



Architecture for Research Computing in Health (ARCH)

Using i2b2 to Find Patient Cohorts of Interest

Three Basic Query Types

1. Treat all groups Independently (**any point in time**)
2. Selected groups occur in the same financial encounter (**same visit**)
3. Define sequence of events

TREAT ALL GROUPS INDEPENDENTLY

- Did event occur at **any point in time** in the history of the patient's EMR?

EXAMPLES

“How many patients have been seen at the 2315 Broadway Interventional Radiology clinic and have had a colectomy at some point in their medical history?”

“How many patients have been diagnosed with both diabetes and hypertension at some point in their medical history?”

The screenshot displays the i2b2 Query & Analysis Tool interface. The top navigation bar includes 'Project: i2b2', 'User: Obfuscated Test User', and various menu options like 'Find Patients', 'Analysis Tools', 'Message Log', 'Help', 'Change Password', and 'Logout'. The main interface is divided into several panels:

- Navigate Terms / Find Terms:** A search box containing '401' with a dropdown menu showing '401: Essential hypertension' and 'Essential hypertension'.
- Workplace:** A list of terms, currently showing 'Obfuscated'.
- Previous Queries:** A list of recent queries, including '250: DI-401: Es@09:43:13 [5-26-2015] [Obf]', '365: GI-WCMC OP@09:40:36 [5-26-2015] [O]', '365: GI-WCMC OP@09:39:11 [5-26-2015] [O]', '365: GI-WCMC OP@09:38:57 [5-26-2015] [O]', and '150-159-bosnian@12:02:33 [5-12-2015] [Obf]'. Each entry includes a small icon and a status indicator.
- Query Tool:** The central configuration area. The 'Query Name' is '250: DI-401: Es@09:43:13'. The 'Temporal Constraint' is set to 'Treat all groups independently', which is highlighted with a red box. Below this, three groups are defined: Group 1 (Diabetes mellitus), Group 2 (Essential hypertension), and Group 3 (empty). Each group has a 'Dates', 'Occurs > 0x', and 'Exclude' column. The groups are connected by 'AND' operators. A yellow box highlights a 'drop a term on here' button in the third group.
- Query Status:** Shows the results of the query: 'Finished Query: "250: DI-401: Es@09:43:13" [6.1 secs]', 'Compute Time: 4.6 secs', and 'Number of patients for "250: DI-401: Es@09:43:13" patient_count: 299843'.



SELECTED GROUPS OCCUR IN THE SAME FINANCIAL ENCOUNTER

- Did the events occur **at the same time and in the same visit** in the history of the EMR?

EXAMPLES

“During the same visit, how many patients were diagnosed with both glaucoma and diabetes?”

“During the same visit, how many patients were diagnosed with glaucoma and were seen at the 156 William Street Weill Cornell Medical College Ophthalmology clinic.”

The screenshot displays the i2b2 Query & Analysis Tool interface. The top navigation bar includes 'Project: i2b2', 'User: Obfuscated Test User', and various utility links like 'Find Patients', 'Analysis Tools', 'Message Log', 'Help', 'Change Password', and 'Logout'. The main workspace is divided into several panels:

- Navigate Terms / Find Terms:** Search by Names (Containing: 156 William) and Search by Codes (Any Category). Results include 'WCMC NEUROLOGY 156 WILLIAM ST 11 FL' and 'WCMC Neurology 156 William ST 7 Fl'.
- Workplace:** Shows a folder named 'Obfuscated'.
- Previous Queries:** Lists recent queries such as '365: GI-WCMC OP@09:40:36 [5-26-2015] [O]' and '150-159-bosnian@12:02:33 [5-12-2015] [Obf]'.
- Query Tool:** The central configuration area. The 'Query Name' is '365: GI-WCMC OP@09:40:36'. The 'Temporal Constraint' is 'Selected groups occur in the same financial encounter'. It shows three groups: Group 1 (365: Glaucoma), Group 2 (WCMC OPHTHALMOLOGY), and Group 3 (empty). Logical connectors 'AND' are placed between groups. A yellow box says 'drop a term on here'.
- Query Status:** Shows 'Finished Query: "365: GI-WCMC OP@09:40:36" [5.2 secs]' with a 'Compute Time: 3.6 secs' and 'Number of patients for "365: GI-WCMC OP@09:40:36" patient_count: 1283±3'.

DEFINE SEQUENCE OF EVENTS

- Did event A occur at a **specific point in time** in relation to event B, event C, ...?

EXAMPLE

“How many patients were diagnosed with early onset (<55yr) colon cancer and had a colectomy after diagnosis and within 14 days after diagnosis?”



Step 1

Population in which events occur

Define query population: Colon cancer diagnosis via ICD-9 codes AND patients under 55yr

The screenshot shows the i2b2 Query & Analysis Tool interface. The 'Query Tool' section is active, showing a 'Query Name' field with the text '153: Ma-0-9 yea153: Ma44204: @10:18:57'. Below this, the 'Temporal Constraint' is set to 'Define sequence of Events'. A dropdown menu labeled 'Population in which events occur' is highlighted with a red box. The main workspace contains three groups: Group 1 (Anchoring Observation) with ICD-9 codes 153 and 154; Group 2 (Age ranges) with options for 0-9, 10-17, 18-34, 35-44, and 45-54 years old; and Group 3 (empty). The groups are connected by 'AND' operators. A yellow box in Group 3 says 'drop a term on here'. The bottom of the interface shows 'Run Query', 'Clear', 'Print Query', and '1 Group'.

Step 2:

Event 1

Define Event 1: Colon cancer diagnosis via ICD-9 codes AND patients under 55yr

The screenshot shows the i2b2 Query & Analysis Tool interface. The 'Query Tool' section is active, showing a 'Query Name' field. Below this, the 'Temporal Constraint' is set to 'Define sequence of Events'. A dropdown menu labeled 'Event 1' is highlighted with a red box. The main workspace contains three groups: Group 1 (Anchoring Observation) with ICD-9 codes 153 and 154; Group 2 (Age ranges) with options for 0-9, 10-17, 18-34, 35-44, and 45-54 years old; and Group 3 (empty). The groups are connected by 'AND' operators. A yellow box in Group 3 says 'drop a term on here'. The bottom of the interface shows 'Run Query', 'Clear', 'Print Query', and '2 Groups'.



Step 3:

Event 2

Define Event 2: Colectomy via CPT procedures

i2b2 Query & Analysis Tool

Project: i2b2 User: Obfuscated Test Find Patients | Analysis Tools | Message Log | Help | Change Password | Logout

Navigate Terms Find Terms

- 0-9 years old
- 10-17 years old
- 18-34 years old
- 35-44 years old
- 45-54 years old
- 55-64 years old
- 65-74 years old

Workplace

- Obfuscated

Query Tool

Query Name: []

Temporal Constraint: Define sequence of Events

Event 2 New Event

Anchoring Observation			Group 2			Group 3		
Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude
Items Instance will be the same			Treat Independently			Treat Independently		
44204: Laparo partial colect								
44207: L colectomy/coloproc								
44213: Lap mobil splenic fl a								

one or more of these AND drop a term on here

Run Query Clear Print Query 2 Groups New Group

Step 4:

Define order of events

Event 2 (colectomy) occur from 1 to 14 days after Event 1 (colon cancer)

i2b2 Query & Analysis Tool

Project: i2b2 User: Obfuscated Test Find Patients | Analysis Tools | Message Log | Help | Change Password | Logout

Navigate Terms Find Terms

- 0-9 years old
- 10-17 years old
- 18-34 years old
- 35-44 years old
- 45-54 years old
- 55-64 years old
- 65-74 years old

Workplace

- Obfuscated

Query Tool

Query Name: 153: Ma-0-9 yea153: Ma-0-9 yea44204: @10:32:00

Temporal Constraint: Define sequence of Events

Define order of events New Event

Start of the First Ever Event 1

Occurs Before

Start of the First Ever Event 2

By ≥ 1 day(s)

And ≤ 14 day(s)

Add Temporal Relationship

Run Query Clear Print Query 2 Groups New Group

Query Status

Finished Query: "(t) 153: Ma-0-9 yea153: Ma-0-9 yea44204: @10:32:00" [12.2 secs]
Compute Time: 10.8 secs

Number of patients for "(t) 153: Ma-0-9 yea153: Ma-0-9 yea44204: @10:32:00"
patient_count: 16±3