i2b2 Development at UAB (UABi2b2)
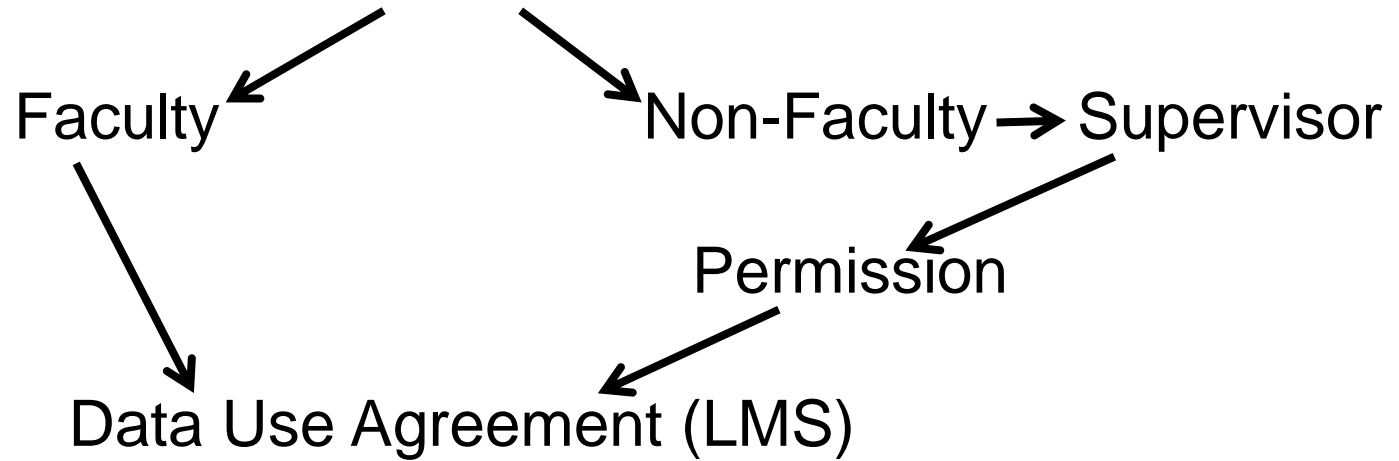
James Cimino, MD
Director, Informatics Institute
University of Alabama at Birmingham

i2b2 Academic Users Group/SHRINE Meeting
Boston, MA
June 21, 2016

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- Automatic IRB approval for limited data sets

- IRB agreed that i2b2 summary queries are not human subjects data

- Data without identifiers (but with dates and zip codes) are limited data sets

- One acknowledgment of data use agreement is sufficient for all data sets (renewable annually)

- Download (but not query) requires title, description, other data users (must have acknowledged DUA)

- Repeat queries not allowed (nor supported)

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Human Subjects Research and Privacy Training (LMS)

Faculty   Non-Faculty → Supervisor

Permission

Data Use Agreement (LMS)

UAB Learning System

Profile ∨   Catalog   Connections   Help

Acknowledgement of Restrictions on the Use of Limited Data Sets

COURSE

STATUS: Not Yet Started   **EST. TIME:** 15m

0%

Learning Activities   Overview

Learning Activities *in this Course*

Read Terms and Conditions of Limited Data Set (LDS)
COURSE ATTACHMENT   **STATUS:** Not Yet Started

[View]

Attestation
TEST   **STATUS:** Not Yet Started
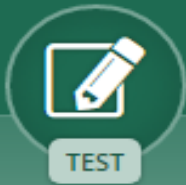
[🔒 Locked]

Options

[Un-Enroll from Course]

Support

For assistance, please contact Learning System Support at 205.996.4444 or email learningsystem@uab.edu

Description

This course is an acknowledgement and attestation that users have read and understood the terms and conditions of receiving access to Limited Data Set (LDS) from the UAB i2b2 system.

Course Version: 1

Acknowledgement of Restrictions on the Use of Limited Data Sets

As a condition of receipt of a Limited Data Set (LDS) from the UAB i2b2 system, you agree to the following terms and conditions:

1. The research is supported by and approved by your superiors.
2. You acknowledge and accept that UAB is not permitted to release to you the key to the code that links information to individual research subjects.
3. You are the individual responsible for the use of these data and any subsequent publications. You will follow the appropriate human subjects research, data security and privacy protections and will maintain the confidentiality of these data in compliance with all applicable UAB policies and procedures as the data sets may contain Protected Health Information (PHI).
4. Use and disclosure of an LDS:
    a. As the Recipient, you agree that you will provide a full title and explanation of your research pertaining to the use of the LDS, as requested in the form provided at the time of data access.
    b. You will only give access to the LDS to other individuals who are within UAB and have completed Human Subjects Research and HIPAA training; you will provide the names of these other individuals on request.
    c. You agree to apprise all individuals that have access to the LDS of the terms and conditions of data use.
    d. You shall use appropriate safeguards to protect the LDS from misuse or inappropriate disclosure and to prevent any use or disclosure of the LDS other than as provided by law or regulation.
    e. You shall not attempt to identify individuals to whom the data pertain or attempt to contact such individuals.
    f. That you are making use of previously collected ("on the shelf") data only and you shall not attempt to carry out subsequent data queries for the purposes of collecting data ("updates") about individuals whose data are in the LDS.
5. You will use the data only for the research use described and will maintain the LDS as per UAB policy.
6. You shall report to the UAB Privacy Office any unauthorized use or disclosure for the PII of which you become aware. You will take reasonable steps to any further use or disclosure. To contact the UAB Privacy Office, call (205) 996-5051 or e-mail ssearson@uabmc.edu.
7. You agree to these terms of use for as long as you retain the LDS, unless otherwise terminated by applicable law or regulation.

This Acknowledgement applies to the LDS resulting from the i2b2 query and shall continue as long as I retain the LDS, unless otherwise terminated by applicable law or regulation. I may terminate this Acknowledgement by returning or destroying the LDS and providing a written notice to the i2b2 administration at: Director of Research Commons, UAB CCTS, 111 PCAM, 1720 2nd Avenue South, Birmingham, AL 35294-0007. Should I commit a material breach of this Acknowledgement, which is not cured within thirty (30) days after I receive a notice of such a breach from i2b2, then i2b2 will discontinue disclosure of LDS and will report the breach to the UAB Privacy Office by phone at (205) 996-5051 or e-mail ssearson@uabmc.edu.

To Do   Completed   Profile ⌄   Catalog   Connections   Help

Attestation

TEST

STATUS: **In Progress**   QUESTIONS: **1**
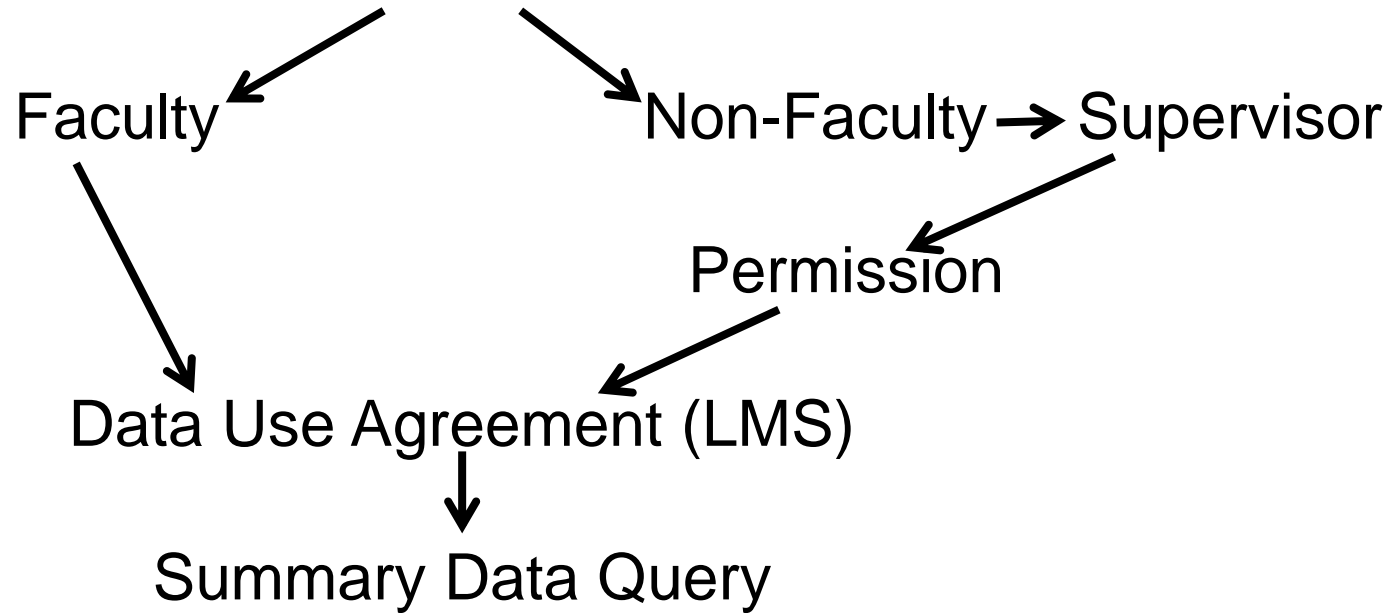
Question 1 *of 1*

By clicking Yes below, I acknowledge/attest that I have read and understand the terms, conditions, and restrictions on the Use of Limited Data Sets.

○ Yes

○ No

Complete Test

Human Subjects Research and Privacy Training (LMS)

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Permission

Data Use Agreement (LMS)

Summary Data Query

Navigate Terms | Find

- ⊞ 📁 Allergies [1,205,232 facts]
- ⊞ 📁 Diagnosis - ICD10-ICD9 (Combined Ontology) [22,967,576 facts]
- ⊞ 📁 Lab Tests (LOINC Ontology) [122,809,045 facts]
- ⊞ 📁 Medications (Multum Ontology) [22,720,612 facts]
- ⊞ 📁 Patient Demographic Data [883,054 patients]
- ⊞ 📁 Procedures (ICD10 PCS Codes) [46,684 facts]
- ⊞ 📁 Procedures (ICD9 Codes) [36,024 facts]
- ⊞ 📁 Visit Details [10,590,877 encounters]
- ⊞ 📁 Vital Signs [3,109,107 facts]

Workplace

- ⊞ 📁 mcwyatt

Previous Queries | Find

- ⊞ 📁 Black-FEMAL-* Dis@12:43:39 [4-5-2016] [mcwyatt]
- ⊞ 📁 * Myopia (ICD10@13:46:17 [4-4-2016] [mcwyatt]
- ⊞ 📁 * Sicca syndrom@13:42:51 [4-4-2016] [mcwyatt]
- ⊞ 📁 * Sicca syndrom@13:42:15 [4-4-2016] [mcwyatt]
- ⊞ 📁 * Sicca syndrom@13:41:09 [4-4-2016] [mcwyatt]
- ⊞ 📁 * Dry e-* Bleph@13:32:34 [4-4-2016] [mcwyatt]

Query Tool

Query Name: Black-FEMAL-* Dis@12:43:39

Temporal Constraint: Treat Independently

Group 1 ⊠	Group 2 ⊠	Group 3
Dates — Occurs > 0x — Exclude	Dates — Occurs > 0x — Exclude	Dates — Occurs > 0x
Treat Independently ▼	Treat Independently ▼	Treat Independently ▼
📁 Black or African American - 184441	📁 FEMALE - 492589	📁 * Diseases of the eye and a (h00-h59) - 32300
one or more of these	**AND** — one or more of these	**AND** — one or more of these

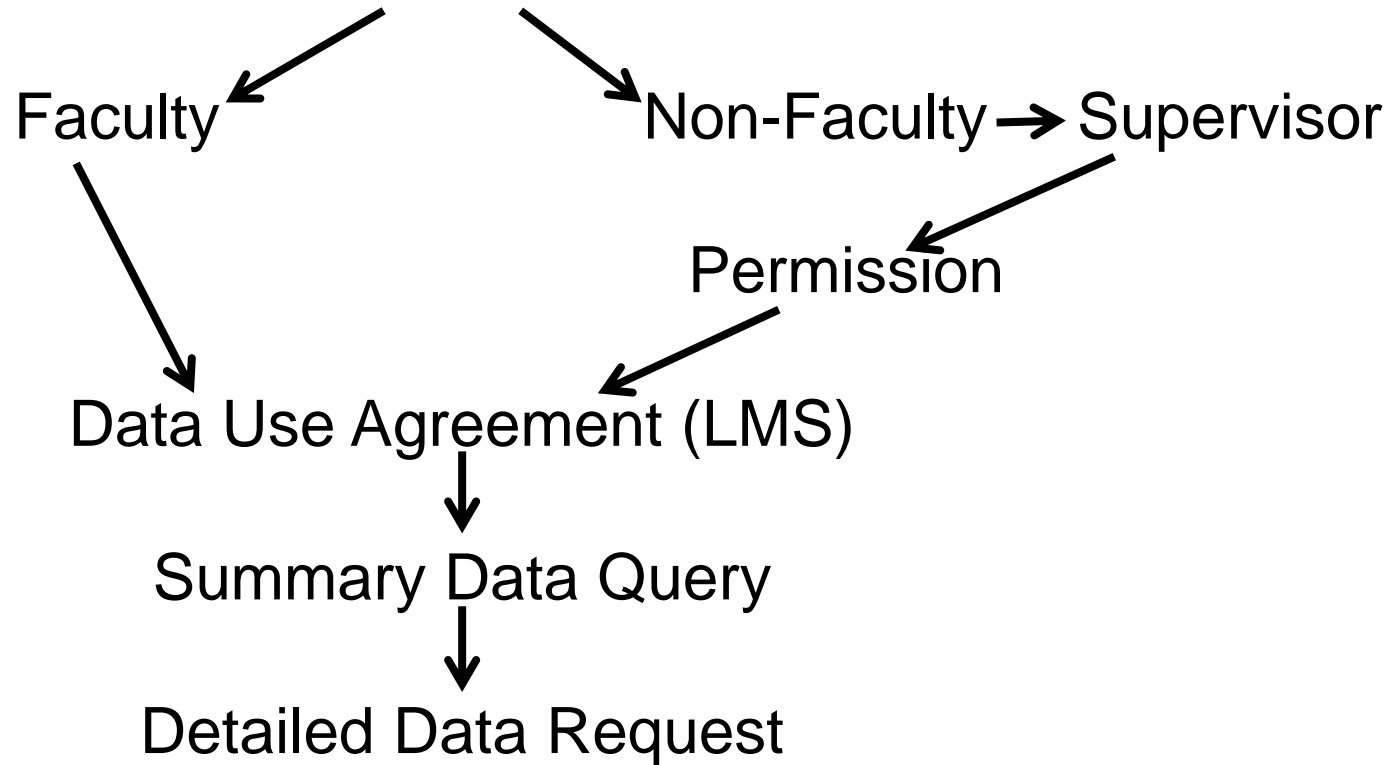Run Query | Clear | Print Query | 3 Groups | ⏮ ◀ New Gro

Show Query Status | Graph Results

Number of patients

7524

For Query "Black-FEMAL-* Dis@12:43:39"

Human Subjects Research and Privacy Training (LMS)

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Data Use Agreement (LMS)

Summary Data Query

Detailed Data Request

Patient Data Download and Consultation Request

Self-Service Limited Data Set Download

UAB Informatics Institute

CCTS
Center for Clinical and Translational Science

- **What facts do you want to download?** By default, <u>all fact types</u> will be downloaded for selected patient sets. This might be too much data, so you can limit what is downloaded below.
- **IMPORTANT**: With each download, you acknowledge that you have read and understood the terms and conditions of receiving access to Limited Data Set (LDS) from the UAB i2b2 system. This agreement applies for as long as you retain the LDS.

Limit Fact Type

☐ **Meds**   ☐ **Labs**   ☐ **Diagnoses**   ☐ **Vitals**

Limit Date Range

From: [MM/DD/YYYY]   **To:** [MM/DD/YYYY]

Limit Details

◉ **Download all data rows**   ○ **Download a summary (get patient counts for each concept)**

Information Recorded with this Download

Displaying your most recently recorded project information; you may alter this information for each download request.

*Title of Research Project   ***Description of the Research Project**

[testing]   [testing]

List Blazer IDs of Others Who Will View/Use This Data (comma separated)
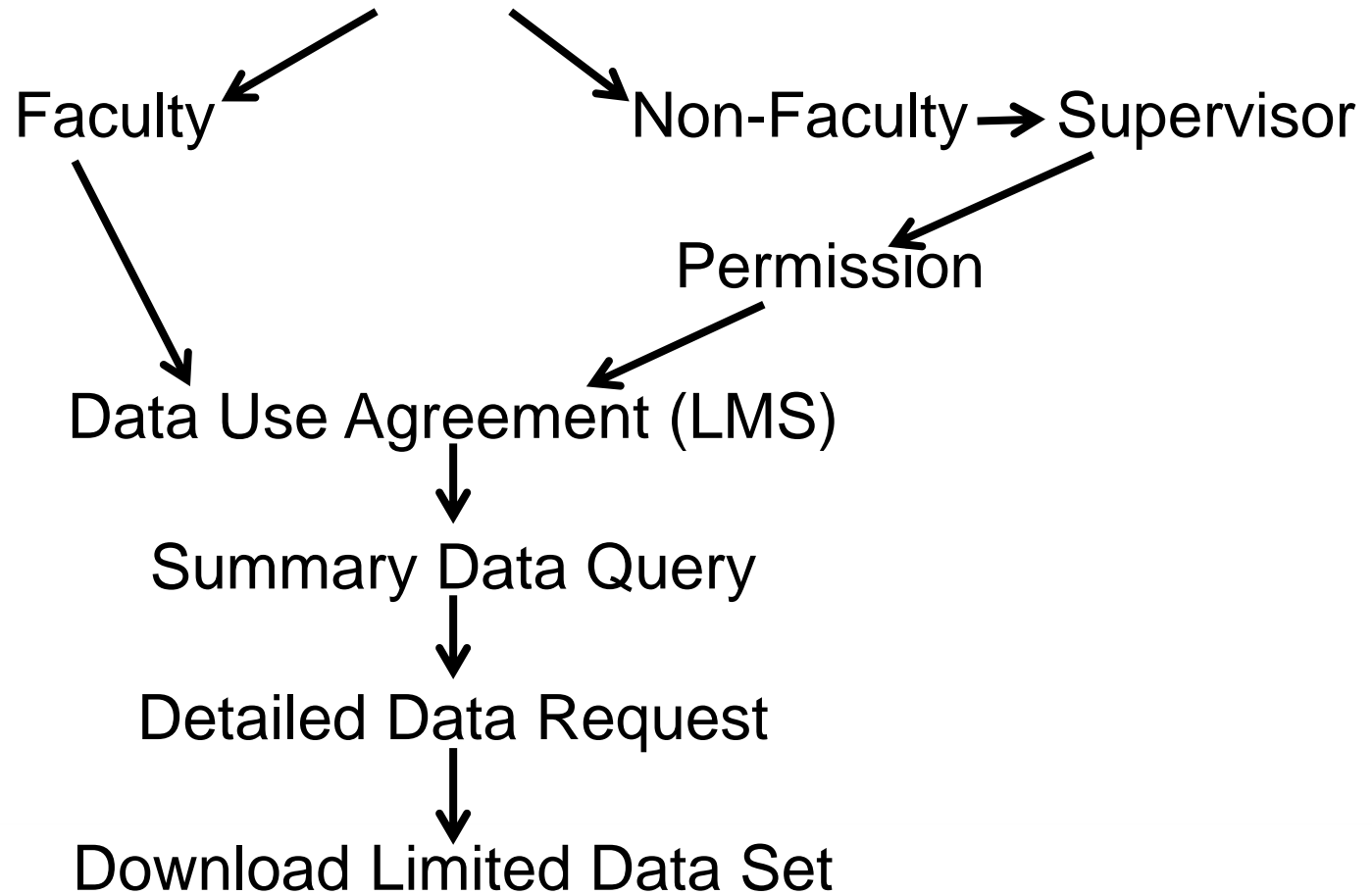
[blazer1, blazer2, blazer3,...]

*Select at Least One Data Set

Only completed queries that return patient sets are displayed below. Most recent is first.

☐ Patient Set for Black-FEMAL-* Dis@12:43:39   Patients in Set: **7524**   Created 04/05/2016 12:43:46 PM
☐ Patient Set for * Myopia (ICD10@13:46:17   Patients in Set: **229**   Created 04/04/2016 01:46:19 PM
☐ Patient Set for * Sicca syndrom@13:42:51   Patients in Set: **277**   Created 04/04/2016 01:42:53 PM

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Permission

Data Use Agreement (LMS)

Summary Data Query

Detailed Data Request

Download Limited Data Set

- Automatic IRB approval for limited data sets

- i2b2 incremental updates

- Out of the box, i2b2 has two tables for mapping i2b2's anonymous identifiers to your system's actual identifiers

  - ◆ PATIENT_MAPPING - patient identifiers

  - ◆ ENCOUNTER_MAPPING - encounter identifiers

- Tables are not accessible from the i2b2 webclient

- Used when protected data needed from source system

- Never want to delete rows from the *_MAPPING tables

- ## PATIENT_MAPPING

PATIENT_NUM	PATIENT_IDE	PATIENT_IDE_SOURCE	IMPORT_DATE	SOURCESYSTEM_CD
7055581	3340f45gab1800-4	PowerInsight PERSON_SK	06/17/2016 06:12:57	PowerInsight
7055581	605*60560560511A*	PowerInsight PATIENT_MRN	06/17/2016 06:12:57	PowerInsight
7055581	801~2730AA3BBK0833	PowerInsight PERSON_KEY	06/17/2016 06:12:57	PowerInsight

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- ENCOUNTER_MAPPING

ENCOUNTER_NUM	ENCOUNTER_IDE	ENCOUNTER_IDE_SOURCE	IMPORT_DATE	SOURCESYSTEM_CD
504493889822	1107720071028711	PowerInsight ENCOUNTER_SK	06/17/2016 06:37:49	PowerInsight
504493889822	67885!0888AA	PowerInsight FFN	06/17/2016 06:37:49	PowerInsight
504493889822	70782772-66.2	PowerInsight ENCOUNTER_KEY	06/17/2016 06:37:49	PowerInsight

- Assume your last i2b2 load was on 5/30/2016

  - Select all patient records in your source system updated since 5/30/2016.

  - Work through the list of updated records…Does the patient identifier exist in PATIENT_MAPPING?

    - NO: Perform an insert into PATIENT_MAPPING and PATIENT_DIMENSION

    - YES: Perform an update of PATIENT_MAPPING and PATIENT_DIMENSION

- Accomplished with single MERGE or separate INSERTs and UPDATEs.

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- OBSERVATION_FACT

ENCOUNTER_NUM	PATIENT_NUM	CONCEPT_CD	NVAL_NUM	UNITS_CD
504493889822	7055581	ALLERGY:penicillin		
504493889822	7055581	BP:Diastolic	73	mmHg
504493889822	7055581	BP:Systolic	114	mmHg
504493889822	7055581	ICD9:786.05		
504493889822	7055581	MEDICATION:3087712		
504493889822	7055581	UABLABS:432325571	3.3	mMol/L

- OBSERVATION_FACT

ENCOUNTER_NUM	PATIENT_NUM	CONCEPT_CD	NVAL_NUM	UNITS_CD	MODIFIER_CD	TVAL_CHAR
504493889822	7055581	ALLERGY:penicillin				
504493889822	7055581	BP:Diastolic	73	mmHg		
504493889822	7055581	BP:Systolic	114	mmHg		
504493889822	7055581	ICD9:786.05				
504493889822	7055581	MEDICATION:3087712				
504493889822	7055581	MEDICATION:3087712			MEDS:FREQ	Every 6 hours
504493889822	7055581	MEDICATION:3087712			MEDS:ROUTE	Oral
504493889822	7055581	MEDICATION:3087712	250	mg	MEDS:DOSE:mg	
504493889822	7055581	UABLABS:432325571	3.3	mMol/L		

- There is no _MAPPING table equivalent for OBSERVATION_FACT

- Partitioned observation_fact - each type of fact (diagnosis, lab, med, etc.) has its own partition

  - ◆ Easily replace all the records in a single partition or merge records into that partition

  - ◆ Add a new partition for new types of facts whenever we want.

- Added new column JOIN_SEQ_NUM to observation_fact to hold a unique, simple sequence-based ID for every single row

- We created a _Mapping table for each type of fact - there is a MEDICATIONS_MAPPING table, a LABS_MAPPING table, etc.

  - ◆ These tables store the relationship between the JOIN_SEQ_NUM and the keys in the EDW that gave us that fact in OBSERVATION_FACT

OBSERVATION_FACT

ENCOUNTER_NUM	PATIENT_NUM	CONCEPT_CD	NVAL_NUM	UNITS_CD	MODIFIER_CD	TVAL_CHAR	JOIN_SEQ_NUM
504493889822	7055581	MEDICATION:3087712					1
504493889822	7055581	MEDICATION:3087712	250	mg	MEDS:DOSE:mg		2
504493889822	7055581	MEDICATION:3087712			MEDS:ROUTE	Oral	3
504493889822	7055581	MEDICATION:3087712			MEDS:FREQ	Every 6 hours	4
504493889822	7055581	ICD9:786.05					5
504493889822	7055581	BP:Systolic	114	mmHg			6
504493889822	7055581	BP:Diastolic	73	mmHg			7

DIAGNOSIS_MAPPING

JOIN_SEQ_NUM	DIAGNOSIS_KEY	SOURCESYSTEM_CD
5	12089384	PowerInsight WH_CLN_DIAGNOSIS

VITALS_MAPPING

JOIN_SEQ_NUM	CLINICAL_EVENT_KEY	SOURCESYSTEM_CD
6	208384082	PowerInsight WH_CLN_CLINICAL_EVENT
7	208384083	PowerInsight WH_CLN_CLINICAL_EVENT

Assume your last i2b2 load was on 5/30/2016

- Select all diagnosis records in your source system updated since 5/30/2016.
- Work through the list of updated diag records… does the diagnosis_key exist in diagnosis_mapping?
    - NO: Perform insert into the diagnosis partition of OBSERVATION_FACT and an insert into DIAGNOSIS_MAPPING
    - YES: Perform update on the diagnosis partition of OBSERVATION_FACT and an update into DIAGNOSIS_MAPPING. Use the JOIN_SEQ_NUM to find the right OBSERVATION_FACT record to update.

OBSERVATION_FACT

ENCOUNTER_NUM	PATIENT_NUM	CONCEPT_CD	NVAL_NUM	UNITS_CD	MODIFIER_CD	TVAL_CHAR	JOIN_SEQ_NUM
504493889822	7055581	MEDICATION:3087712					1
504493889822	7055581	MEDICATION:3087712	250	mg	MEDS:DOSE:mg		2
504493889822	7055581	MEDICATION:3087712			MEDS:ROUTE	Oral	3
504493889822	7055581	MEDICATION:3087712			MEDS:FREQ	Every 6 hours	4
504493889822	7055581	ICD9:786.05					5
504493889822	7055581	BP:Systolic	114	mmHg			6
504493889822	7055581	BP:Diastolic	73	mmHg			7

DIAGNOSIS_MAPPING

JOIN_SEQ_NUM	DIAGNOSIS_KEY	SOURCESYSTEM_CD
5	12089384	PowerInsight WH_CLN_DIAGNOSIS

- The _MAPPING table for facts helps us troubleshoot. If we need to know how a fact ended up in i2b2, we have all the source system keys

- We NEVER in any way drop or delete rows from the fact _MAPPING tables. But, if we want to completely refresh the entire OBSERVATION_FACT table, we would do so

- For very small loads, such as DRGs or tumor data, we might choose to simply exchange the entire partition in OBSERVATION_FACT

- Robert ("Dale") Johnson <rdjohnson@uabmc.edu>

- Automatic IRB approval for limited data sets

- i2b2 incremental updates

- Infobuttons for i2b2 (i3b3 plug-in)

i363

① The user submits a patient set to the InfoButton plugin in i2b2.

User

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Navigate Terms   **Find Terms**

- Circulatory system
  - Admit Diagnosis
  - Principa
  - Second
  - Acute R
  - Arterial
  - Cerebro
  - Chronic
  - Disease
  - Disease
  - Hyperte
  - Ischemi
  - Other fo
  - Venous
- Conditions in the perinatal period
- Congenital anomalies
- Digestive system
- Endocrine disorders
- Events of pregnancy
- Genitourinary system

Query Tool

Query Name:

Group 1	✕
Dates	**Occurs > 0x**	**Exclude**

Treat Independently ▾

🗁 Female

Group 2
Dates	**Occurs > 0x**

Treat Independently ▾

🗁 Hypertensive disease

Workplace

- demo
- SHARED

one or more of these   **AND**   one or more of these

Run Query   **Clear**   **Print Query**   2 Groups

Query Status

Previous Queries

- Hyperte-Female@10:02:42 [8-25-2015] [demo]
- Female-Acute R@10:02:19 [8-25-2015] [demo]
- Acute R-Male@10:00:54 [8-25-2015] [demo]
- Hyperte-Arteria@10:00:05 [8-25-2015] [demo]
- Hypertensive di@09:12:30 [8-25-2015] [demo]
- Acute Rheumatic@08:58:19 [8-25-2015] [demo]

i2b2 Query & Analysis Tool

Project: i2b2 Demo   User: i2b2 User

Navigate Terms | Find

i3b3

- Clinical Trials
- Custom Metadata
- Demographics
- Diagnoses
- Diagnoses (ICD10)
- Expression Profiles Data
- Laboratory Tests
- Medications
- Procedures
- Providers
- Reports
- Visit Details

Plugin | Help

Select the type of information desired for each patient and then drop a patient set into the box. Then click on one of the links to learn m

○ Diagnosis   ○ Medications   ○ Choose my own

Patient Set: Drop Here

Workplace

- demo
- SHARED

Plugins

Detailed List View ▼

CARE CARE (Cohort Analysis & Refinement Expeditor) - Concept Demographics Histograms
This plugin generates the histograms of demographic break-downs of a selected subset of a Patient Set against those from that subset th

InfoButton Plugin -- basic build to get it working
Plugin built to retrieve information from OpenInfoButton in an HL7 compliant standard

Previous Queries | Find

- Digestive syste@15:22:41 [12-9-2015] [demo]
- Digestive syste@15:22:31 [12-9-2015] [demo]
- Circulatory sys@14:32:48 [12-9-2015] [demo]
- Acute Rheumatic@14:31:17 [12-9-2015] [demo]
- Acute Rheumatic@14:21:55 [12-9-2015] [demo]
- Acute Rheumatic@14:16:43 [12-9-2015] [demo]

i2b2 Query & Analysis Tool   Project: i2b2 Demo   User: i2b2 User

Navigate Terms   **Find Terms**   **InfoButton Plugin**

- Clinical Trials
- Custom Metadata
- Demographics
- Diagnoses
- Diagnoses (ICD10)
- Expression Profiles Data
- Laboratory Tests
- Medications
- Procedures
- Providers
- Reports
- Visit Details

Plugin   **Help**

Select the type of information desired for each patient and then drop a patient set into the box. Then click on one of the links b learn m

○ Diagnosis   ● Medications   ○ Choose my own

Patient Set: Female-Hyperte@10:12:43 [10-9-2015] [demo] [PATIENTSET_17]

Workplace

- demo
- SHARED

Previous Queries

- Female-Hyperte@10:12:43 [10-9-2015] [demo]
  - Results of Female-Hyperte@10:12:43 [10-9-2015] [demo]
    - Patient Set for "Female-Hyperte@10:12:43"Patient setFINISHED - FINISHED
    - Number of patients for "Female-Hyperte@10:12:43"Number of patientsFINISHED - FINISHED
- Hyperte-Female@10:02:42 [8-25-2015] [demo]
- Female-Acute R@10:02:19 [8-25-2015] [demo]

- Concept Demographics Histograms
  downs of a selected subset of a Patient Set against those from that subset th

  HL7 compliant standard

i2b2 Query & Analysis Tool   Project: i2b2 Demo   User: i2b2 User   **i3b3**

Na...

CLINICAL TRIALS

Clinical Trials Res

LAB TEST ONLINE

Lab Test Res

PUBMED CLINICAL QUERIES

PubMed Resources

RXLIST

RxList Res

e of the links

S NCBI   Resources ⊠ How To ⊠   Sign in to NCBI

PubMed Clinical Queries

Results of searches on this page are limited to specific clinical research areas. For comprehensive searches, use PubMed directly.

albuterol   ⊗   **Search**

Clinical Study Categories   **Systematic Reviews**   **Medical Genetics**

Category: Therapy ▼   Topic: All ▼

Scope: Broad ▼

Results: 5 of 7337   **Results: 5 of 208**   **Results: 5 of 279**

Therapeutic effects of Ventolin versus hypertonic saline 3% for acute bronchiolitis in children.

Zamani MA, Movahhedi M, Nourbakhsh SM, Ganji F, Rafieian-Kopaei M, Mobasheri M, Khoshdel A, Etemadifar S, Shirani M, Keivani Hafshejani Z.

Med J Islam Repub Iran. 2015; 29:212. Epub 2015 May 6.

Novel albuterol multidose dry powder inhaler in patients with exercise-induced bronchoconstriction: A single-dose, double-blind, randomized, 2-way crossover study.

Albuterol in the treatment of acute respiratory distress syndrome: A meta-analysis of randomized controlled trials.

Wu R, Lin SY, Zhao HM.

World J Emerg Med. 2015; 6(3):165-71.

Principal findings of systematic reviews of acute asthma treatment in childhood.

Castro-Rodriguez JA, J Rodrigo G, E Rodríguez-Martínez C.

J Asthma. 2015 Aug 24; :1-8. Epub 2015 Aug 24.

The metabolomics of asthma control: a promising link between genetics and disease.

McGeachie MJ, Dahlin A, Qiu W, Croteau-Chonka DC, Savage J, Wu AC, Wan ES, Sordillo JE, Al-Garawi A, Martinez FD, et al.

Immun Inflamm Dis. 2015 Sep; 3(3):224-38. Epub 2015 May 7.

Maternal asthma medication use during pregnancy and risk of congenital heart defects.

o Albuterol Sulfate 4mg tablet ESI Lederle Generics ⓘ

o Albuterol Sulfate 4mg tablet ESI Lederle Generics ⓘ

o Albuterol Sulfate 4mg tablet ESI Lederle Generics ⓘ

Previous Queries

Female-Hyperte@10:12:43 [10-9-2015] [demo]
  Results of Female-Hyperte@10:12:43 [10-9-2015] [demo]
    Patient Set for "Female-Hyperte@10:12:43"Patient setFINISHED - FINISHED
    Number of patients for "Female-Hyperte@10:12:43"Number of patientsFINISHED - FINISHED
Hyperte-Female@10:02:42 [8-25-2015] [demo]
Female-Acute R@10:02:19 [8-25-2015] [demo]

Detailed List View ▼

CARE (Cohort Analysis & Refinement Expeditor) - Concept Demographics Histograms
This plugin generates the histograms of demographic break-downs of a selected subset of a Patient Set against those from that subset th

InfoButton Plugin -- basic build to get it working
Plugin built to retrieve information from OpenInfoButton in an HL7 compliant standard

- GitHub repository: https://github.com/uab-informatics-institute/i3b3

  - ◆ Clone

  - ◆ Zip

  - ◆ Release

- Put in plugin directory

- Modify *i2b2_loader.js* for loading

- View in i2b2 instance

- Detailed instructions at repository

- Tim Kennel (tikenn@uab.edu)

i2b2

i363

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