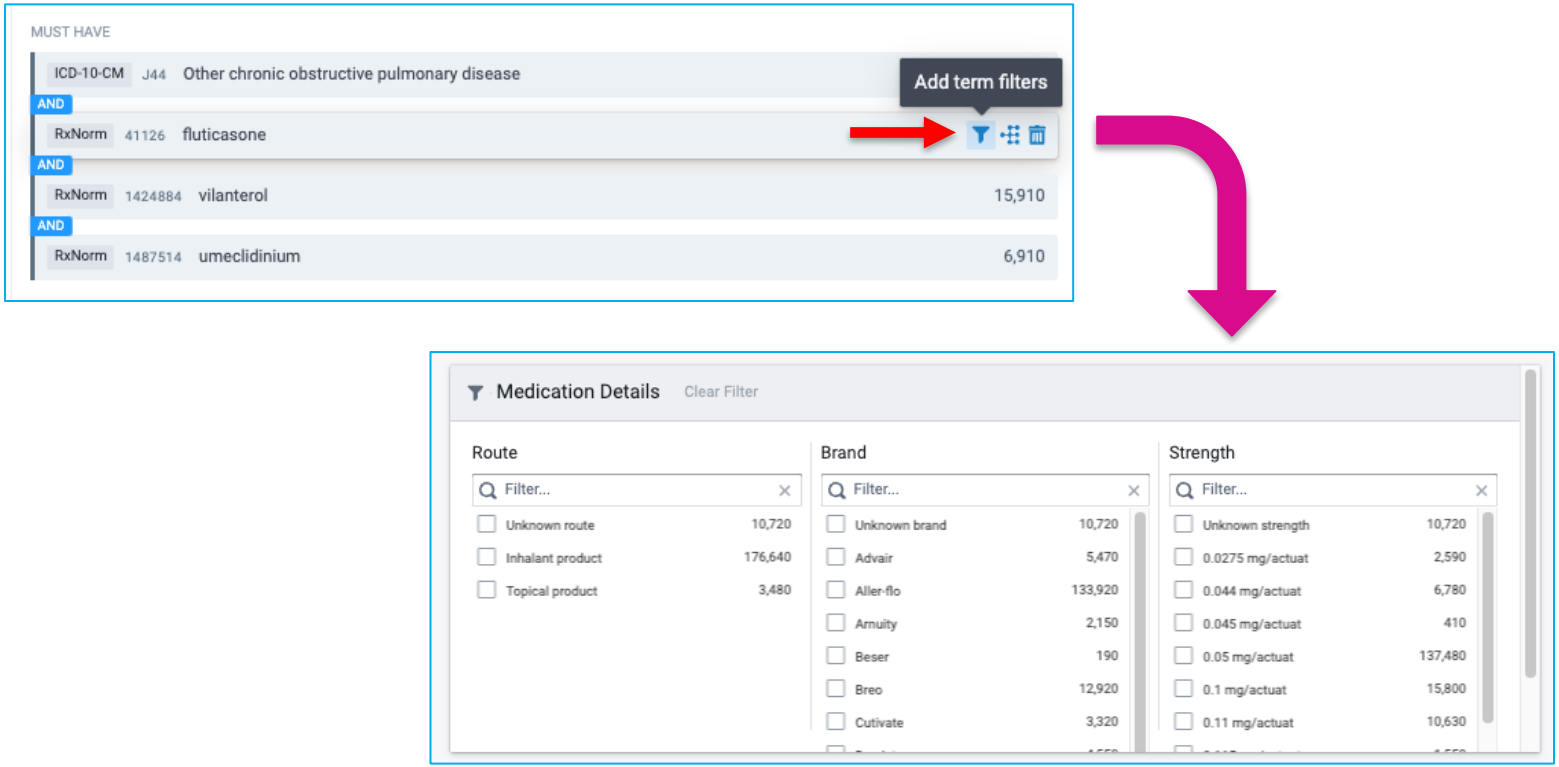
Adding Additional Terms

Click on the operator to switch between ‘AND’ & ‘OR’



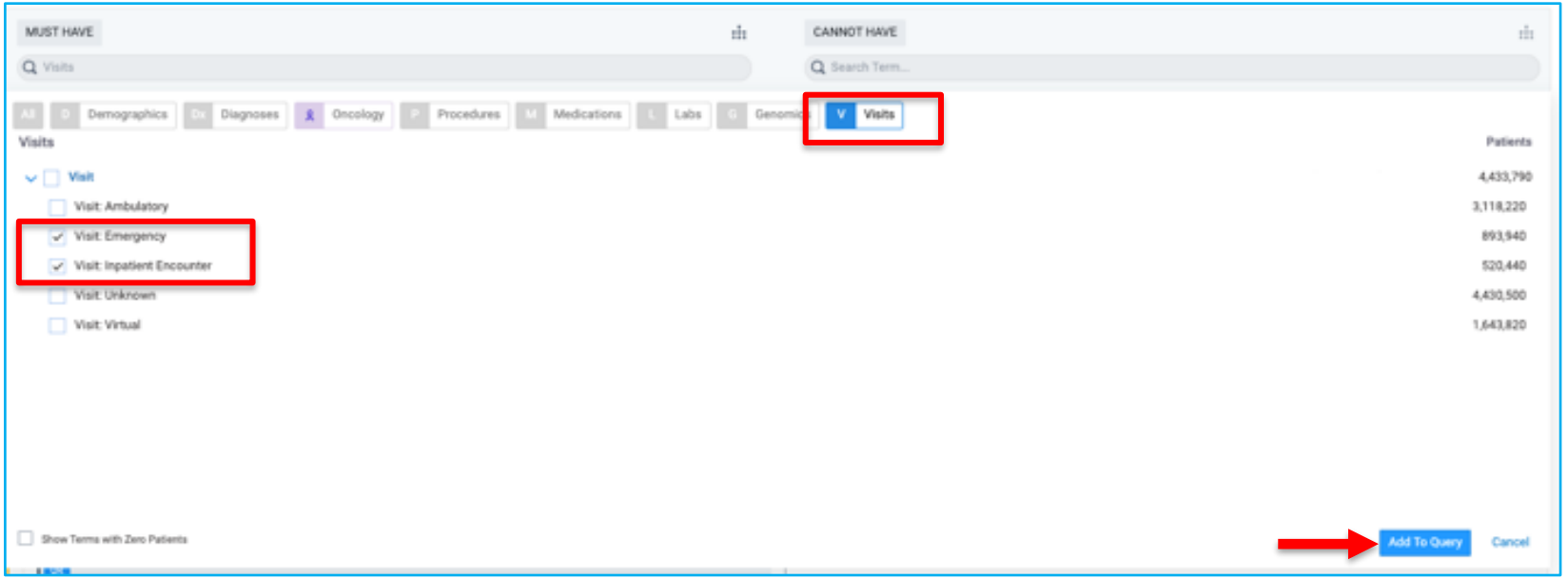
Medications

Hover over a medication term and click on the blue flunnel to add details (i.e. Route, Brand, Strength)



Visits

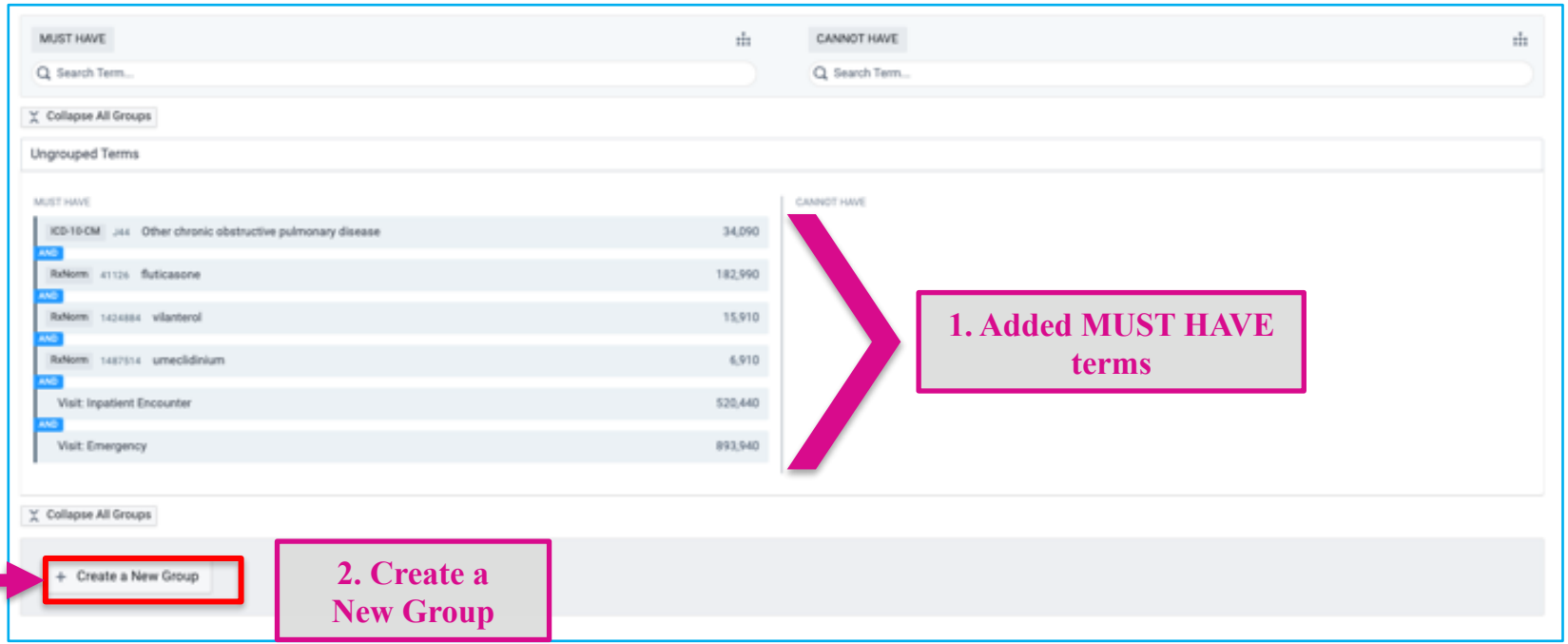
Add the terms for Emergency (ED) and Inpatient visit under MUST HAVE



Create Groups of Terms

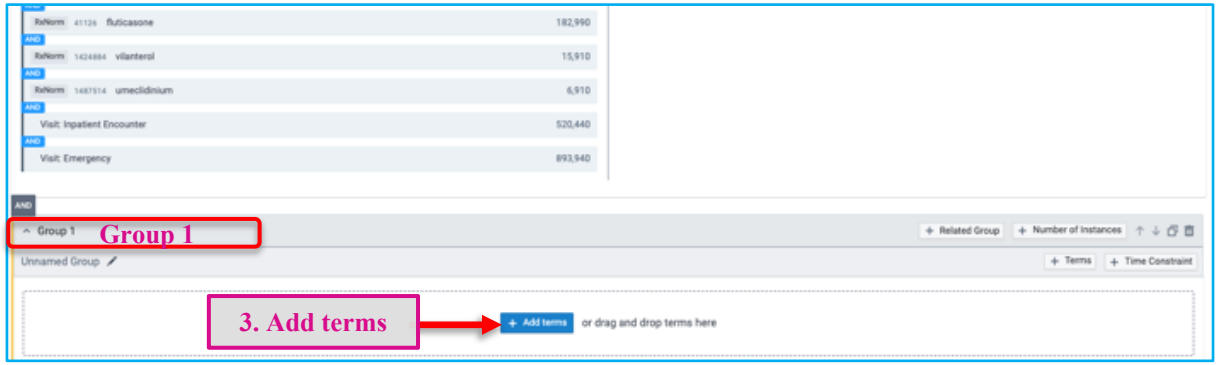
Once terms of interest have been added, click **Create a New Group** to group terms of interest

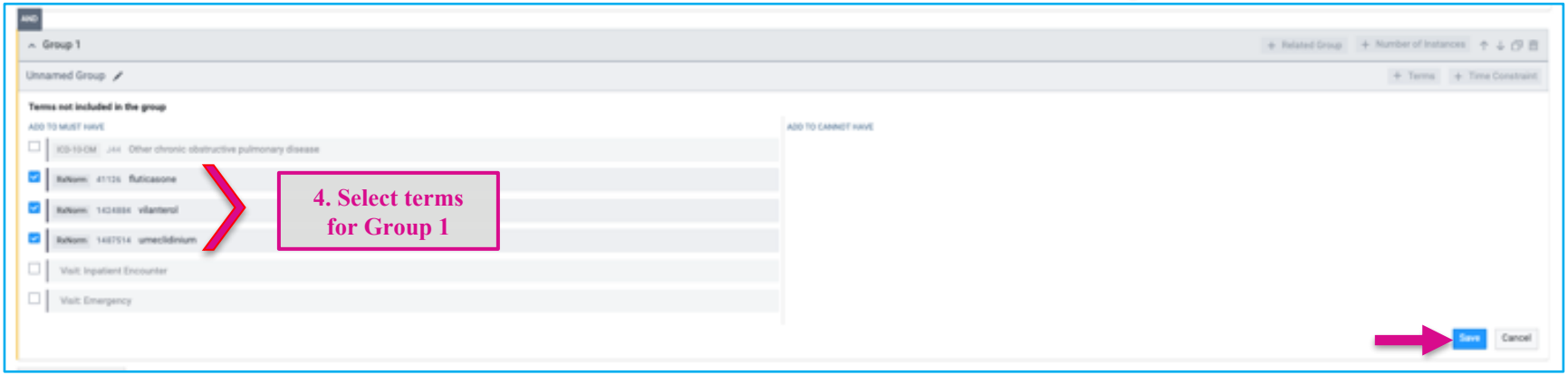
- *Example*: Group medications: *fluticasone, vilanterol, umeclidinium*



Groups of Terms

3. Click **Add terms** of interest → 4.Select terms (i.e. fluticasone, vilanterol, umeclidinium) for newly created Group

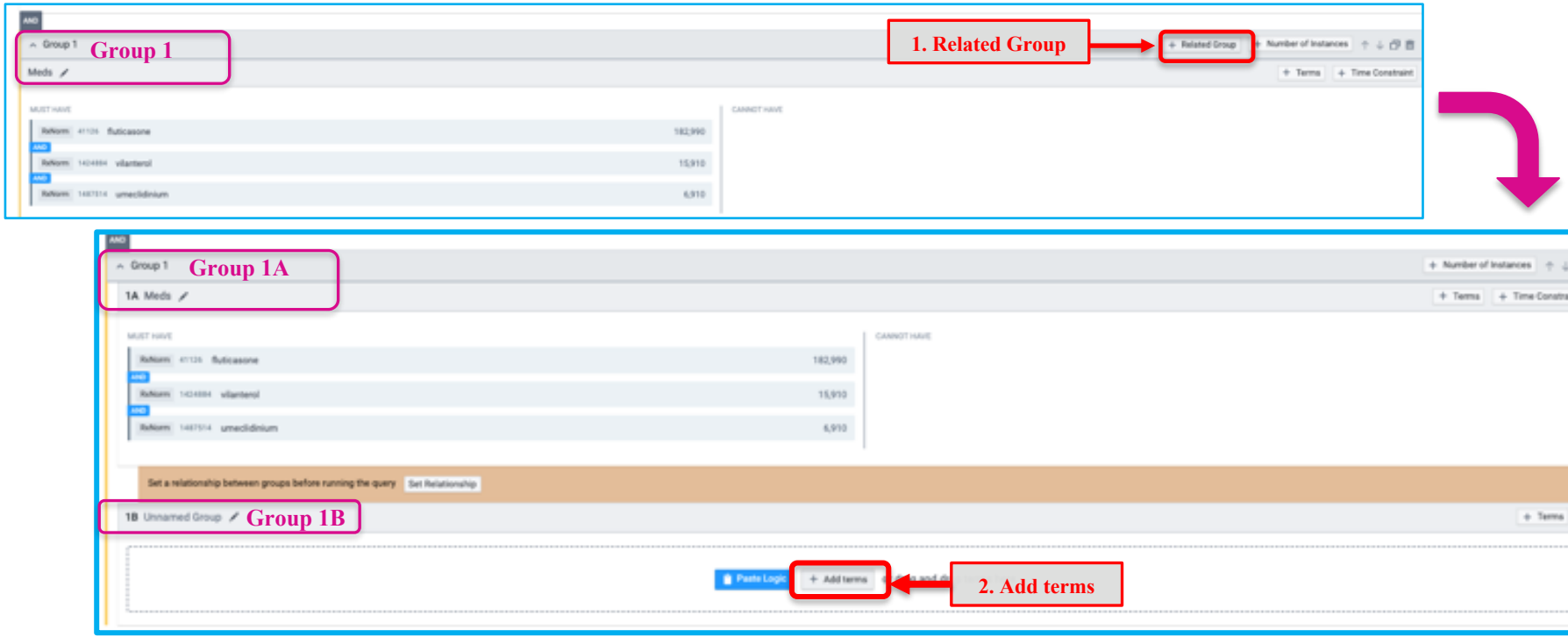




Define Temporal Relationship between two Clinical Events

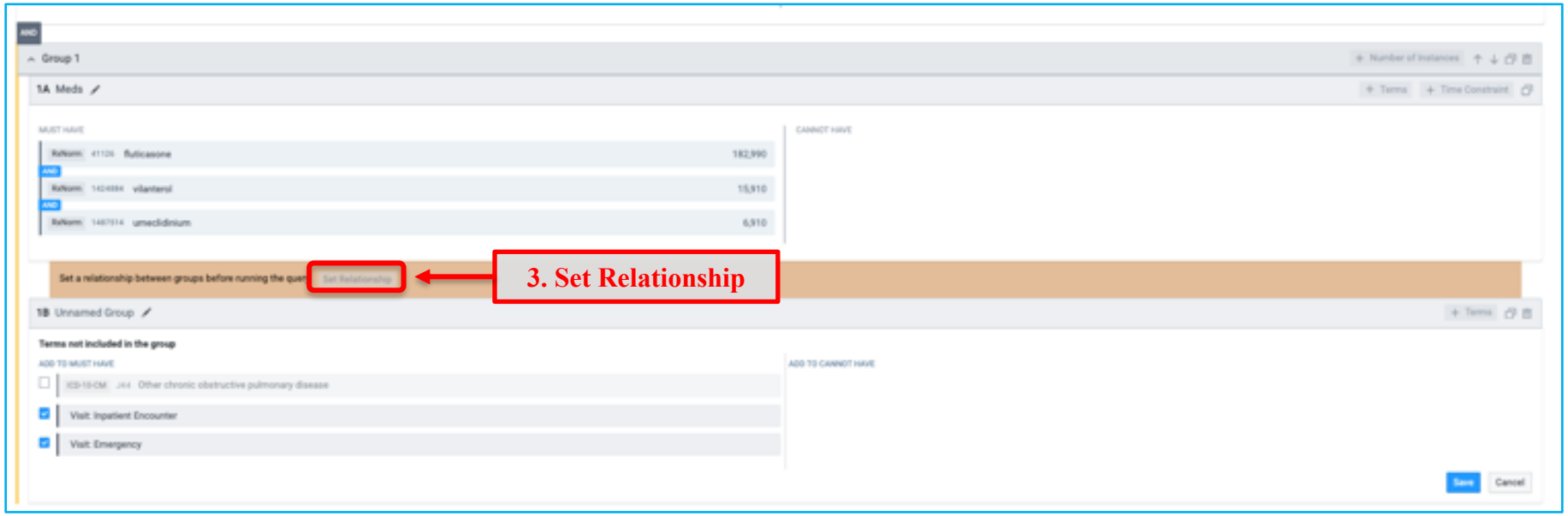
Related Group - Can indicate that Group B occurred before, on or after Group A

- Example: Patient must be on medications before ED or Inpatient Visit
- 1. Click **Related Group** from Group 1 (*Meds*) ➔ 2. Click **Add terms** to Group B



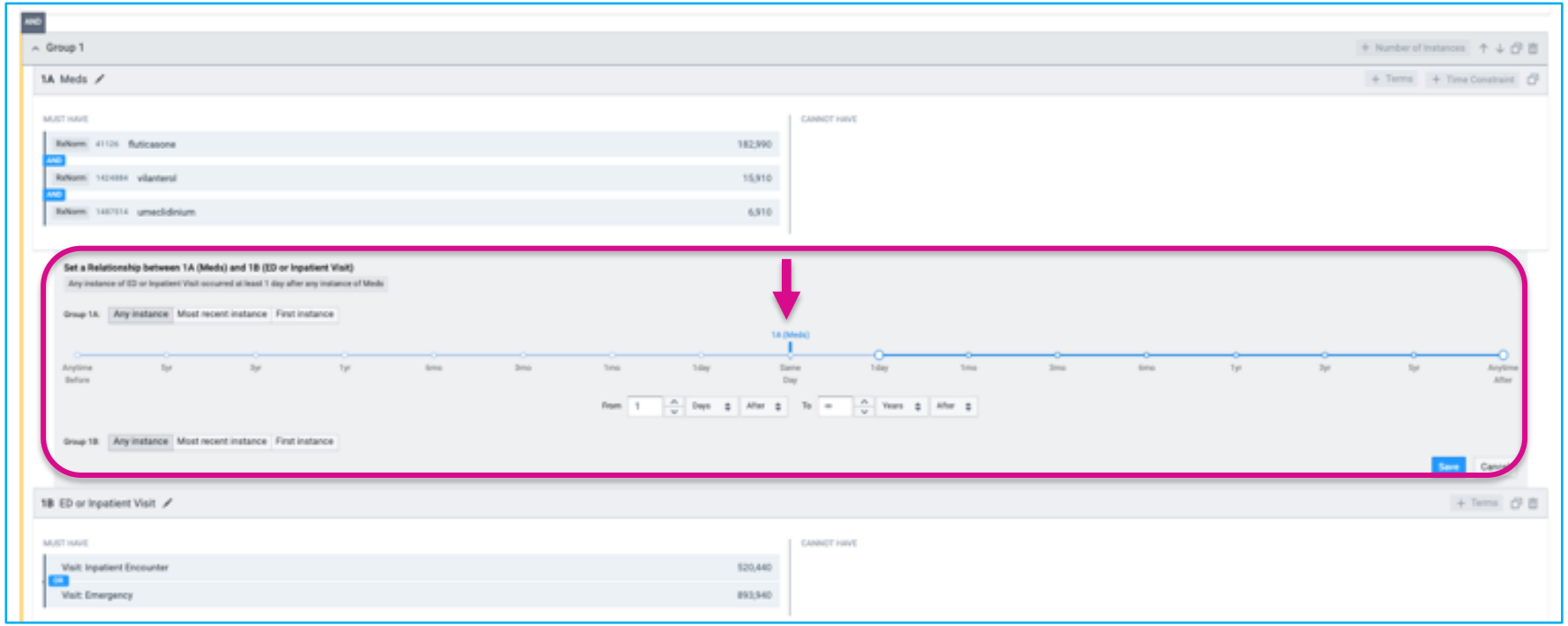
Define Temporal Relationship between two Clinical Events

3. Click **Set Relationship** between Group A and Group B



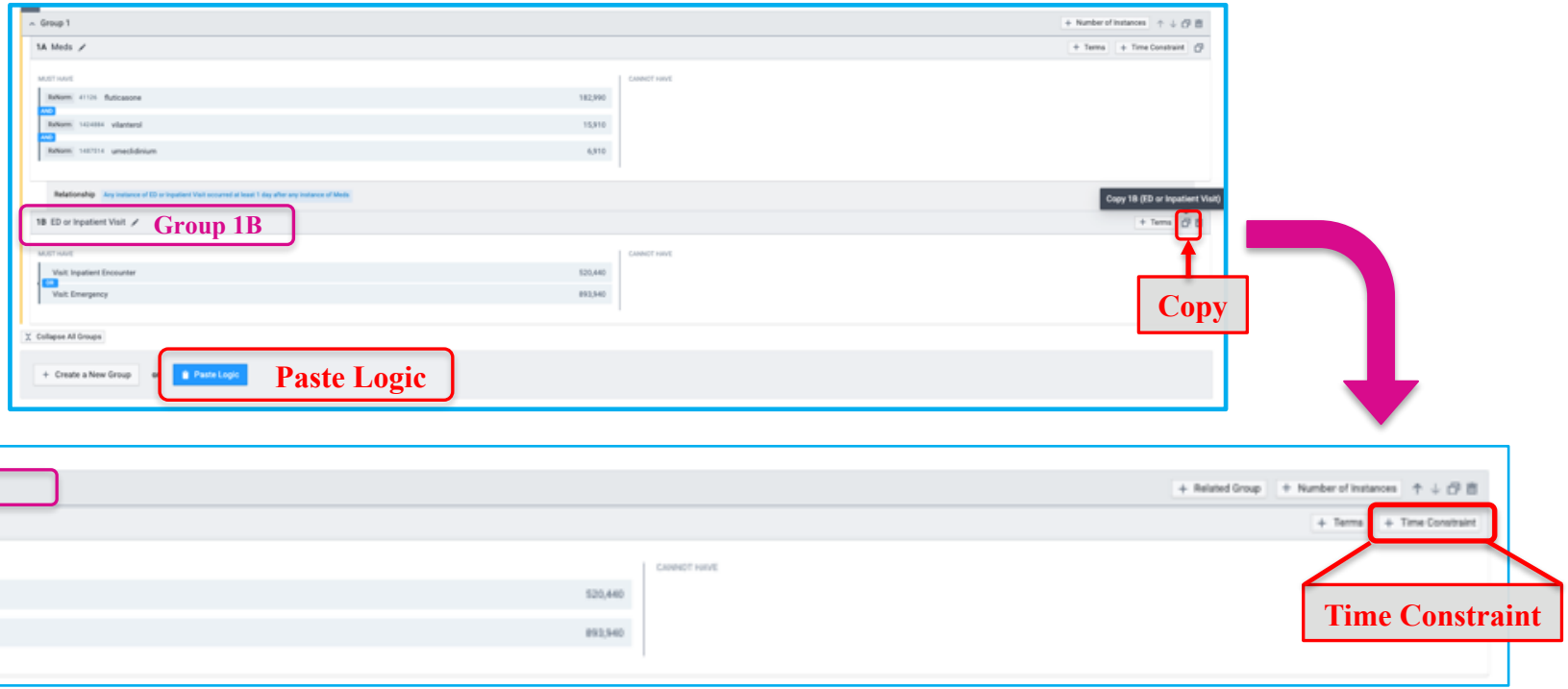
Define Temporal Relationship between two Clinical Events

4. Define temporal relationship between Group A and Group B.



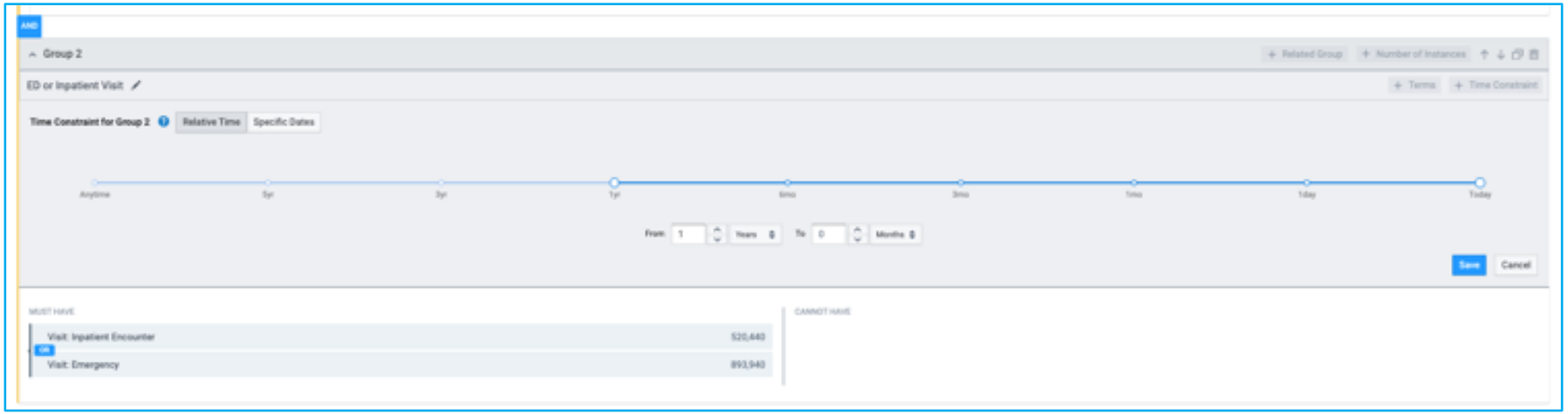
Copy a Group and Paste

1. Copy Group1B, and click **Paste Logic** to create **Group 2** (Example: COPD patients on meds who had an ED or Inpatient visit in the past year)
2. Click **Time Constraint** for Group 2



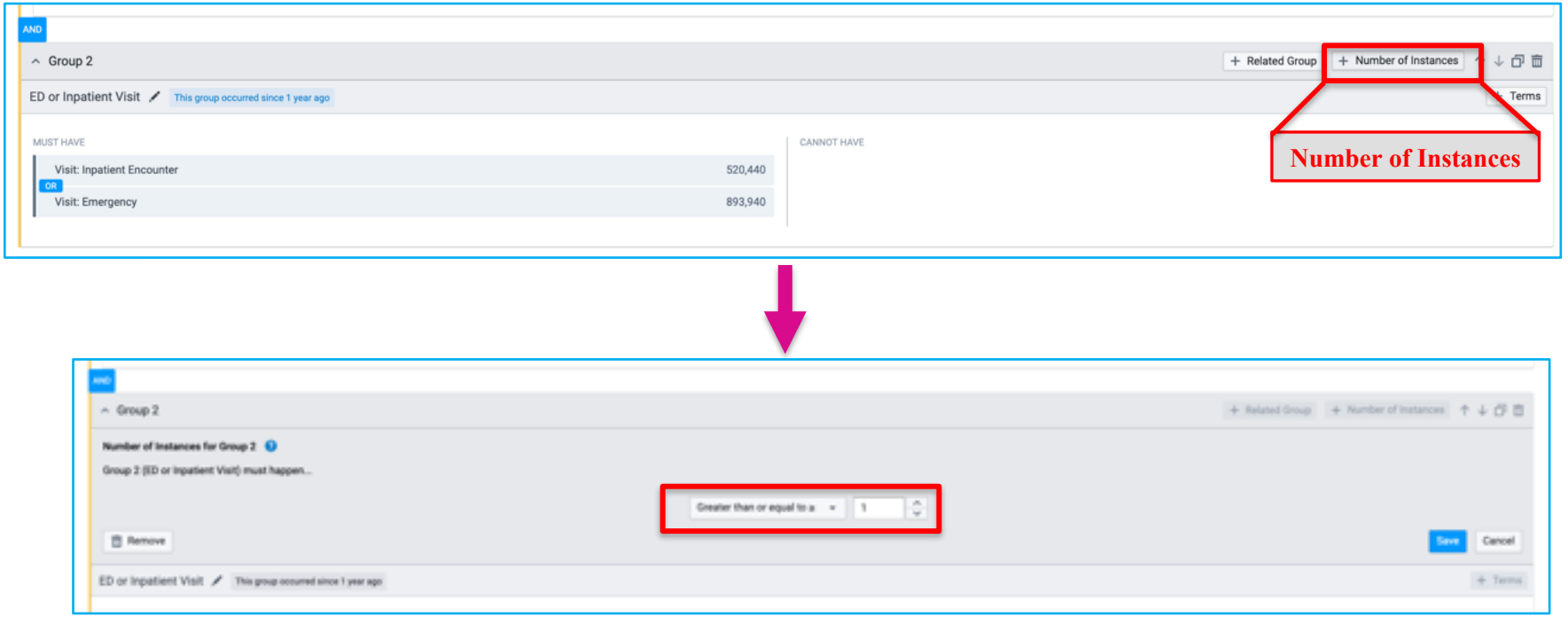
Adding Time Constraints

- Set time constraint for Group 2



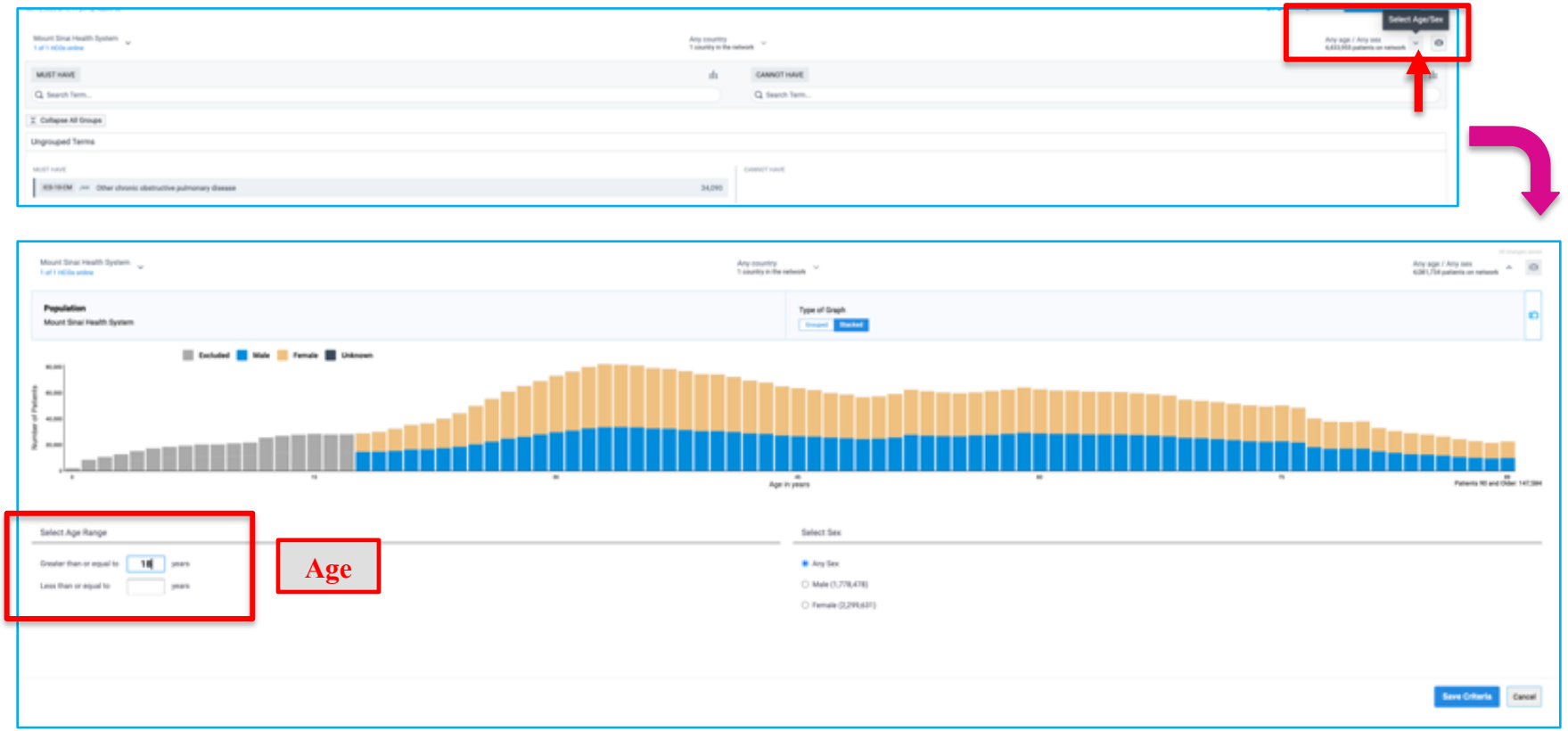
Adding Number of Instances

Example: COPD patients on meds who had an ED or Inpatient visit at least once in the past year



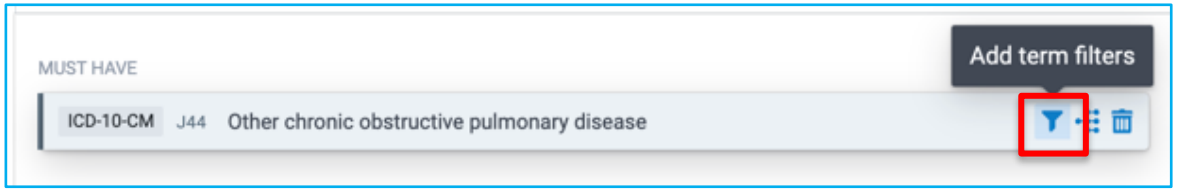
Restrict by Current Age

Example: COPD adult patients on meds who had an ED or inpatient visit at least once in the past year

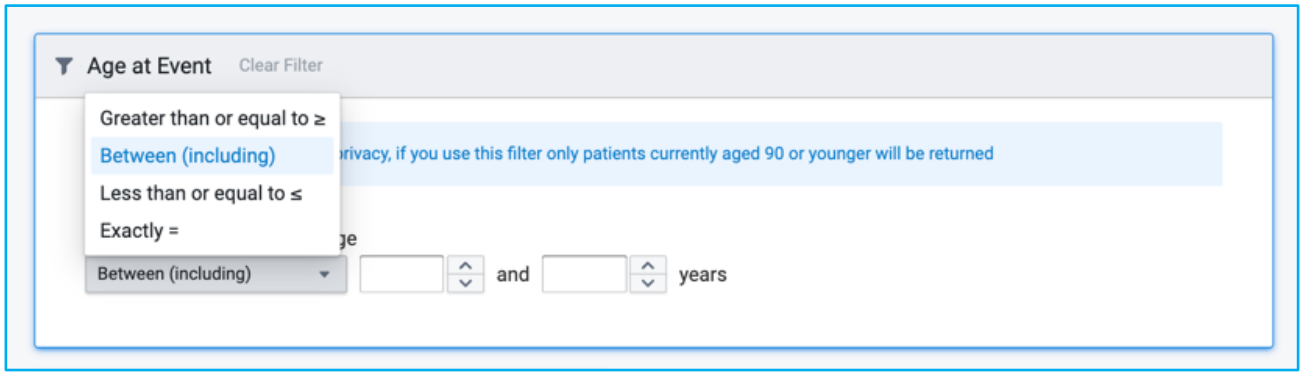


Restrict by Age at Event

Hover mouse over the term in Query Builder and click on **Blue Funnel**:

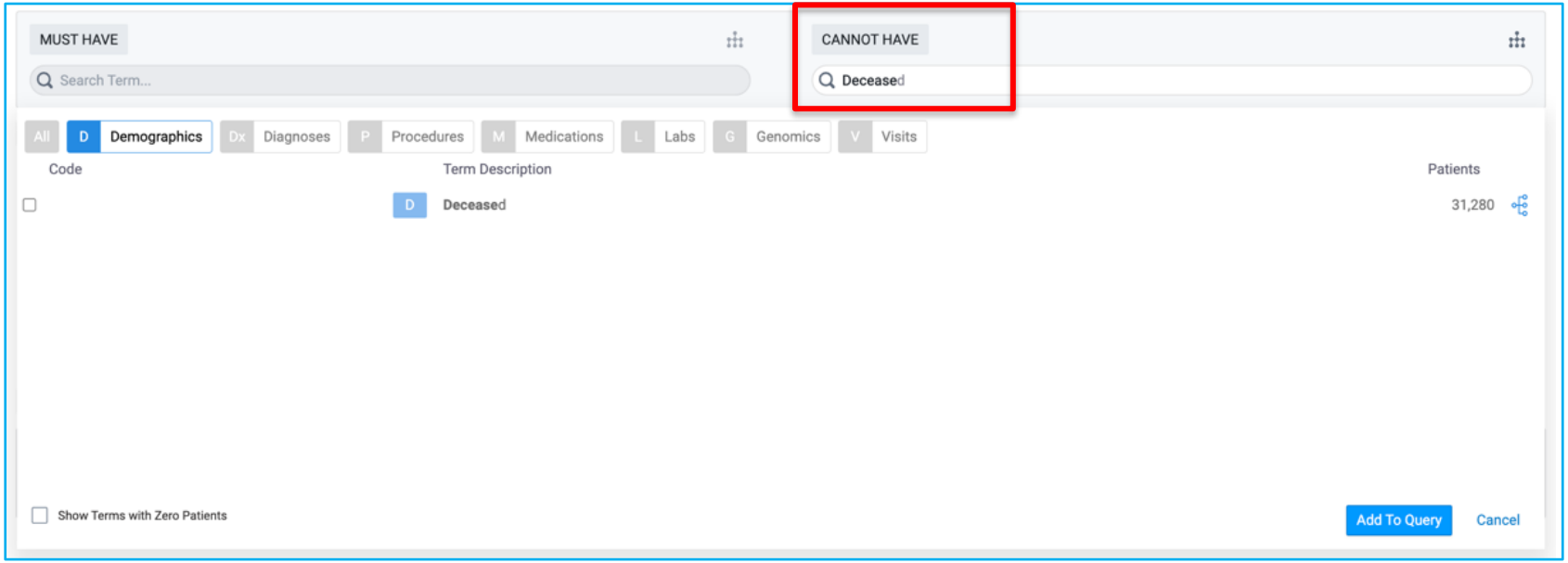


Indicate age or age range for when patient had the term documented:



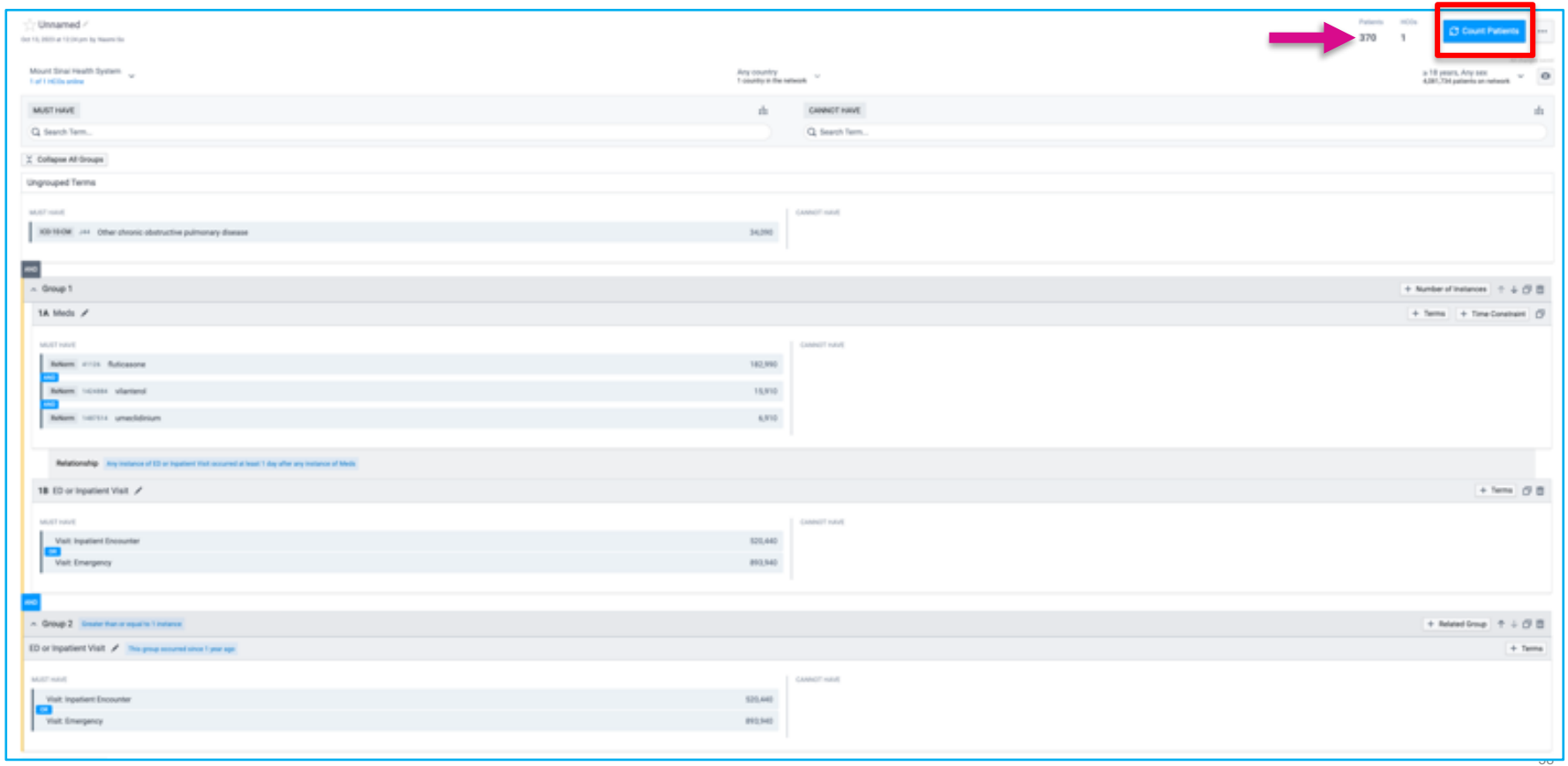
Exclude Deceased Patients

Found under Demographics

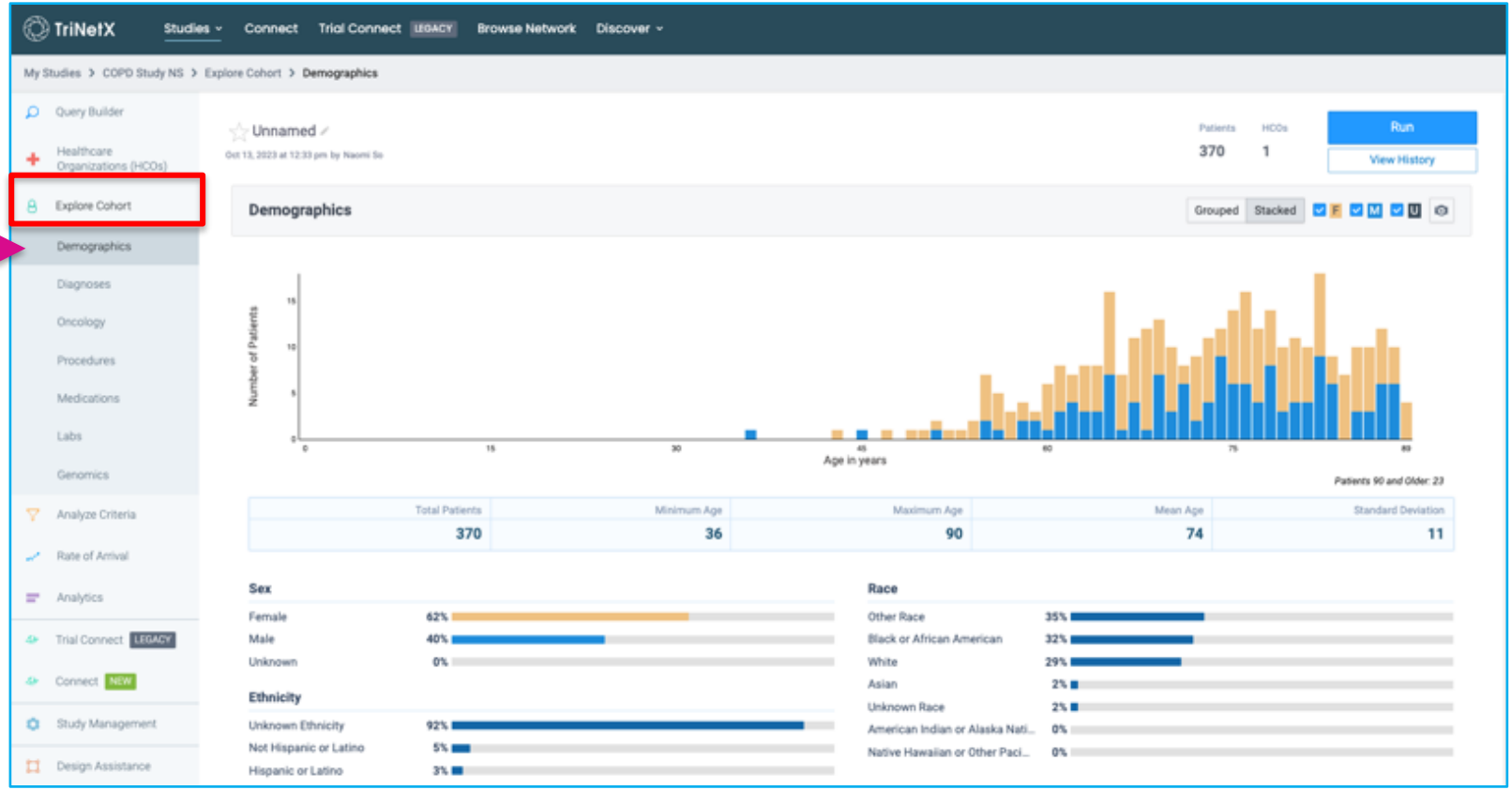


Count Patients

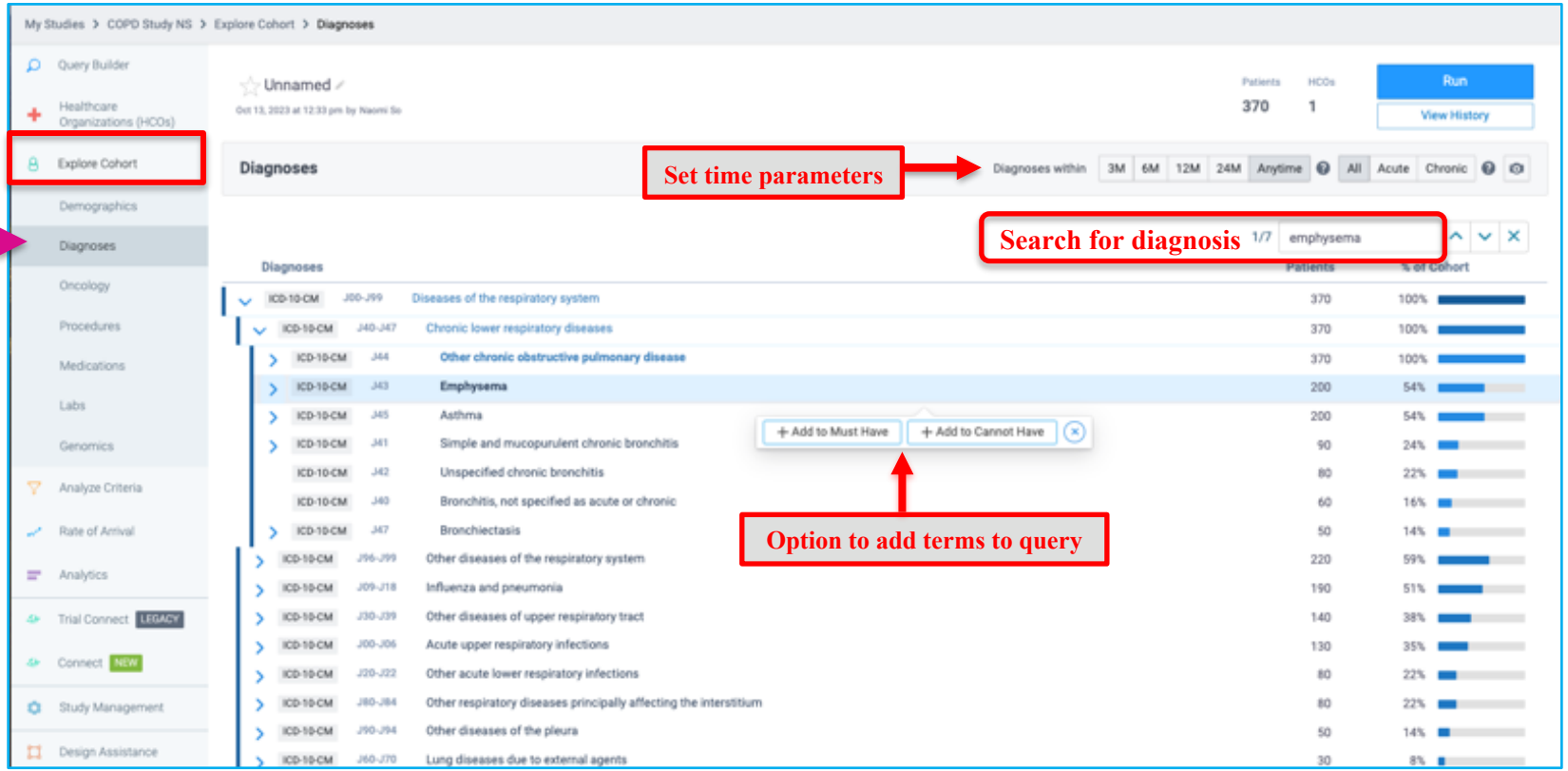
Once query has been built, click **Count Patients** to generate cohort



Explore Cohort - Demographics



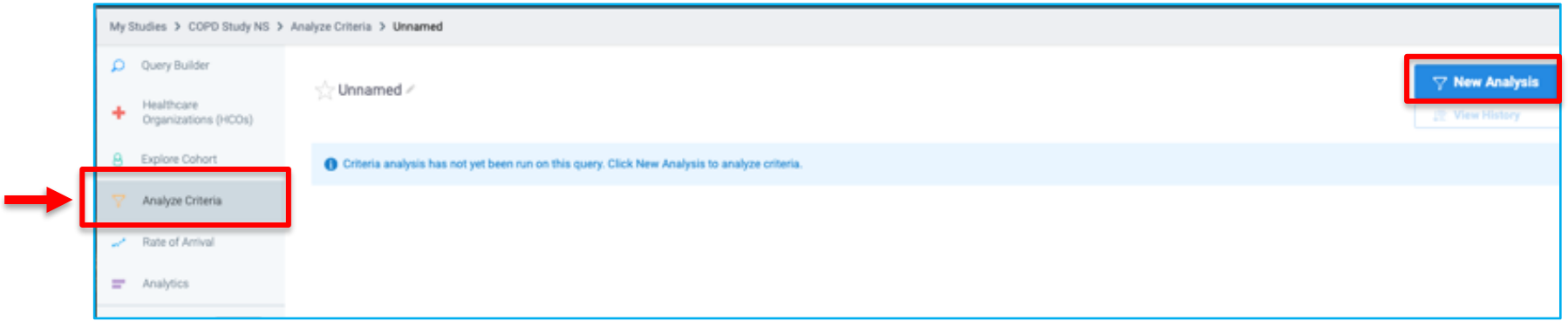
Explore Cohort - Diagnoses



Analyze Criteria

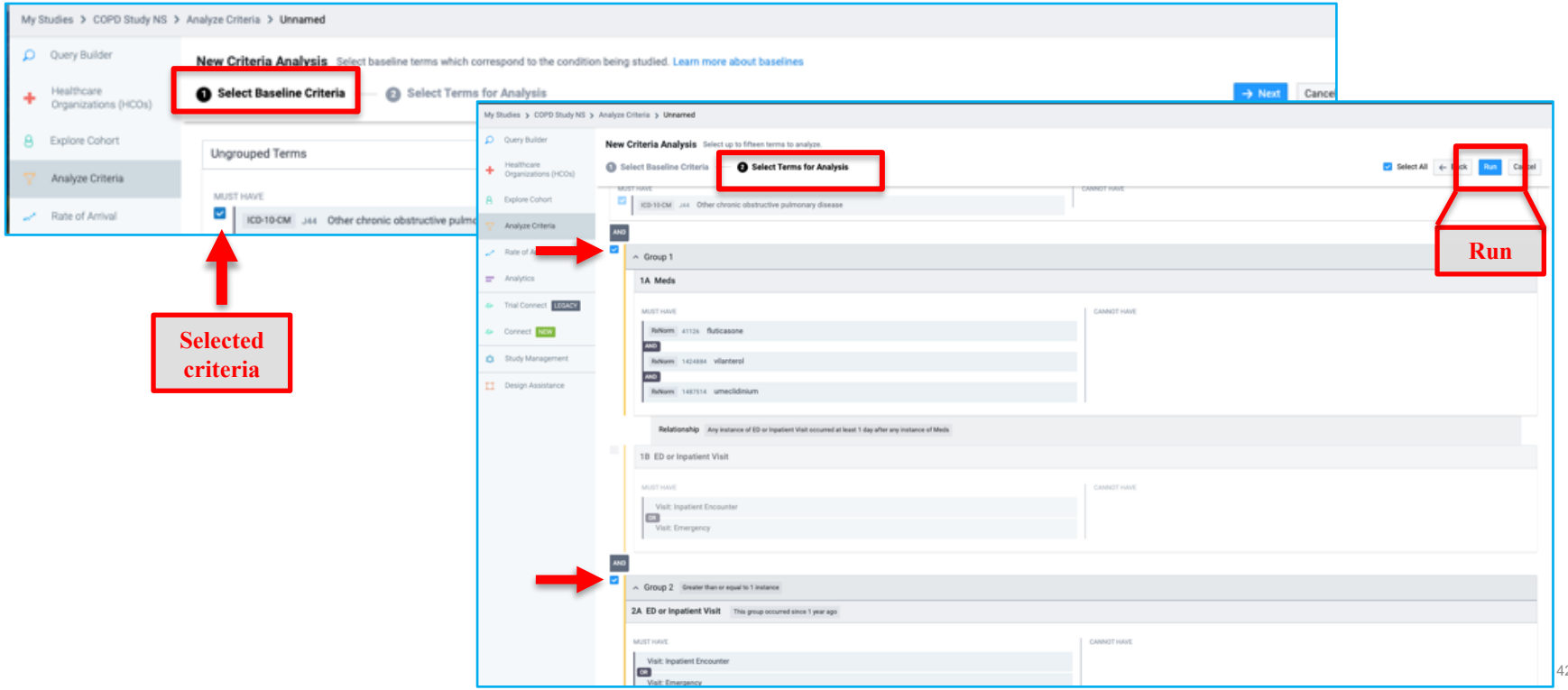
View the impact each criteria has on the total patient count

1. Click **New Analysis**



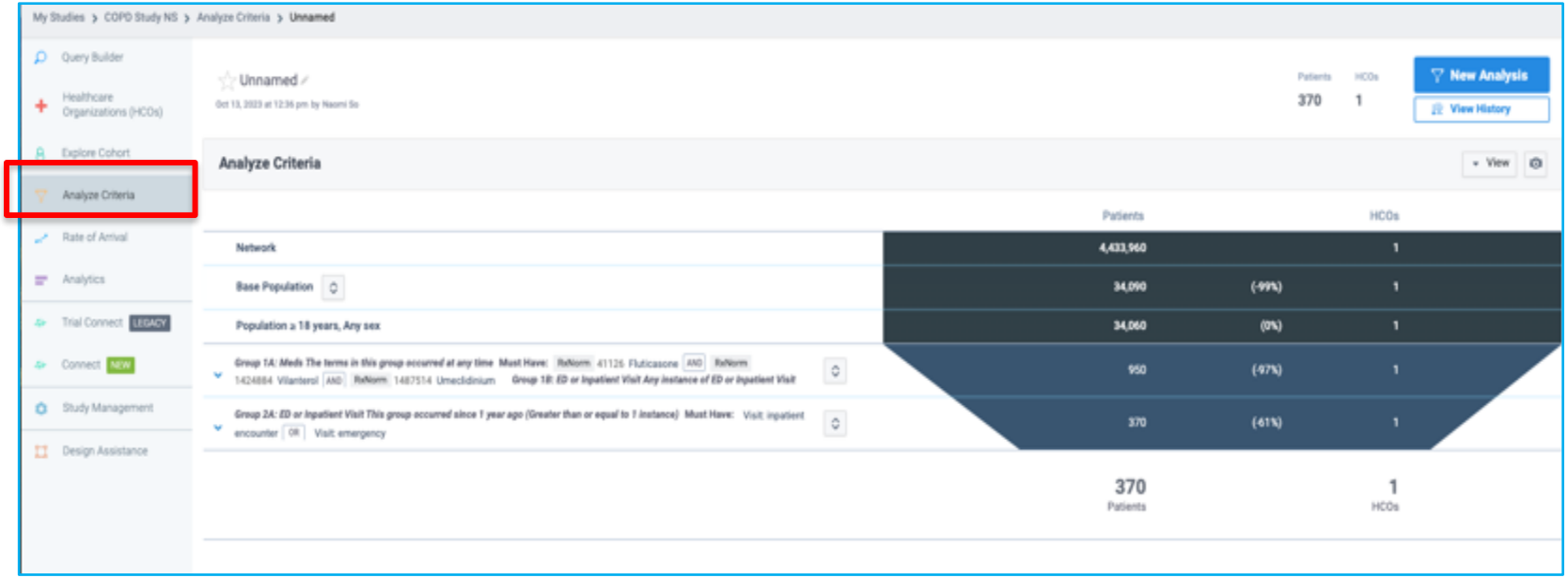
Analyze Criteria

2. **Select Baseline Criteria** to define base population (i.e. patients with COPD)
3. **Select Terms for Analysis**
4. Click **Run**



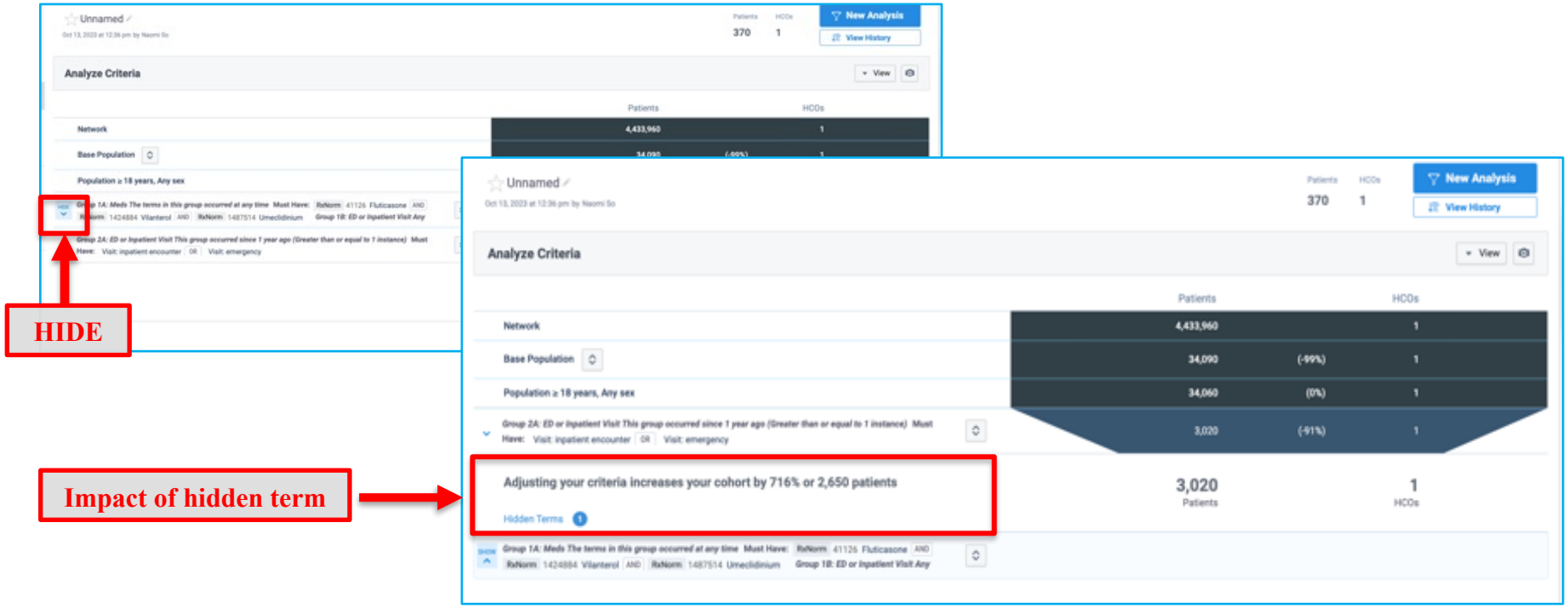
Analyze Criteria

- View the impact each criteria has on the total patient count
- The % decrease is from the criteria above



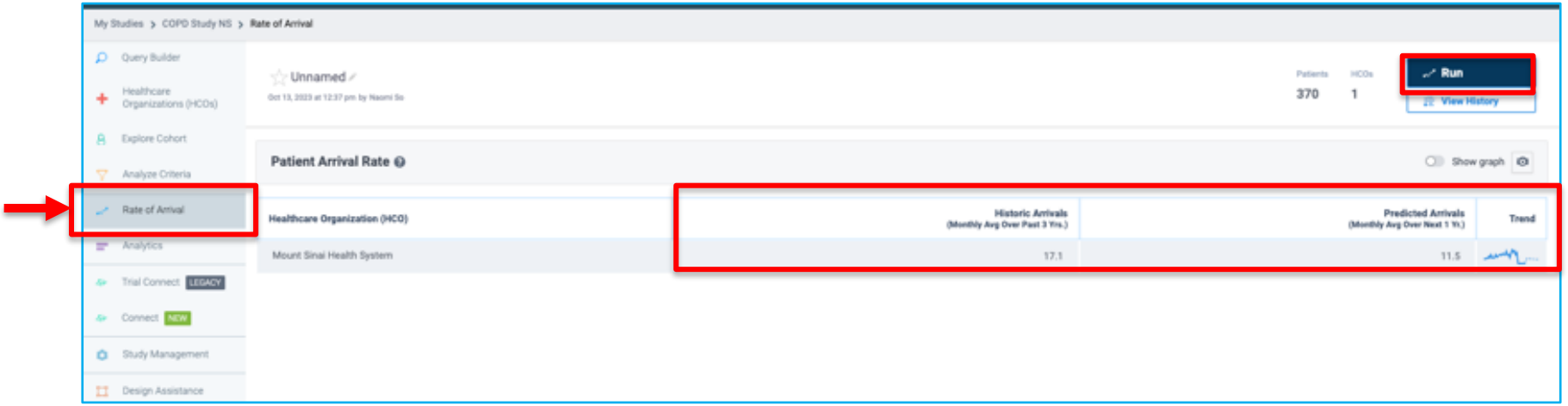
Analyze Criteria

Option to **Hide** criteria to see how it impacts patient count



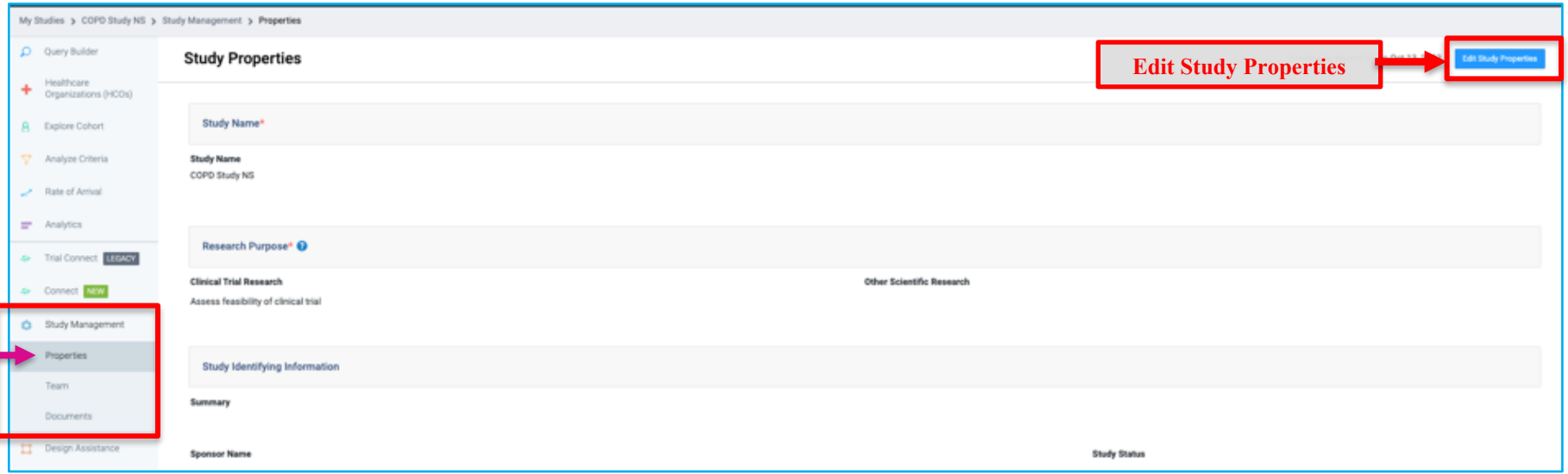
Rate of Arrival

View how many patients who meet query criteria enter patient cohort each month



Study Management

- **Properties** → Edit Study Properties
- **Team** → Share Study
- **Documents** → Upload relevant study documents



Demo of Example Query in TriNetX

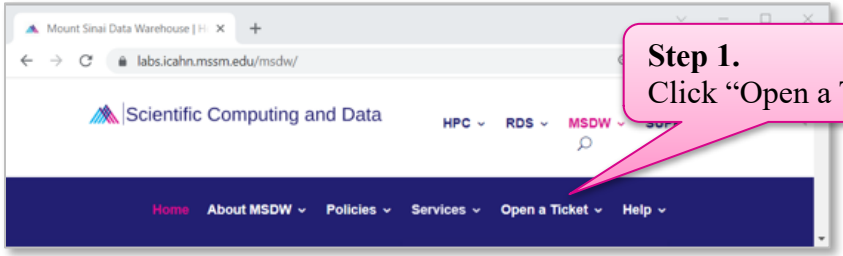
MSDW Custom Data Request

When You Need Custom Data

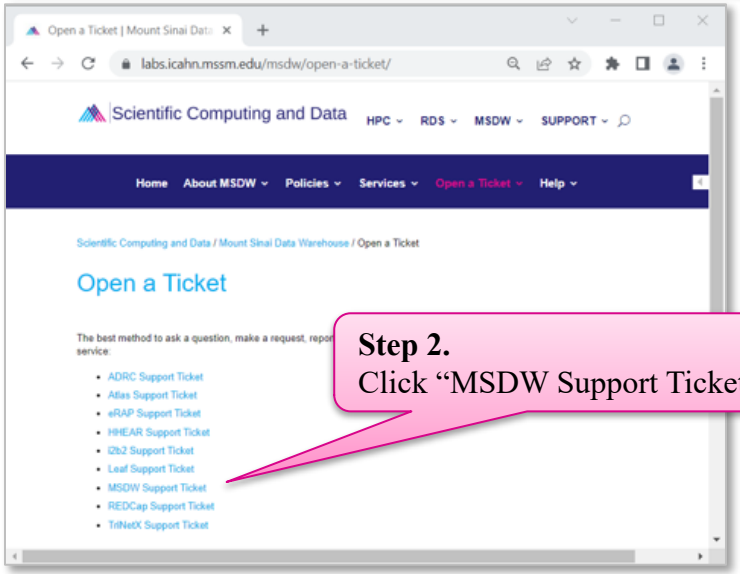
- Complex question that cannot be answered with one of the self-service query tools
- Need additional data that is not included in a de-identified data set
- Need PHI data for your analysis

https://scicomp.mssm.edu/jira/servicedesk/customer/portal/4

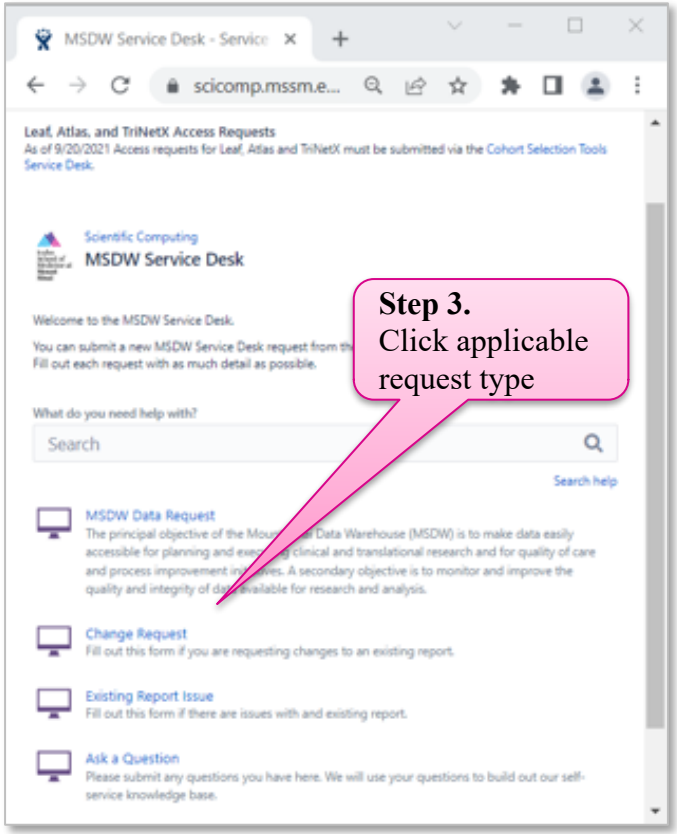
How to Open an MSDW Request Ticket



Step 1.
Click "Open a Ticket"

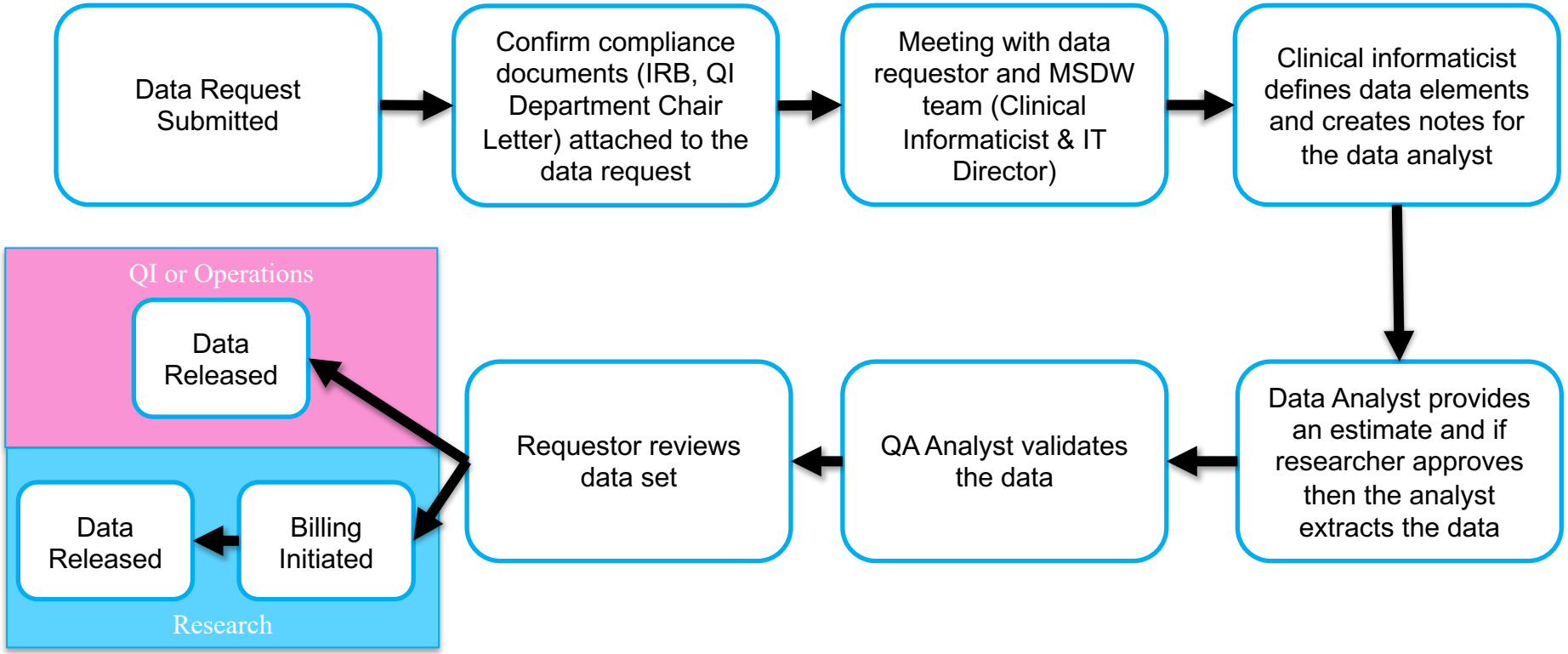


Step 2.
Click "MSDW Support Ticket"



Step 3.
Click applicable request type

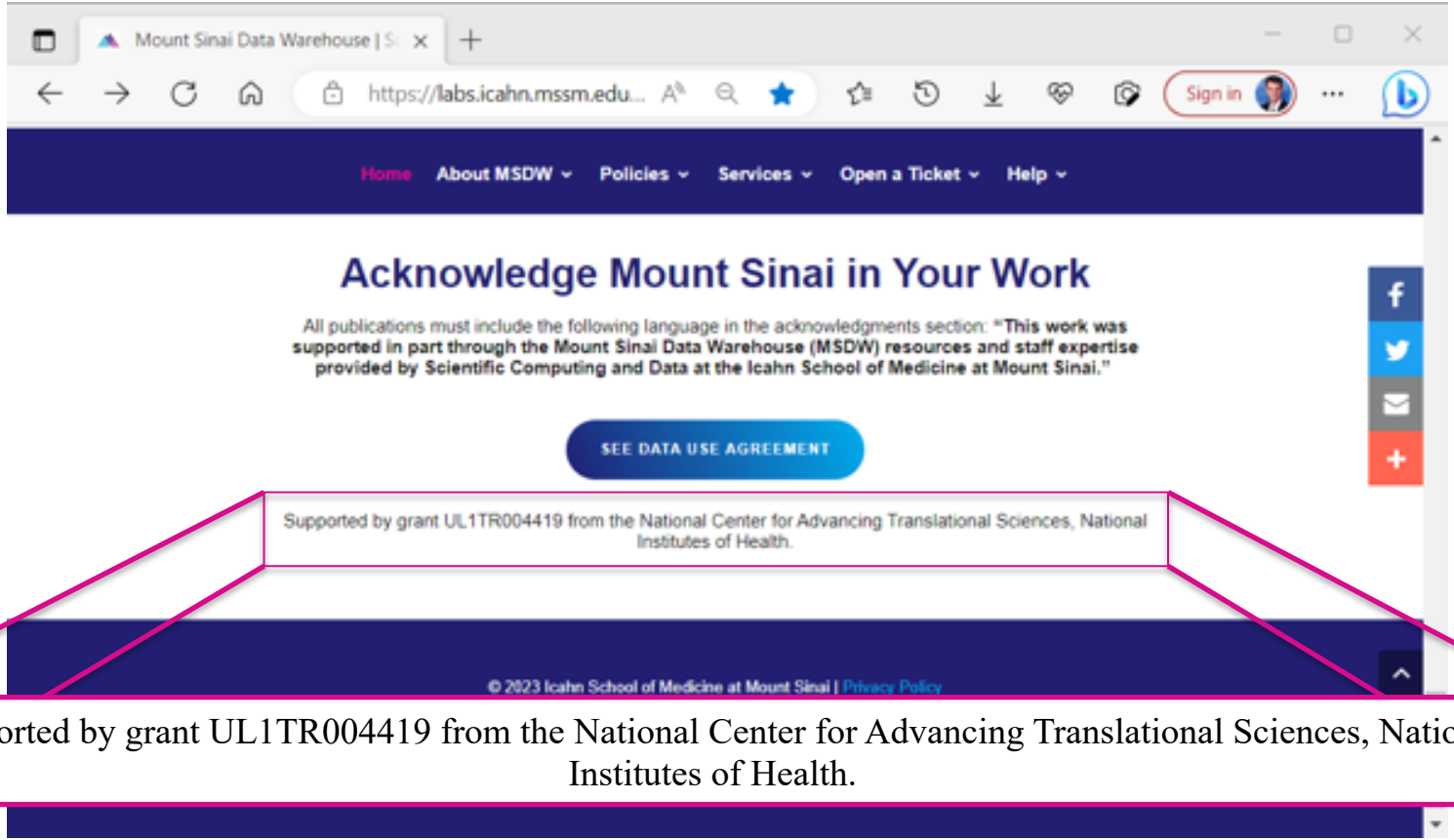
Workflow Once Data Request Submitted



JIRA ticketing system used to monitor the status of data requests

Acknowledgements

Encourage MSDW Users to Acknowledge CTSA



Supported by grant UL1TR004419 from the National Center for Advancing Translational Sciences, National Institutes of Health.

Acknowledge CTSA

- HPC team now requiring current & new Minerva users to agree annually to acknowledge Mount Sinai's CTSA grant
  - Users failing to agree risk having their access revoked
- REDCap team will put this policy into place
- MSDW team could enact the same policy
  - Direct database access users
  - Customers receiving custom data sets

CTSA Clinical & Translational Science Awards ®

Your Publications

Report publications to Scientific Computing and Data:

All publications that resulted from Scientific Computing and Data resources and services, including TriNetX, should be reported annually.

To report your publications, submit them here:
https://redcap.mountsinai.org/redcap/surveys/?s=HPEMDCYLNTXF3E3E

For 20 or more publications, email Maria at marajulia.castro@mssm.edu

Learn more about MSDW and Clinical Query tools from the links below:

https://labs.icahn.mssm.edu/msdw/

https://labs.icahn.mssm.edu/msdw/services/

https://labs.icahn.mssm.edu/msdw/data-sources/

"Walk-in" Digital Concierge service hosted by the MSDW

- Every Wednesday from 3:30 PM to 4:30 PM

Icahn School of Medicine at Mount Sinai

Thank you!

Thank you for your time! We hope you enjoyed this presentation.

Please take a minute to complete a short survey to provide your feedback and help improve our services:

TriNetX

https://redcap.link/hyzm6it3