

# I - Tour of the Web Client

## Introduction

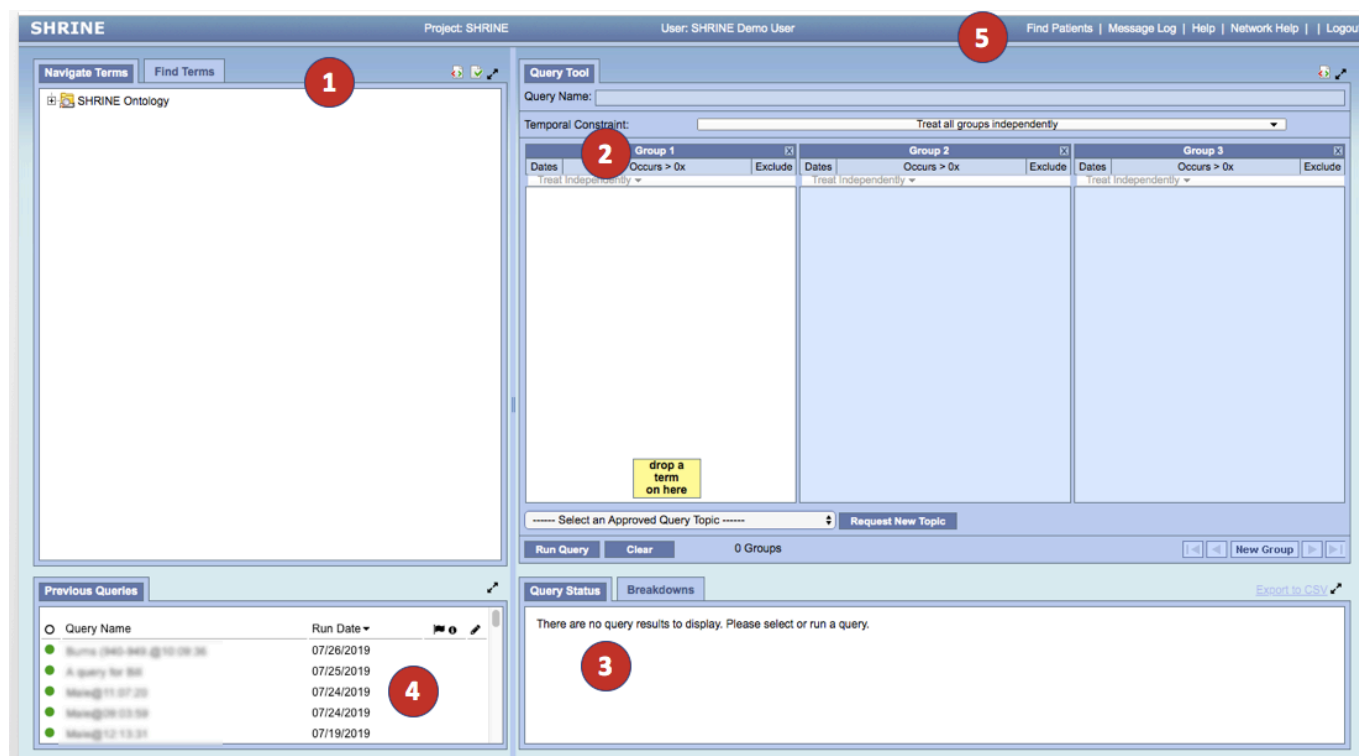
The functionality described in Part I of the user guide assumes that you have received the necessary prior authorizations to access a SHRINE network at your institution. The process for this authorization varies according to your institution and network.

Most SHRINE networks use a tool called the Data Steward Application to request and approve query topics prior to use of the SHRINE Web Client. Your local administrator or network contact will provide information about this prerequisite step, if applicable.

Details of shots presented in this document may vary from network to network. Each network uses a different ontology and may be uniquely configured. We have attempted to note in this document where these situations may be expected. If you have questions, please contact your local network representative.

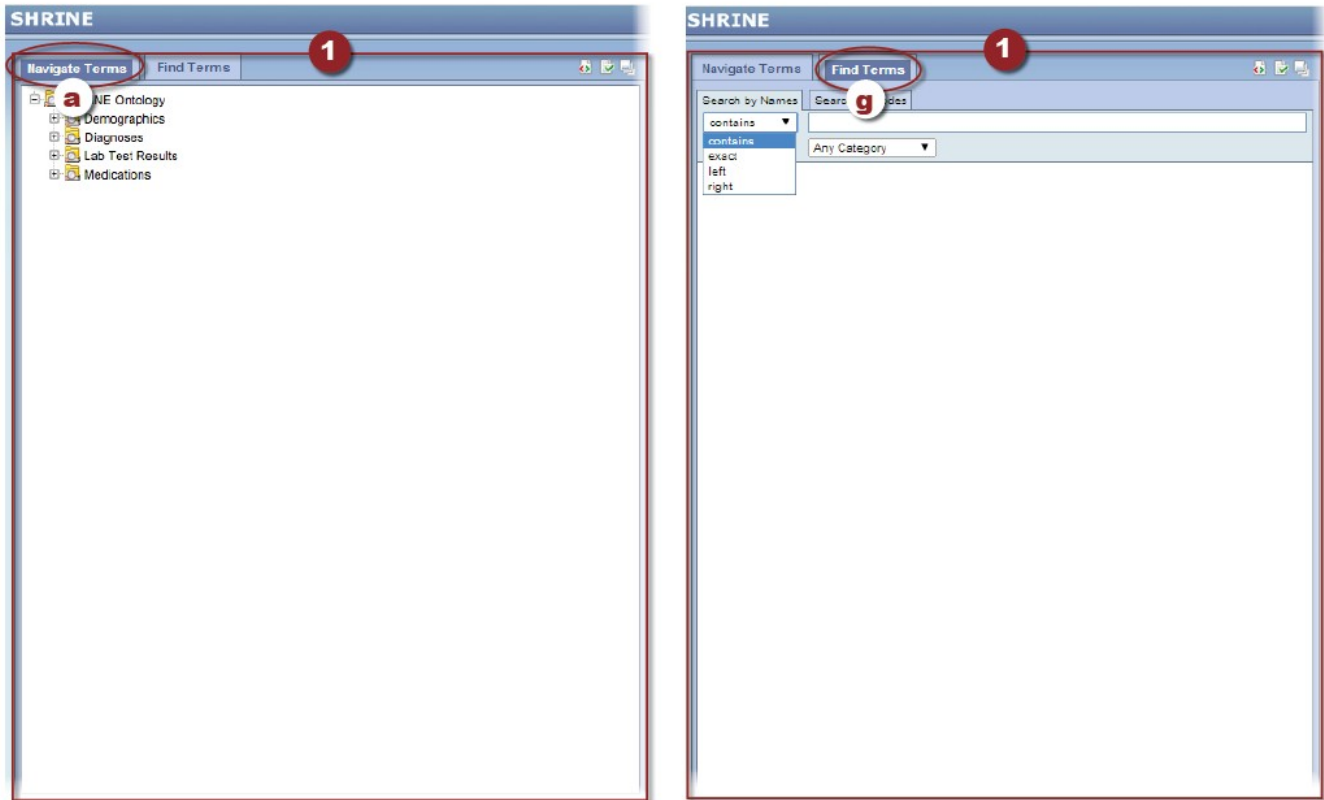
## User Interface

The SHRINE web client user interface (UI) is based on the web client developed for i2b2 and RPDR. The UI is divided into four modules: **1** Terms, **2** Query Tool, **3** Query Viewer, and **4** Previous Queries. The main menu is in the upper right **5**.



# 1 - Terms Module

Choosing between the two tabs in the Terms module allows you to browse (**Navigate**) or search (**Find**) the medical terms you wish to query.



Two tabs of the Terms module: **Navigate Terms** (left; see **a–f** below) and **Find Terms** (right; see **g–i** below). Only one tab is visible at a time in the web client.


**a Navigate Terms tab** – This is the default tab of the Terms module. Use Expand (+) and Compress (-) buttons to browse through available patient characteristics in the SHRINE Ontology, which are organized into four main folders:

- b** Demographics
- c** Diagnoses
- d** Lab Tests
- e** Medications

Each folder contains multiple categories that are displayed in subfolders containing more specific terms by which you can refine your query. The contents of these folder may vary by SHRINE network, and may thus deviate from As you navigate through the folders and locate a term or category of terms that you would like to include in your query, drag that entry to the Query Tool and drop it in a Group panel. For more information see the section, **2-- Query Tool Module**.

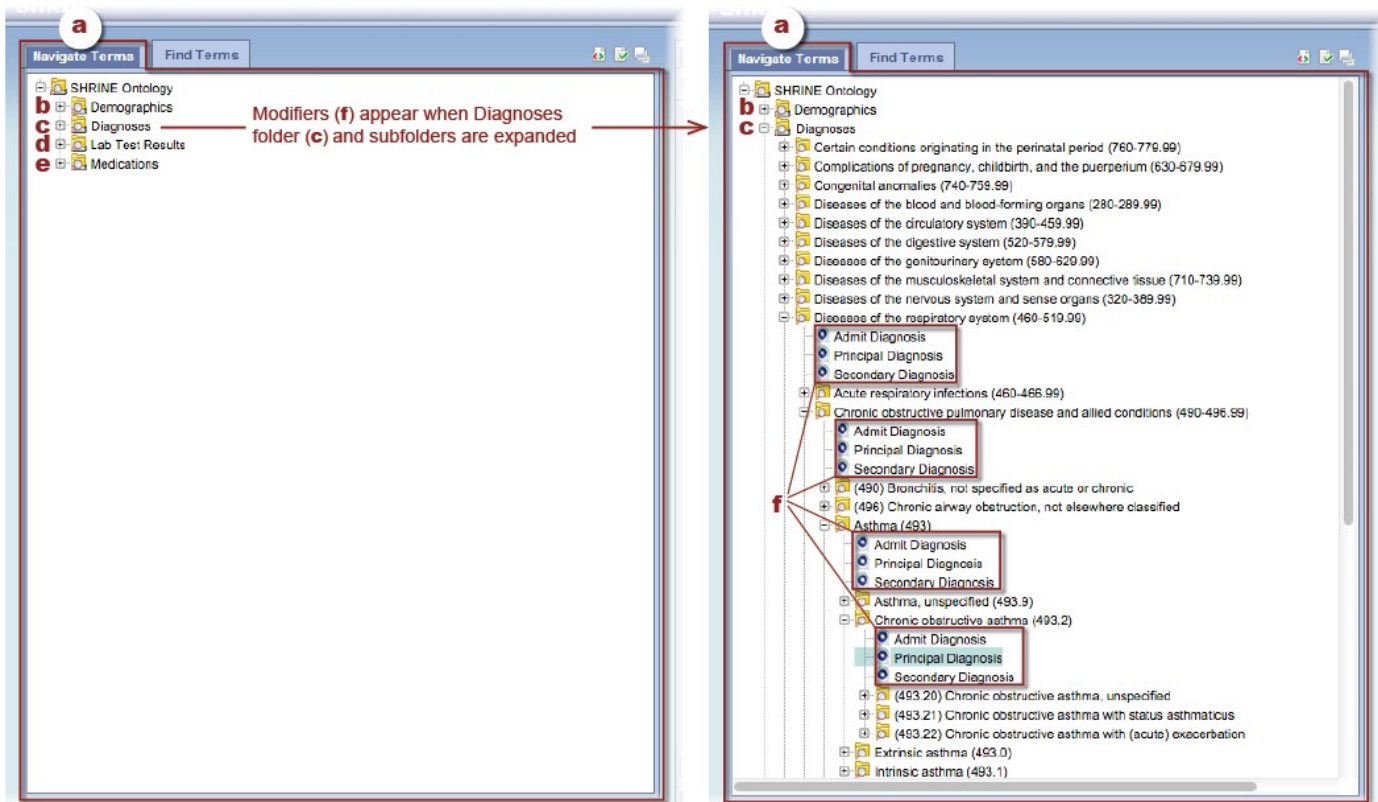
## **f** Modifiers

A term may also contain modifiers, which are subsets of that term that allow you to further refine your query.

Modifiers are indicated by a blue dot [  ] in place of a folder icon. For example, as shown below, terms within Diagnoses might contain the following three modifiers:

- Admit Diagnosis
- Principal Diagnosis

- Secondary Diagnosis



The **Navigate Terms** tab of the Terms module, shown here with the four main term categories collapsed (left) and with four levels of Diagnoses categories expanded (right). Modifiers (f) are also shown within the expanded categories.

**g Find Terms tab** – To search for specific characteristics on which to query, click the Find Terms tab and then search by either Names or Codes.

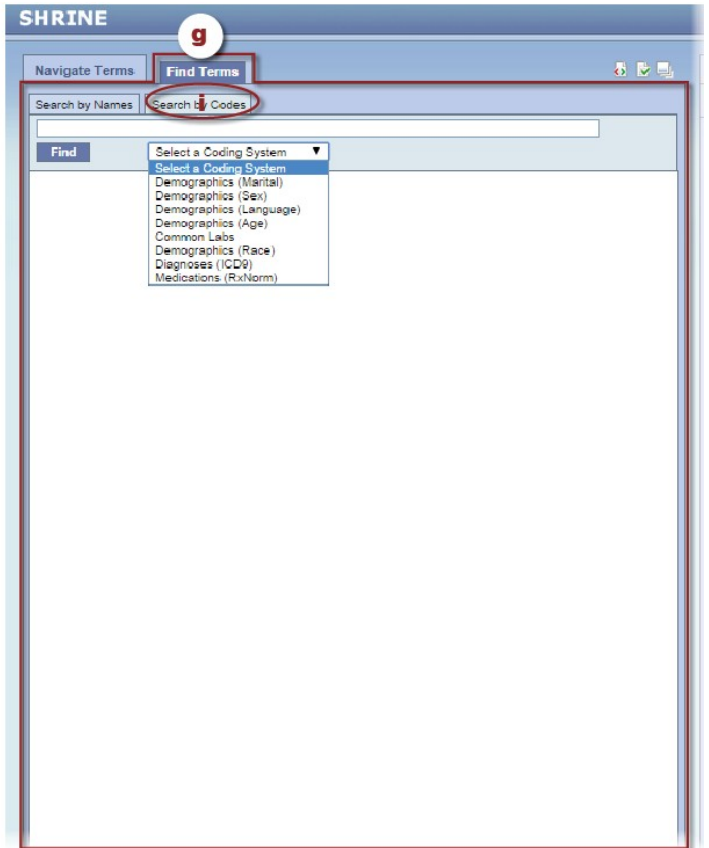
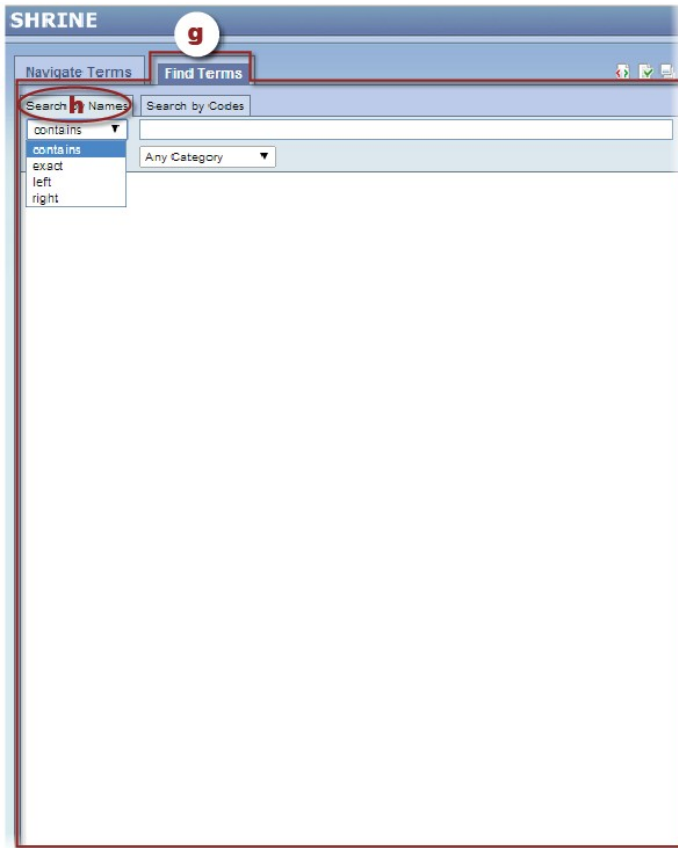
**h Search by Names**

1. Click the pull-down list to select the logical search operator. Options are: Contains, Exact, Left (starts with), or Right (ends with).
2. Enter your search string in the text field beside the operator pull-down list.
3. Click Find.

Note: the Category pull-down list under the text field can be left at Any Category because SHRINE is the only choice.

**i Search by Codes**

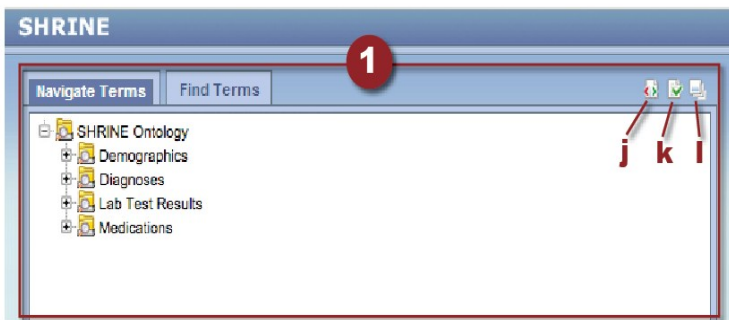
1. Use the “Select a Coding System” pull-down list to select the specific code type for the specific code on which you are searching. Coding system options include:
  - Demographics (Marital)
  - Demographics (Sex)
  - Demographics (Language)
  - Demographics (Age)
  - Demographics (Race)
  - Lab Tests
  - Diagnoses (ICD9)
  - Medications (RxNorm)
2. Enter the search term in the text field above the list.
3. Click Find.



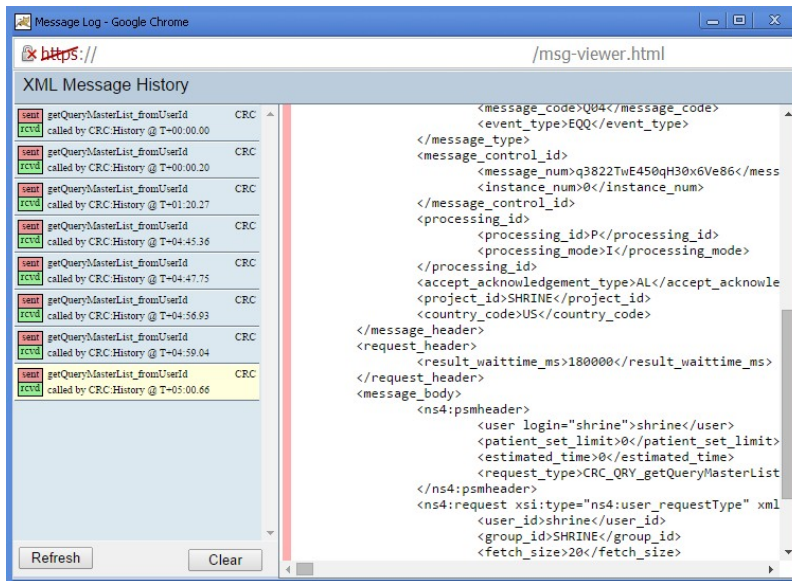
The *Find Terms* tab of the *Terms* module; *Search by Names* tab (left) and *Search by Codes* tab (right).


## Terms Module Icons

The three icons at the top-right corner of the *Terms* module, labeled **j** – **l** below, offer additional viewing options specific to the module.



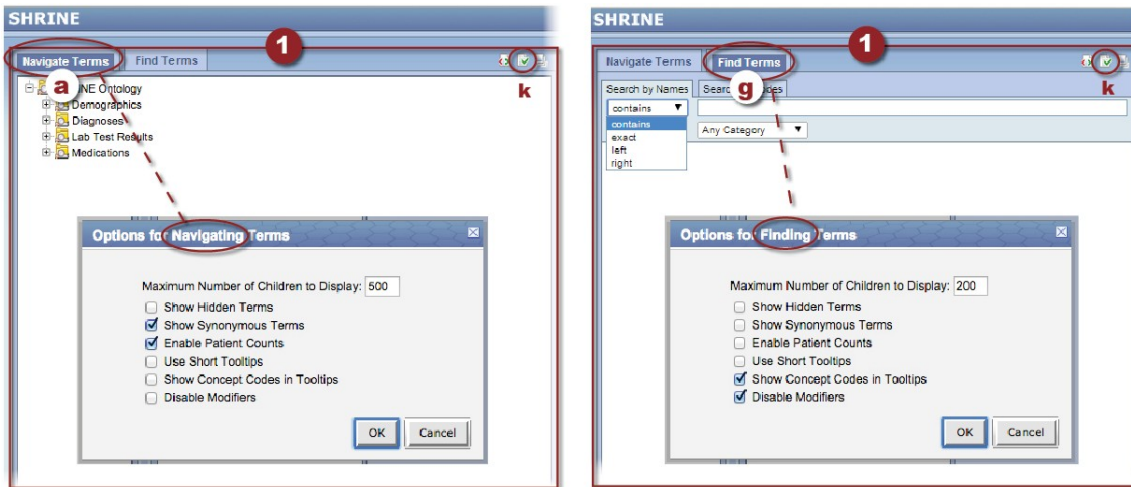
**j Show XML icon** – Click  to show XML Message History. A popup window like the one below appears.




**k Show Options icon** – Click  to open the dialog box shown below, where you can select from the following options for navigating and finding terms:

- Maximum Number of Children to Display – Default is 200
- Show Hidden Terms
- Show Synonymous Terms
- Enable Patient Counts
- Use Short Tooltips
- Show Concept Codes in Tooltips
- Disable Modifiers

The options are the same for both the Navigating and Finding tabs, but each tab retains its own individual selections as you click from one to the other. If you go from Navigating to Finding and change options for Finding, the Navigating options will not automatically change along with them.



**l Resize Workspace icon** – Click  to toggle between expanded and compressed (default) views of this module. When expanded, the Terms module will extend to the bottom of the web client window and the Previous Queries module will disappear. Clicking the icon a second time will return both modules to their default sizes.

## 2 - Query Tool Module

The Query Tool enables you to create simple and complicated queries. The following overview describes the Query Tool fields and functions. For more information about **constructing a query** see the section, Constructing a SHRINE Query.

**a Query Name** – Each time you click Run Query. You can name the query or use the default name inserted by the tool, which is a string constructed from your term selections at the time at which you run the query. Once you run the query, you cannot change its name. The name will also be used to identify your query parameters in the Previous Queries module.

### ***For a Network that requires Query Topics***

Note the difference between Query Name, which applies to an individual query instance, and Query Topic (**e** below), which is a label describing the broader subject of inquiry that is your purpose for using SHRINE.

**b Group** panels (Group 1, Group 2, etc.) – This is where you drag and drop terms from the Terms module to add them to your query. Query groups represent a set of patients defined by the terms within them and by any constraints applied to the terms. Terms within a group operate as OR logic, while terms in separate groups operate as AND logic. Right-click a term to delete it from your query or to set a specific value.

**c Constraints** – Dates and Occurrences options are located below the Group label. Click **Dates** to specify a date range for the terms in that Group, or the **Occurs > 0x** button to specify the number of times the term must appear for the same patient. Note: not all terms accept all constraints.

**d Exclude** – Each group has an Exclude button. Use this constraint to exclude the group. The green box reading “one or more of these” will change to a red box that reads “none of these.”

### ***e – f For a Network that requires Query Topics:***

**e Query Topic** pull-down list – Before you can run a query, you must select a preapproved Query Topic to which this specific query relates.

**f Request New Topic** button – Clicking this button opens the Data Steward application in a new window. To run a query that does not conform to any of your approved Topics in the drop-down list, you first must request and receive approval for a new Topic. The Data Steward administrator monitors query activities. If you select query terms that do not apply logically to your topic, the administrator can suspend your access to SHRINE, **and a review of your activities will be required.**

**g Run Query** button – When you complete construction of your query using the terms, constraints, and options available, click Run Query to start the query process. You can run additional queries by retaining the existing terms in the Query Tool fields, and then adding new criteria to the query. You can run multiple queries simultaneously.

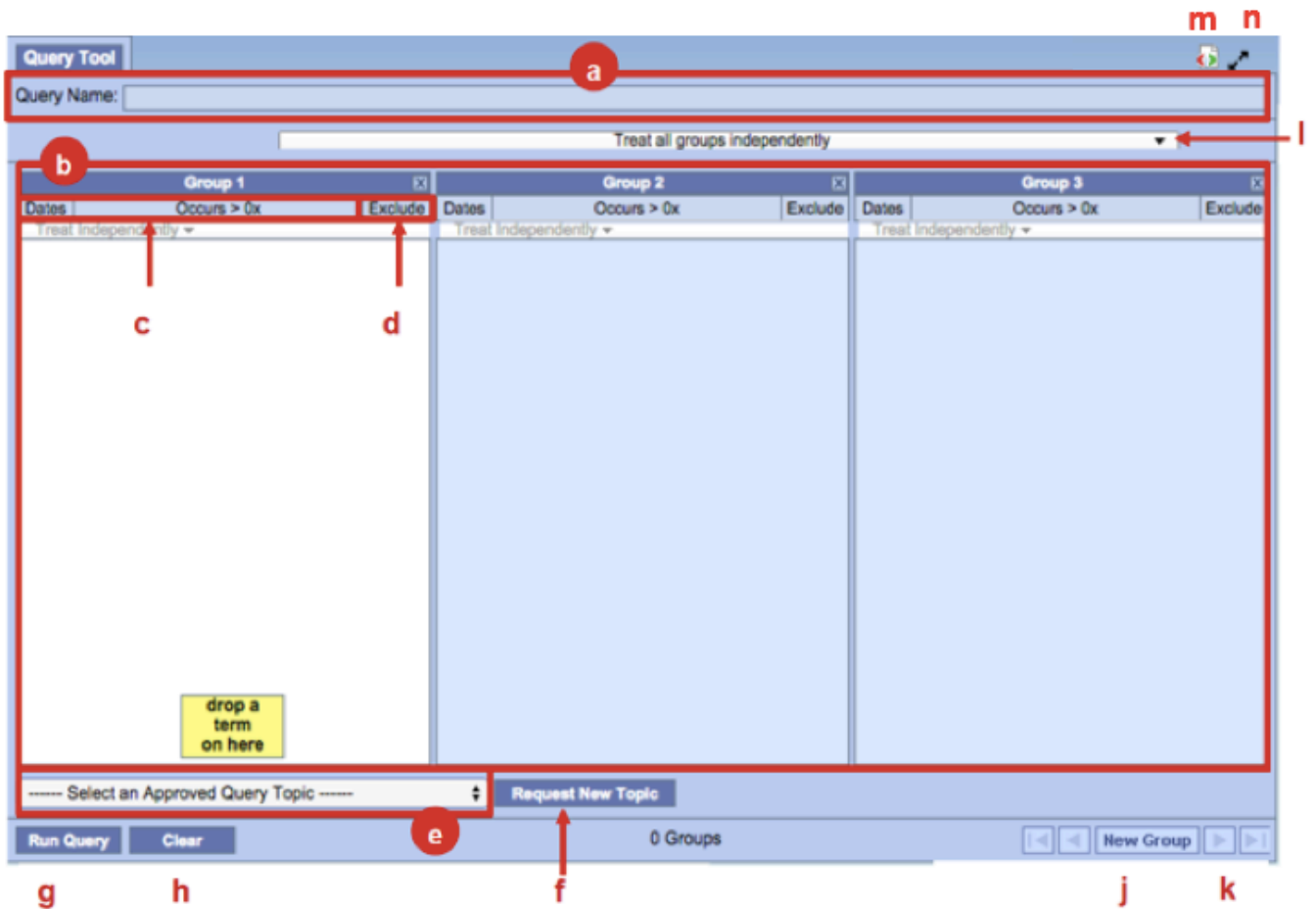
**h Clear / New Query** button – Clears all Query Tool fields and starts a new query. To remove an individual query term, right-click on the term.

**j New Group** button – Click to add additional groups of terms to your query.

**k Group page controls** – If you add new groups to the three default groups displayed in the tool, they may exceed the space in the window you have open. If so, use the page controls to navigate to your additional groups.


**l Query Constraints** –The options on this list are used to define group encounters and construct temporal queries. Defining encounter groups and creating temporal queries are explained in more detail in Part II.

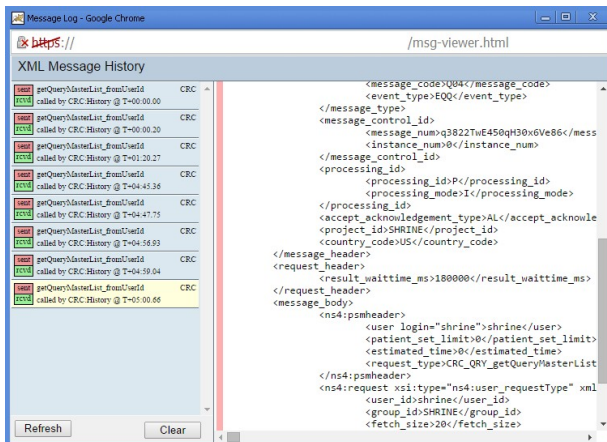





## Query Tool Module Icons

The three icons at the top-right corner of the Query Tool module offer additional viewing options specific to the module:

**m Show XML icon**  – Click to show XML Message History in a window that is similar to the one below.

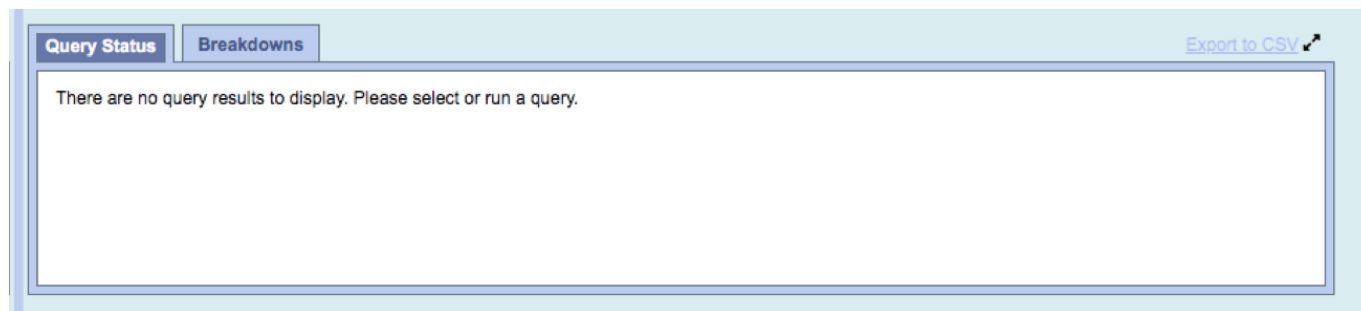


**n Resize Workspace icon**  – Click to toggle between expanded and compressed views of the module. When expanded, the Query Tool module will extend to the bottom of the web client window and the Query Status

module will disappear. Clicking the icon a second time will return both to their default sizes.

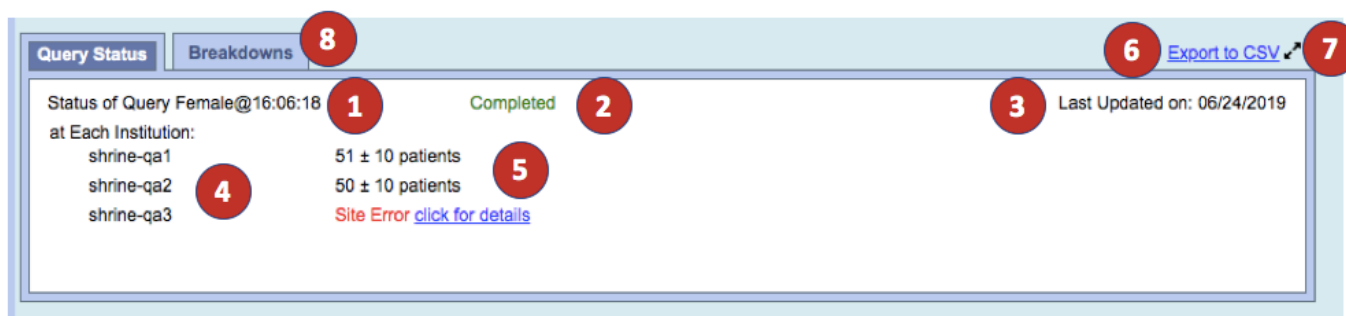
### 3 - Query Viewer Module

The results of your query are displayed in the Query Viewer module. These results are saved when you log out of SHRINE and can be accessed during future sessions in the **Previous Queries module** described in section 4.



#### Query Viewer Features

The SHRINE application sends the query to each institution. Each institution processes the query independently. While the institutions are running the query, the SHRINE application polls the institution for query status and results. The status values and results are displayed in the Query Status tab.



- 1) The Status of Query heading contains the query name. Long query names may be truncated.
- 2) A query processing status is shown for the entire query. There are five possible query status values:

Submitted	The query has been sent to downstream systems for processing. This query status will change when results or errors are received.
Submission Error	An error has occurred. Clicking the words "Click for Details" shows a pop-up with an expanded error message.
Network Error	An error has occurred. Clicking the words "Click for Details" shows a pop-up with an expanded error message.
In Progress	At least one site on the network has received the query.
Completed	The query has finished running for the network. All of the sites either display a patient count or a site error. If patient breakdowns were selected, they are shown in the "Breakdown" Tab in the Query Viewer tab.

- 3) The timestamp in the upper right corner of the window show the latest time at which the SHRINE application polled the institutions for results. This polling takes place at least every 30 seconds.
- 4) The institution names are shown in the right-hand column.
- 5) An individual site processing status is shown for each site. There are five possible site status values:



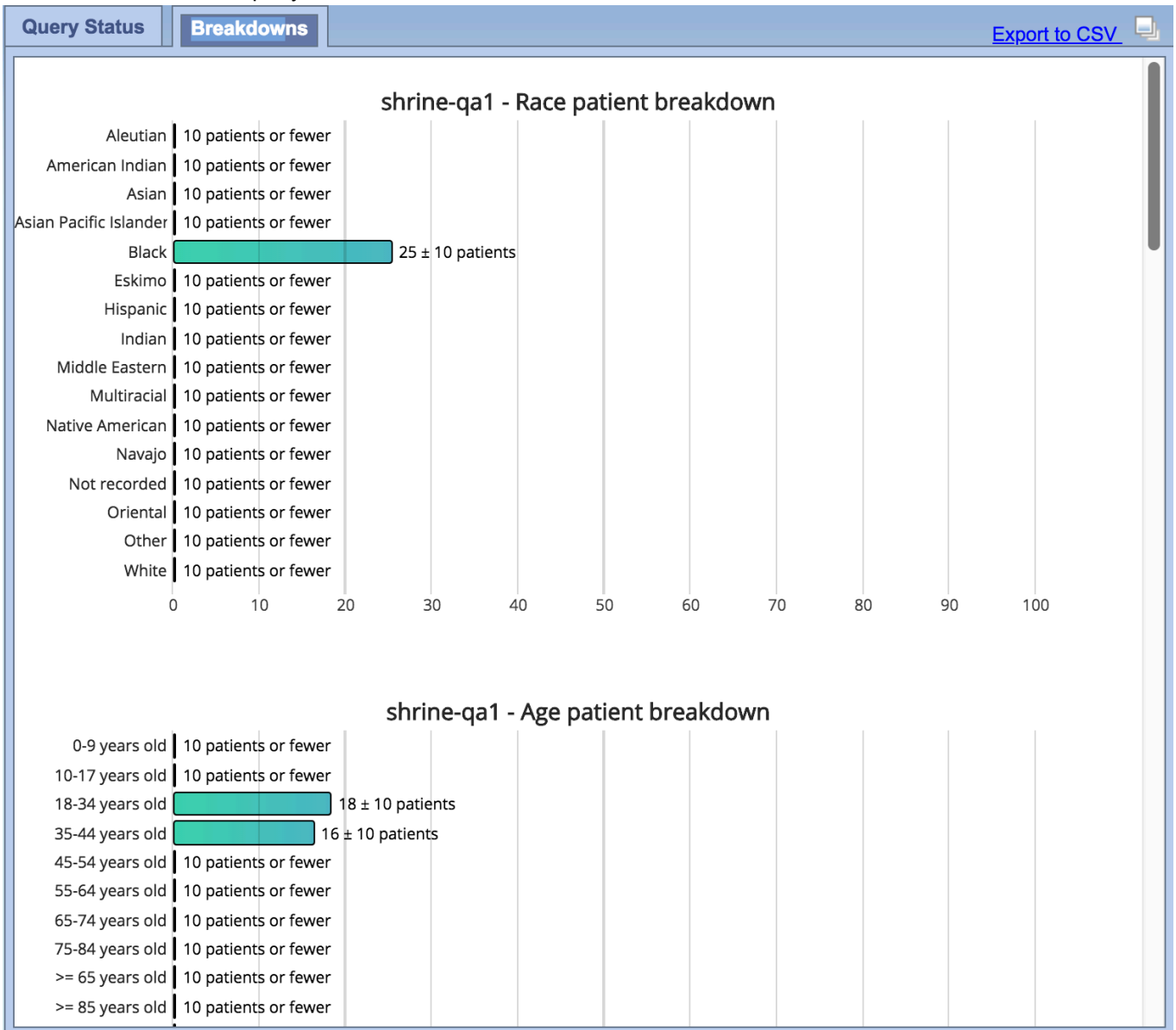
Sent to Site	The query has been sent to a downstream systems for processing.
Processing at Site	The query has has received by the downstream systems for processing.
Delayed at Site	Downstream system(s) are too busy to process the query at this time.
Site Error	A site error has occurred. Clicking the words "Click for Details" shows a pop-up with an expanded error message.
Obfuscated Patient Count	The query processing is completed at the institution without errors.

- 6) Query results can be exported in CSV format by clicking the "Export to CSV" link.
- 7) The Query Viewer tab can be resized by clicking the expand button. The following example shows an expanded Query Viewer tab. Results are shown for completed queries. Error messages can be clicked for a pop-up expanded error message.

The screenshot displays a web interface for query status. At the top, there are two tabs: "Query Status" (selected) and "Breakdowns". To the right of the tabs is a link "Export to CSV" with a small icon. Below the tabs, the main content area shows the following information:

- Status of Query Female@16:06:18 Completed Last Updated on: 06/24/2019
- at Each Institution:
- shrine-qa1                    51 ± 10 patients
- shrine-qa2                    50 ± 10 patients
- shrine-qa3                    Site Error [click for details](#)

8) The Breakdown tab will show a graph of the breakdowns for each institution. The following example shows a zoomed Breakdowns tab. Note that this tab will only show breakdown graphs if breakdowns were selected for the current query.

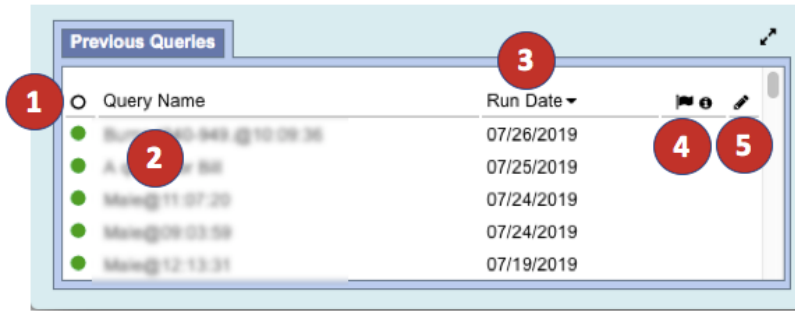


## 4 - Previous Queries Module

The Previous Queries Module is designed to display the most recent queries run by a user. A previous query is created when a query is run from the *Query Tool*. All queries are stored and displayed in the Previous Queries Module. These previous queries can be used to run new queries or to view the results of the queries in the Query Status Module.

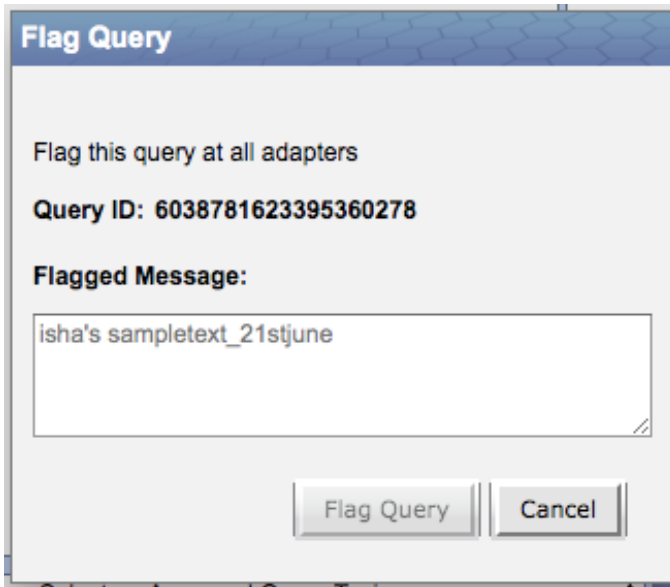
Previous Queries is default sorted by Run Date, with the latest query run appearing at the top.

In addition to query status and name (1 and 2 carried over from Query Status module), the entry also contains **3 Run Date**. In addition, you can flag a query **4** and edit the query name **5**



## Flag and unflag a query

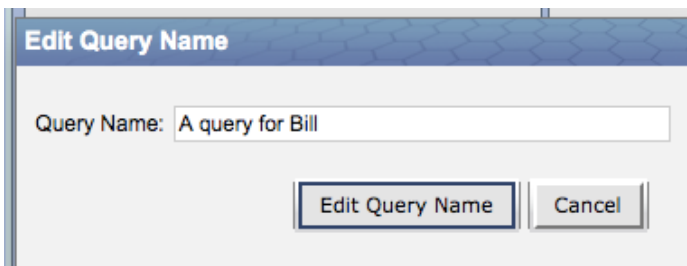
Hover the row in previous query and click on the flag icon. This will display the following pop-up selection box:



Enter a message and save. Click the “Flag” selection to create and send a message to the SHRINE data steward. Click the flag icon again to edit the message or to unflag and remove the message to the SHRINE data steward.

## Edit query name

Hover the row in previous query and click on the pencil icon. This will display the following pop-up selection box in which you may enter a query name (under 250 characters) of your choosing:



## To View the Results of a Previous Query

Simply click a previous query in the Previous Queries window, that query name is highlighted and the query terms are displayed in the Query Tool window and the query’s current results are displayed in the Query Viewer window.

The screenshot displays the SHRINE web interface. At the top, the navigation bar includes the project name 'SHRINE', the user 'SHRINE Demo User', and links for 'Find Patients', 'Message Log', 'Help', 'Network Help', and 'Logout'. The main interface is divided into several sections:

- SHRINE Ontology:** A panel on the left for navigating terms.
- Query Tool:** The central area for building queries. It shows a query name 'Male@12:40:12' and a temporal constraint 'Treat Independently'. Below this are three groups (Group 1, Group 2, Group 3) with options for 'Dates', 'Occurs > 0x', and 'Exclude'. A 'Male' term is visible in Group 1. Buttons for 'one or more of these', 'AND', and 'drop a term on here' are present.
- Previous Queries:** A table at the bottom left listing previous queries. A red circle with the number '1' highlights the query 'Male@12:40:12'.
- Query Status:** A section at the bottom right showing the status of the query 'Male@12:40:12' as 'Completed'. It includes a table of results at each institution:
 

at Each Institution:	Patients
shrine-qa1	82 ± 10 patients
shrine-qa2	82 ± 10 patients
shrine-qa3	70 ± 10 patients

 A red circle with the number '3' highlights the 'Completed' status and the patient counts.

## Rerunning a Previous Query

After the viewing the results of the previous query, select an Approved Query Topic, click the Run Query button, and click OK in the Run Query dialog.

## 5 - Main Menu

The main SHRINE menu is located in the top-right corner of the web browser window. Options include:

- **Find Patients** – The default web client page containing the four modules
- **Message Log** – A development tool used by technical staff to track system functions
- **Help** – The link to this guide
- **Network Help** – Link configured by your network administrator
- **Logout** – Exit SHRINE

## II How to Construct a SHRINE Query

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The following sections describe the basic components of a SHRINE query. Temporal queries are covered in more detail in the section, **Constructing Temporal Queries**.

### Hierarchy of Terms

Patient queries are composed using medical terms defined in the **SHRINE Core Ontology**. Because the Core Ontology contains a vast number of terms, including >13,000 diagnoses and >4,500 medications, hierarchical relationships are used to organize the terms into categories. These **term categories** are represented by folders [📁], which you can navigate using the Terms module of the web client. Expand [⊖] folders to reveal increasingly specific term category subfolders and, ultimately, **discrete terms** (represented by document icons [📄]).

### Query Groups and Boolean Search Operators

As you locate each term you wish to search for, add it to your query by dragging and dropping its name to a Group panel in the Query Tool module. Boolean logic is applied as follows:

**OR** – Place two or more terms in the **same Group** if the patients in your query are only required to match one or another of the terms, but not all of them.

**AND** – If you have two or more terms that patients must match both/all of to be counted in your query, place each required term in its own **separate Group**.

**NOT** – To make your query specifically include patients who do **not** match a selected term(s), drag that term(s) to a **separate Group** panel and click **Exclude** (at the top of the panel, under the Group label).

Note: AND logic is applied before OR logic. For example, if you drag a diagnosis of Asthma to Group 1 and then drag demographic terms of 10-17 years old and 0-9 years old to Group 2 (i.e., 10-17 years old OR 0-9 years old), the query first processes diagnosis of asthma AND demographics of 10-17 years old; it then processes diagnosis of asthma AND demographics of 0-9 years old. The two results sets are then added together to return the final query results.

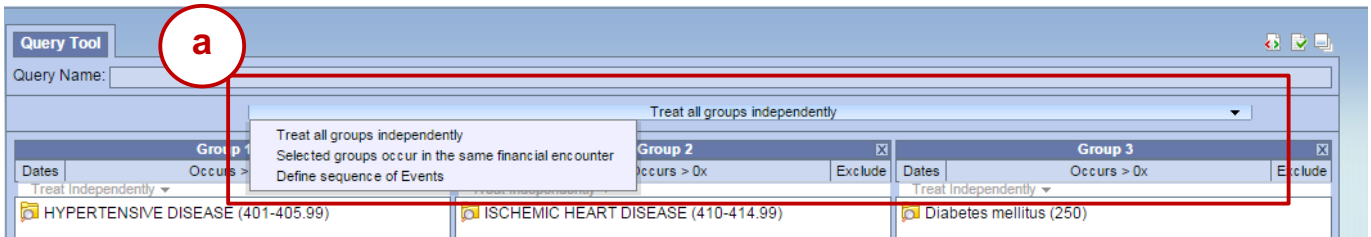
### Term Specificity

In addition to discrete terms, you can also use term categories (folders or subfolders) as query items. However, dragging a folder to the Query Tool module is equivalent to dragging every discrete term within that folder (and/or its subfolders), which may be too broad and take the query too long to process. Therefore, the maximum number of discrete terms allowed in a folder to be selected for querying is 120. If it contains more, you must expand it and select something more specific.

### Constraints

Constraints are used to narrow down the search criteria to a specific time frame, occurrence, or value. There are three categories of constraints: **Query Timing** Constraints, **Group** Constraints and **Item** Constraints. These categories are described in the following sections.

Query constraints are accessed from the drop-down list, shown as (a), in the screen capture below.



## Query Timing Constraints

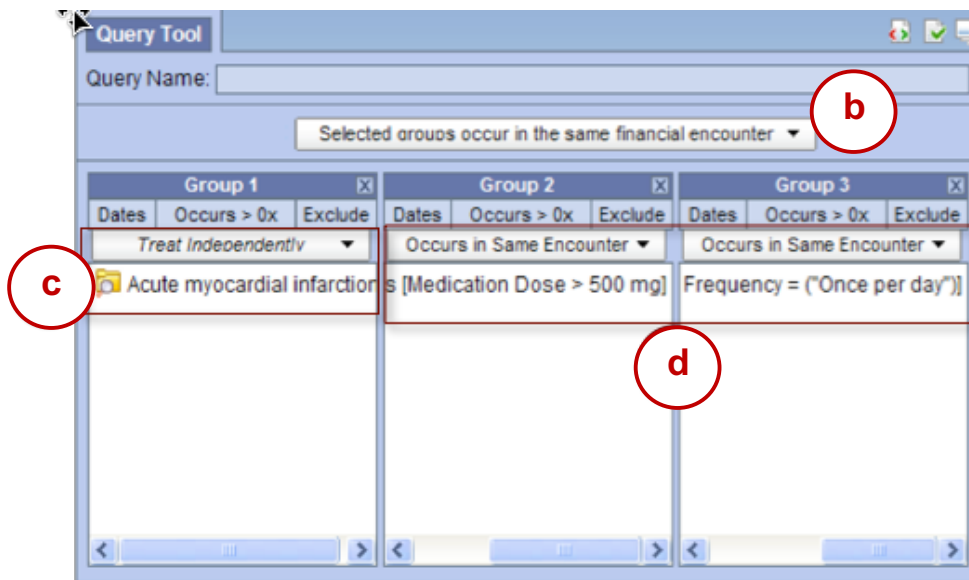
Query timing constraints determine panel timing constraints used to constrain the query at the group level. Query timing options are 1) Groups that occur in the same **Financial Encounter** and 2) **Temporal** (events based)

**Queries.** Encounter queries are described below. For more information about event based temporal queries see the section, **Temporal Queries.**

### Encounter Based Queries

Encounter based queries utilize the visit / encounter information (**b**) along with the terms defined to determine if a patient meets the search criteria.

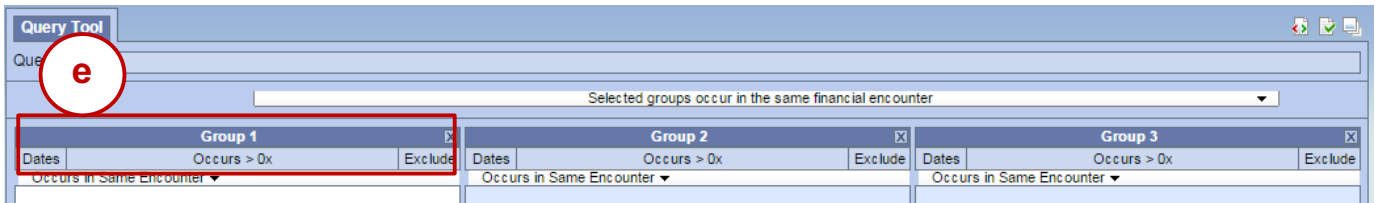
In the following example, we are asking for all patients who have a diagnosis of Acute MI documented at **any time** (**c**) in their history. These patients also have to have a medication with a dose greater than 500 mg **and** a medication that is taken once a day documented during the **same encounter** (**d**).



## Group Constraints

Group constraints are selected at the group level, and are shown as (**e**) in the screenshot below. There are four group constraints:

- **Date**
- **Occurrence**
- **Exclusion**
- **Panel Timing**

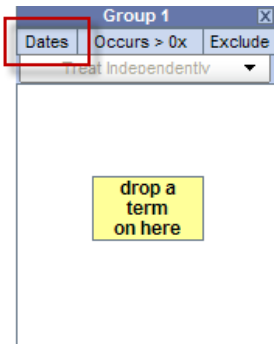


These constraints are described below.

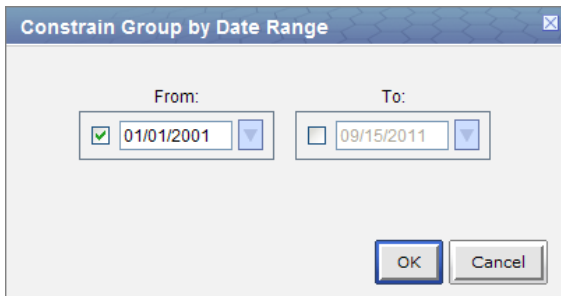
### Date Constraint

A date range is used when determining eligibility.

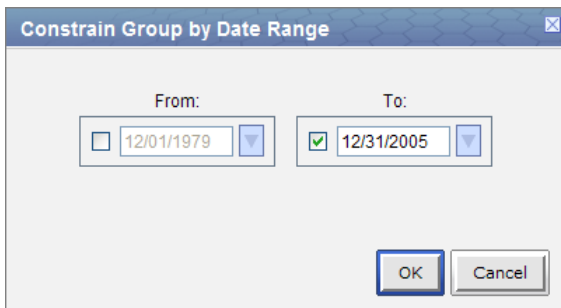
Click **Dates** to open the *Constrain Group by Date Range* dialog. Specify a date range in which you want the term to appear in the patient record.



**Specified date range:** **To** and **From** dates are defined. Only data with activity within the defined date range will be used.



**Specific start date:** only the **From** date is defined. Data from the defined start date to the latest date available. No end date defined.



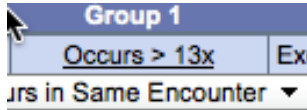
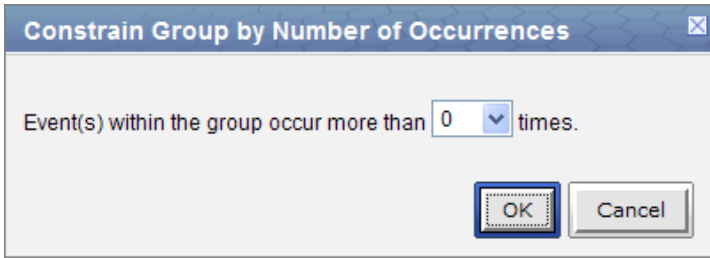
**Specific end date:** only the date to is defined. All data up until the defined end date - no start date defined.

### Occurrence Constraint

You can define the number of times the items listed in the group have to occur in order to be considered a positive “hit”. This is done by clicking on the Occurs > 0x, which will open the *Constrain Group by Number of Occurrences* dialog. The number of occurrences of the items in the group are documented determines Eligibility.

The default, “Occurs > 0x,” means the term will appear at least once and possibly more.

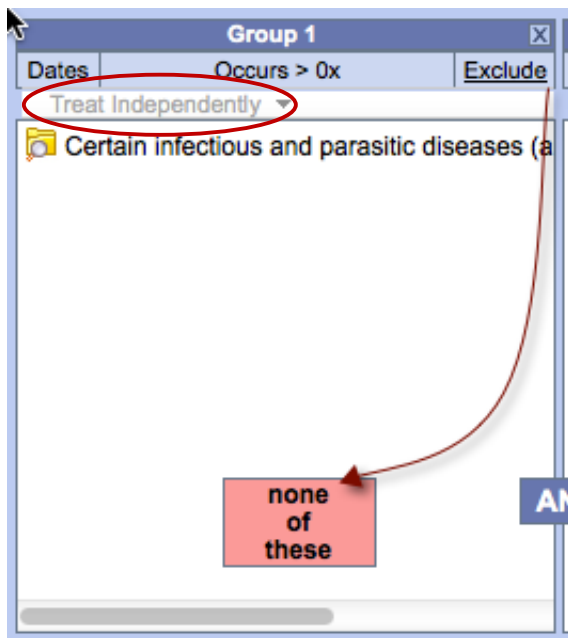




The selected number of occurrences will appear in the selection criteria section of the Group headings.

## Exclusion Constraint

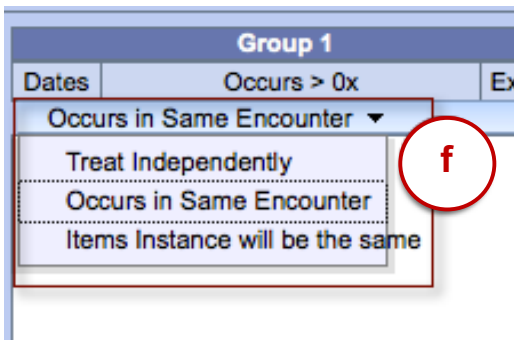
Patients with observations for any of the items listed in the group panel will be excluded from the results.



Click Exclude to exclude the group. The information box changes to indicate none of these.

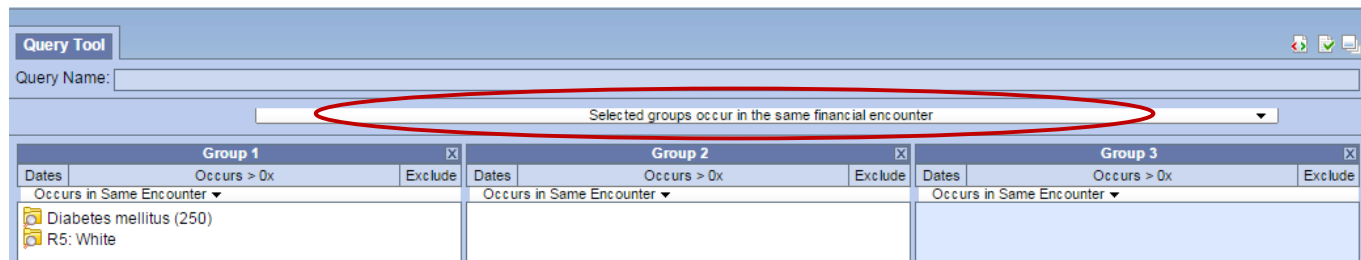
## Panel Timing Constraint

The panel timing constraint provides a way of binding one or more groups by an occurrence such as a financial encounter. "Treat Independently" is the default option for the Panel Timing constraints. (f) This option means the items in this group will not be bound to the items in any other group.



When using multiple groups you can constrain two groups based on the timing of when the items occur in a patient's record.

Before you can change any panel timing constraints you must first select the query constraint that corresponds to the type of timing constraint you want to define on the panel level. For example, to bind two or more groups by the patient's encounters you must first change the query constraint to *Selected groups occur in the same financial encounter*. Once this is selected all the panel timing constraints will be updated to *Occurs in Same Encounter*.



In the following example we are asking for all patients who have a diagnosis of Acute MI documented at **any time** in their history. These patients also have to have a medication with a dose greater than 500 mg **and** a medication that is taken once a day documented during the *same encounter*.

## Item Constraints

Item constraints are used to constrain a specific term within the group.

### Value Constraint

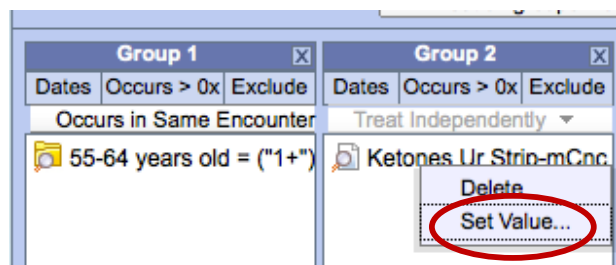
Some Ontology terms and modifiers can be further constrained by defining a value constraint.

Value constraints could be a numeric or text value, or a value flag. For example:

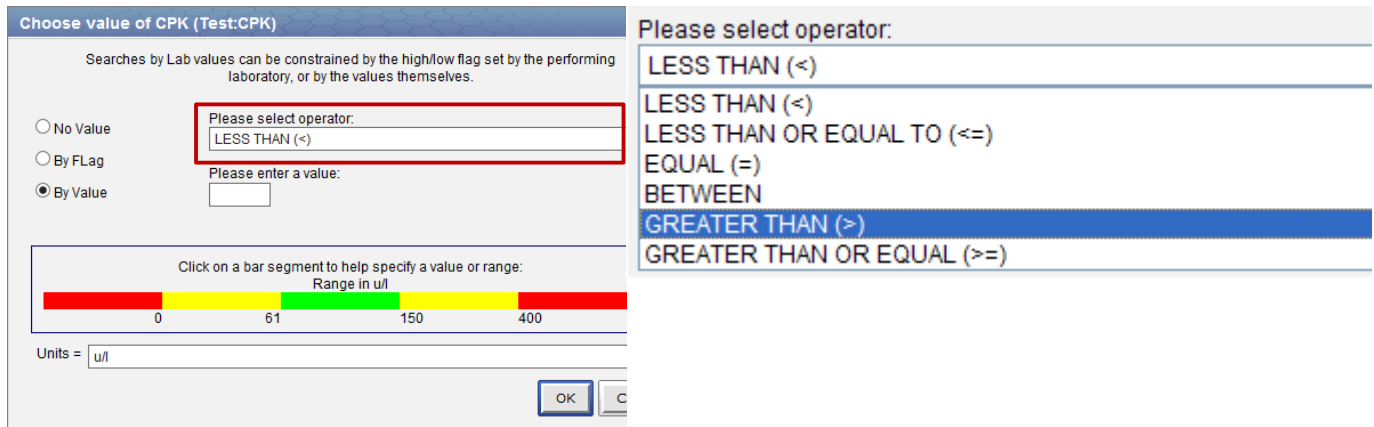
- High
- Low
- Abnormal

The value(s) associated to the item in the group panel will be used when determining eligibility.

When you drop one of these items into a **Group** panel, the **Value Constraint Editor** appears. You can use this editor to specify the values to use when the item is constrained. If an item that supports value constraints already exists in a **Group**, you can right click on the item and select "**Set Value...**" to launch the **Value Editor** for that term.

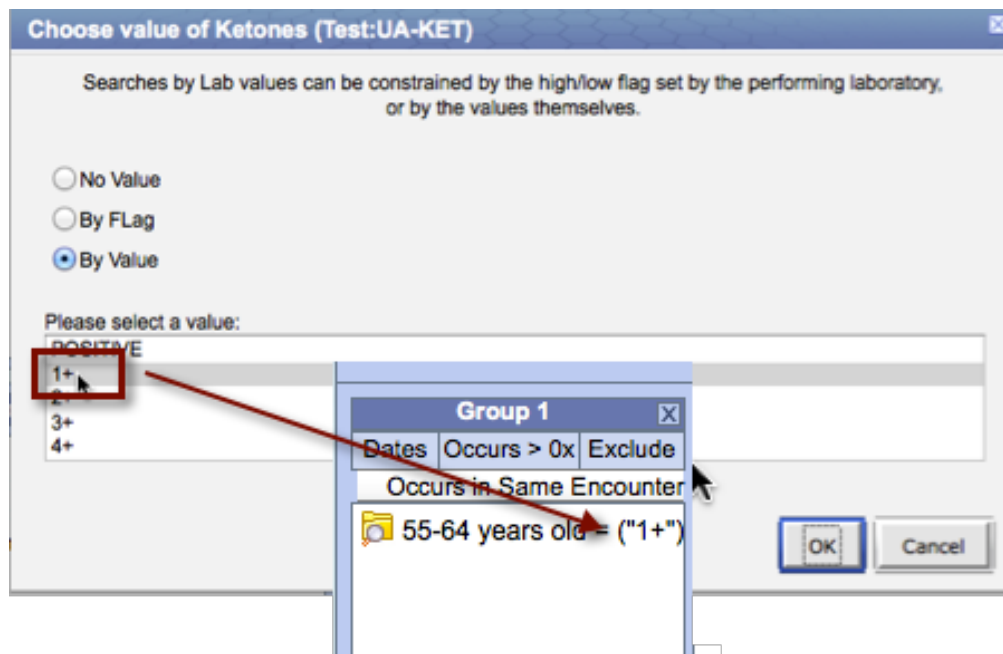


It is important to note that not all Ontology items (terms and modifiers) will have the ability to define a value constraint on them. Click on the drop-down arrow to change the operator or accept the default.



The type of value constraint and the options available for selection in the Choose Value dialog depend on the item selected.

Once you have defined the value constraint, it will appear next to the item in the group panel. You can either select a value or enter a value, pending on the Lab term selected.



## Constructing Temporal queries

Temporal queries are a specific type of query in which multiple events occur on a specific set of patients; these events are further defined by an interval of time. Components of a temporal query include:

1. Defining the set of patients to use when comparing events (*Population in which events occur*)
2. At least two events defined (*Event 1 and Event 2*)
3. Define the interval or span of time in which the events occur in relation to one another (*Define order of events*)

The SHRINE web client is organized to facilitate defining the above components. The image below shows the starting point of the Temporal Query Tool view interface.

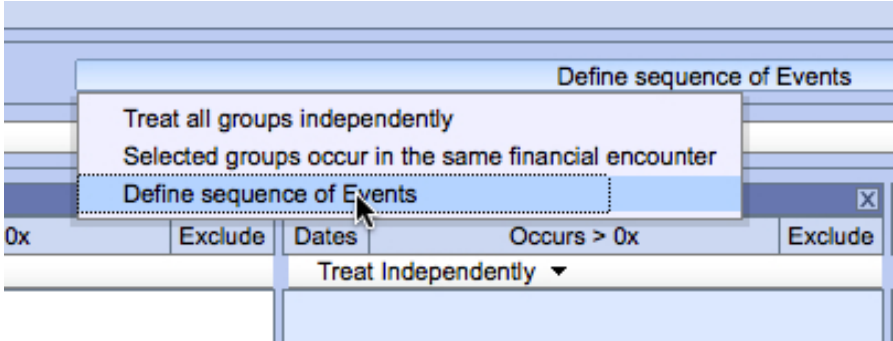
The steps for defining a temporal query are outlined below. First let us setup the example that will be used throughout these steps.

We will be asking for all **male** patients who are either **Asian, Black or African American, or White**. This set of

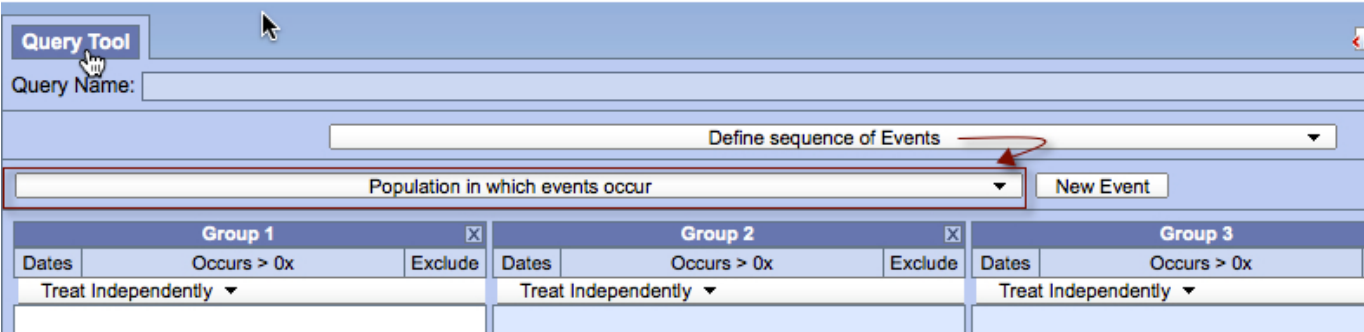
patients will have had their first event of **Hypertension** occurring before their first event of **Ischemic heart disease**.

### Step 1: Define a population

Before you can define your population you must first select *Define sequence of Events* from the list of available Query Constraints.



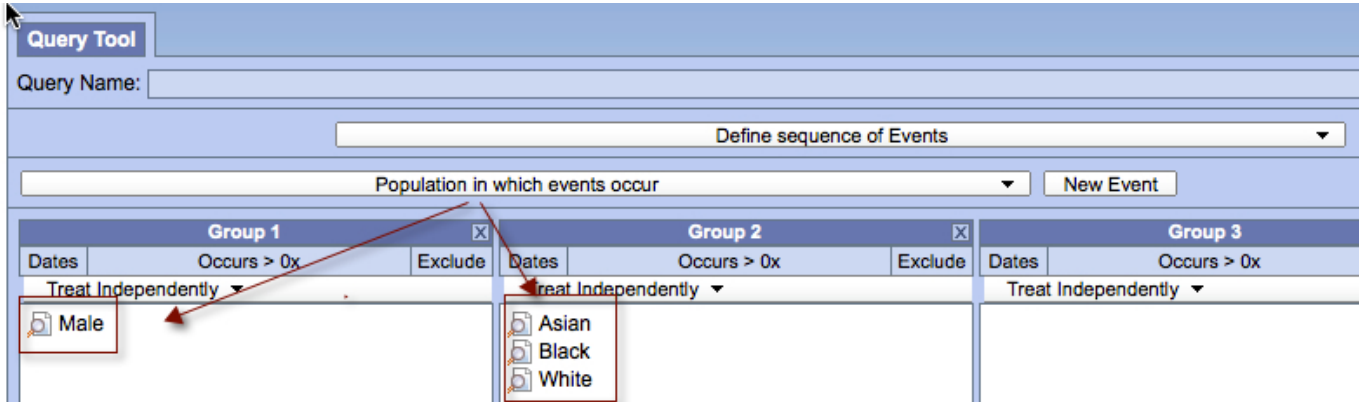
Selecting *Define sequence of Events* automatically opens additional temporal query options. The first step in the temporal query process is to define *the Population in which events occur*.



In the example, the population is going to be all males who are either Asian, Black or African American, or White. The first thing we need to do is add the gender of Male to the panel in the first group. Next we need to add the following races to the second group:

- 1. Asian
- 2. Black or African American
- 3. White

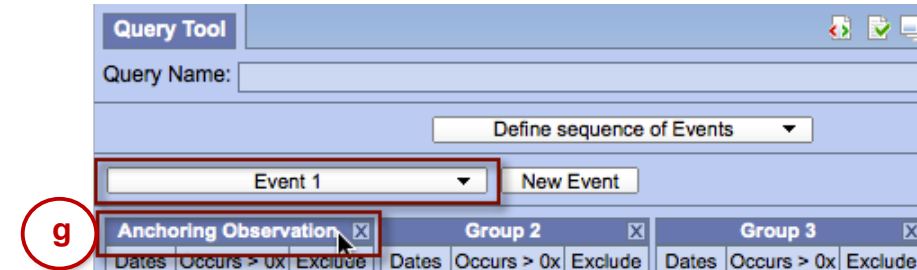
The query results will be limited to this population of patients.



## Step 2: Define Events

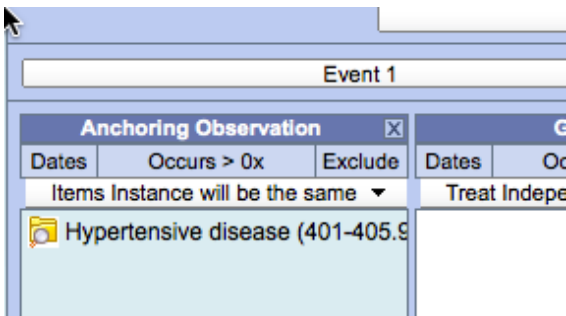
All temporal queries have to have at least two events defined. Each event can have its own set of groups and constraints, all of which works in the same manner as a simple query.

To define the first event, select Event 1 from the drop-down list of temporal components.

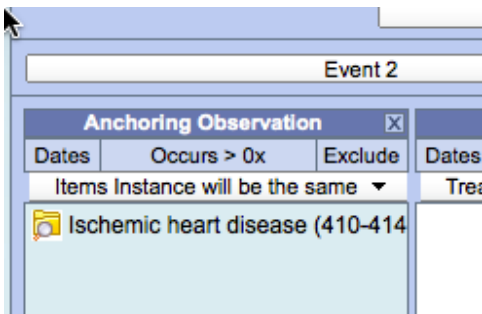


The only requirement when defining events is the first group will always be the anchoring observation group (g) and as such the panel constraint has to be defined, as *Items instance will be the same*. It is for this reason that the panel constraint on the first group is not available for selection when defining your events.

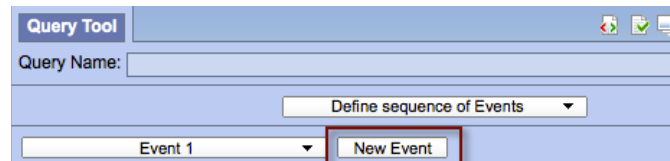
Following our example, we have now defined the first Event as those patients from our defined population who have at least one observation of Hypertensive disease noted in their record.



To define the second event, select *Event 2* from the drop-down list of temporal components. Following our example, we have now defined the second event as those patients from our defined population who have at least one observation of Ischemic heart disease noted in their record.



If you want to add a third event you can click on New Event and it will be added to the drop-down list of available temporal components.

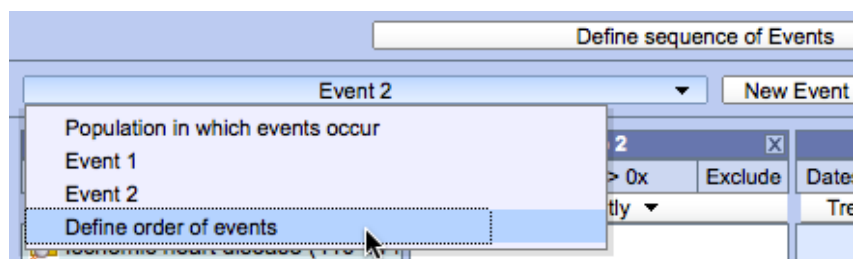


### Step 3: Define the Temporal Relationships

The last step in the temporal query process is to establish the temporal relationship between the events. At least one relationship must be defined before the query can be run. Using the example we previously outlined, the temporal relationship we will be defining is as follows:

The first occurrence of event 1 (Hypertension) has to occur before the first occurrence of event 2 (Ischemic heart disease).

To define relationship between events, select *Define order of events* from the list of available temporal query components.



The fields to define the temporal relationship will display on the screen.



- (1) Top Event definition
- (2) Bottom Event definition
- (3) Event ordering
- (4) Time span

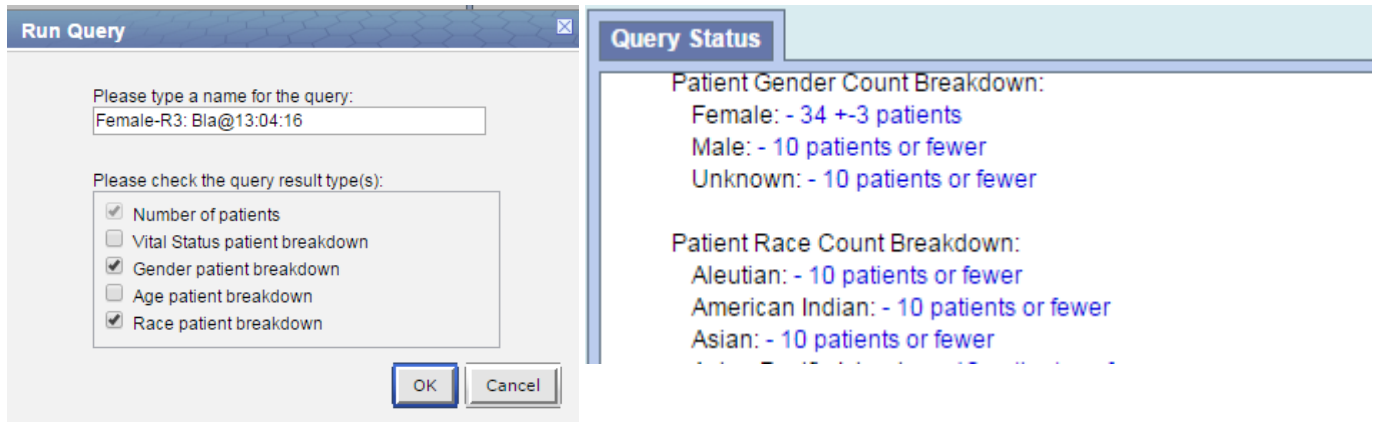
Time span allows you to specify the interval of time between the two events. For example, "Event 1 Occurs Before Event 2 By > 5 day(s)." This additional temporal constraint can be bounded by a range such as "By > 5 day(s) And < 10 day(s)." You must check the "By" checkbox to enable the drop-downs on that row. The "And" checkbox becomes enabled only when the "By" checkbox is checked. Checking the "And" checkbox enables the drop-downs in its row. In our example, the first ever occurrence of Event 1 (Hypertension) must occur at least one year before the start of the first ever occurrence of Event 2 (Ischemic heart disease).

An event must have at least one **Temporal Relationship** defined before the query can be submitted. This means that an event is defined in both the upper and lower drop-down box. An event must have at least one **Group** that contains at least one term (not empty).

### Breakdowns

When running a query you have the option to select from a number of result types that are known as breakdowns. These breakdowns will allow you to easily analyze your results based on the following options: Vital Status, Gender, Age, and Race.

In the example below, the patient counts are broken down per hospital and then per gender and per race.



## Query Optimization Tips

SHRINE runs your query in the order that you select and place terms in the Group panels. Tips for optimizing your query include the following:

- Select the most limiting terms first  
Demographic data is broader in scope than diagnoses or lab values. Therefore, if you select your diagnoses or lab value terms first and then select your demographic terms, SHRINE returns your query results more quickly.
- Add diagnoses and/or medication terms before lab test terms  
Queries that include lab values require a longer processing time than diagnoses or medications. Consider including either diagnoses or medication terms in your first groups before adding a lab test term to your query.

In other words, to make your query most efficient, make your selections in the following order

1. Diagnoses and/or Medications
2. Labs – Lab values require a longer processing time than diagnoses or medications but are more limiting than demographics
3. Demographics