

Temporal Exploration of EHRs Using the i2b2 Open Source Platform

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In the Beginning ...

The screenshot displays the RPDR Query Tool interface within a Microsoft Internet Explorer browser. The browser title is "RPDR Query Tool - Microsoft Internet Explorer provided by Partners HealthCare System". The address bar shows "http://ipdrweb/partners/client/". The tool's main header includes "Research Patient Database Query Tool", "Logging: Jeanne M. Guerin, RN", and "Status: [green dot]".

The interface is divided into several sections:

- Query Items:** A search box with "mb index" and a "Find" button. A list of "Laboratory tests" includes "CK-MB Index".
- Query Builder:** A central area titled "AMI and CK-MB > 3.5 analysis" with a dropdown menu set to "GROUPS DO NOT HAVE TO OCCUR IN THE SAME VISIT". It contains three groups:
 - [GROUP 1]:** Acute myocardial infarction
 - [GROUP 2]:** CK-MB Index > 3.50
 - [GROUP 3]:** (Empty)
- Summary:** A row of buttons: "Create Query", "Export Patients", "Import Patients", "11430 patients.", and "Run Query".
- Demographics:** A table showing patient counts for Gender (Male: 7342, Female: 4068), Age (max: 3484), Race (max: 10078, categories: IABHWOU), and Vital status (Alive, Dead).
- Filters:** A section for "Ages 40-49, 551 patients".

Returning Data to Investigators

Identified data is gathered from RPDR and other Partners sources

The screenshot shows a software window titled "Process RB files" with various settings and a "Run" button. To its right, a file explorer window shows a directory structure with files like "RPDR_12_31_12" and "RPDR_12_31_12_1". Below these, a Microsoft Access database window titled "Microsoft Access - [MIGL_Labs - Tables]" displays a table of test results.

Test Id	Test Description	Result	Result Text	Abnormal Flag	Reference	Unit	Reference Range
SO-PTT	Superstat APTT	29.6			sec		22.1-35.1
SO-PTT	APTT	32.6			sec		22.1-35.1
SO-PTT	APTT	37.6		H	sec		22.1-35.1
SO-PTT	APTT	46.4		H	sec		22.1-35.1
SO-PTT	APTT	43.1	MODERATELY	H	sec		22.1-35.1
SO-PTT	APTT	23.7			sec		22.1-35.1
SO-PTT	APTT	25.4			sec		22.1-35.1
SO-PTT	APTT	24.7			sec		22.1-35.1
SO-PTT	APTT	24.0			sec		22.1-35.1
SO-PTT	APTT	24.7			sec		22.1-35.1
SO-XPPT	Superstat APTT	31.3			sec		22.1-35.1
SO-PTT	APTT	34.6			sec		22.1-35.1
SO-PTT	APTT	40.0		H	sec		22.1-35.1
SO-PTT	APTT	45.0		H	sec		22.1-35.1
SO-XPPT	Superstat APTT	56.2	*** Note New	H	sec		22.1-35.1
SO-PTT	APTT	33.6			sec		22.1-35.1
SO-XPPT	Superstat APTT	34.3			sec		22.1-35.1
SO-PTT	APTT	37.9		H	sec		22.1-35.1
SO-PTT	APTT	22.6			sec		22.1-34.1
SO-PTT	APTT	37.4		H	sec		22.1-34.1
SO-PTT	APTT	37.2	SLT HEMOLYS	H	sec		22.1-34.1
SO-PTT	APTT	36.1		H	sec		22.1-34.1
SO-PTT	APTT	36.4	MODERATE HE	H	sec		22.1-34.1

Files include a Microsoft Access Database

Researchers' Wish List

- To view many patients at a time
- To have a complete view of a patient's data
- To view a patient over time
- To view patient text notes in the application
- To add power to the notes via NLP
- To annotate the data
- To save and reuse work



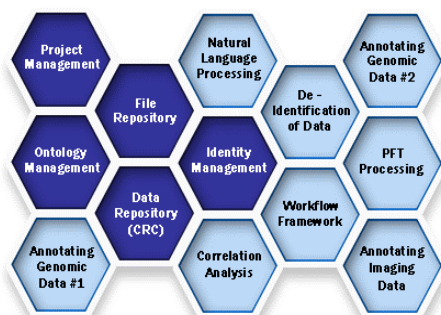
Our Wish List

- An open source framework that is:
- Easy to use for a variety of users
- Scalable
- Extensible
- Robust
- Interoperable
- Platform-independent
- HIPAA-compliant



Tools and Architecture

i2b2 HIVE:



- Service-Oriented Architecture
- XML messages
- Cells
- Eclipse (plug-ins)

Process



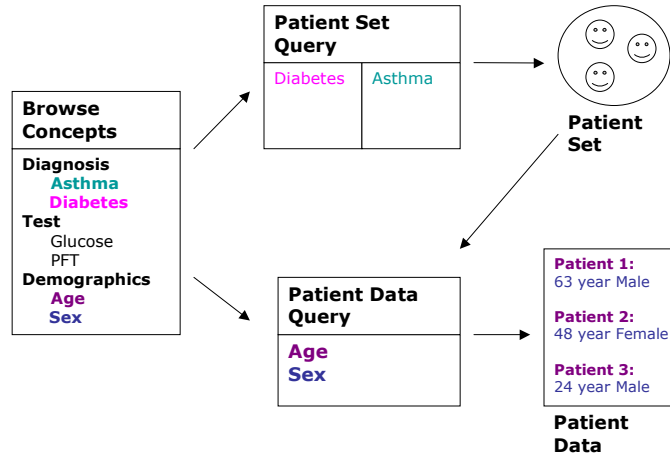
i2b2 Workbench

The screenshot displays the i2b2 Workbench interface for an Asthma Project. The window title is "i2b2 Workbench" and the subtitle is "i2b2 Workbench for Asthma Project". The user is identified as "Shawn Murphy" with a status of "Wk". The interface is divided into several panes:

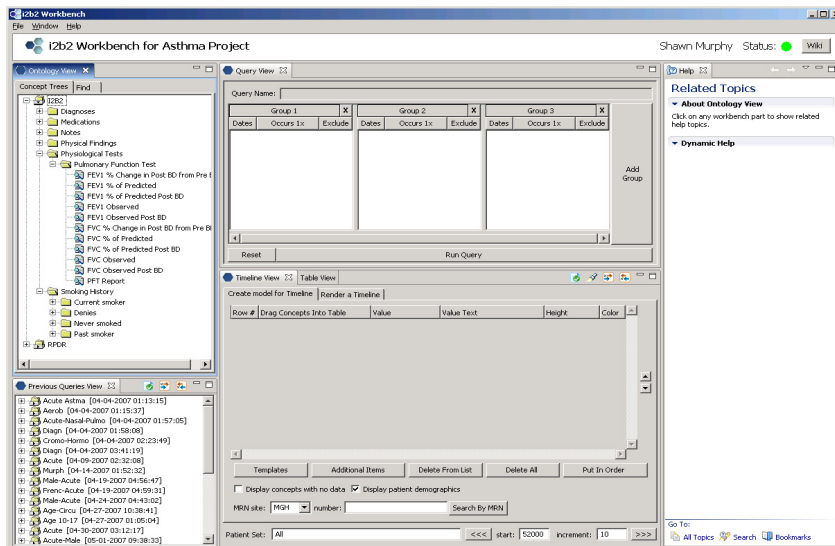
- Ontology View:** Shows a tree structure of concepts, including "Asthma" and "Asthma-Related".
- Query View:** Contains a "Query Name" field and a table for defining query groups. The table has columns for "Group 1", "Group 2", and "Group 3", each with sub-columns for "Dates", "Occurs 1x", and "Exclude".
- Timeline View:** Features a "Create model for Timeline" button and a table with columns for "Row #", "Drag Concepts Into Table", "Value", "Value Text", "Height", and "Color".
- Previous Queries View:** Lists various query results with details like "Acute Asthma [04-04-2007 01:13:15]" and "Asthma-Related [04-04-2007 01:57:07]".
- Related Topics:** A section on the right with "About Query View" and "Dynamic Help" links.

At the bottom, there are controls for "Patient Set" (set to "All"), "start" (set to "1/1/2000"), and "increment" (set to "10").

User Interactions



Browse concepts



Create a Query

The screenshot shows the i2b2 Workbench interface for an Asthma Project. The main window is titled 'Query View' and displays a query named 'PFT R-Curve' with the following structure:

Group	Concepts
Group 1	PFT Report
Group 2	Current smoker
Group 3	(Empty)

Below the query view, the 'Timeline View' is active, showing a table with columns: Row #, Value, Value Text, Height, and Color. The table is currently empty.

The 'Concept Trees' on the left side of the interface show a hierarchy of concepts, with 'PFT Report' and 'Current smoker' highlighted by arrows pointing to their respective positions in the query view.

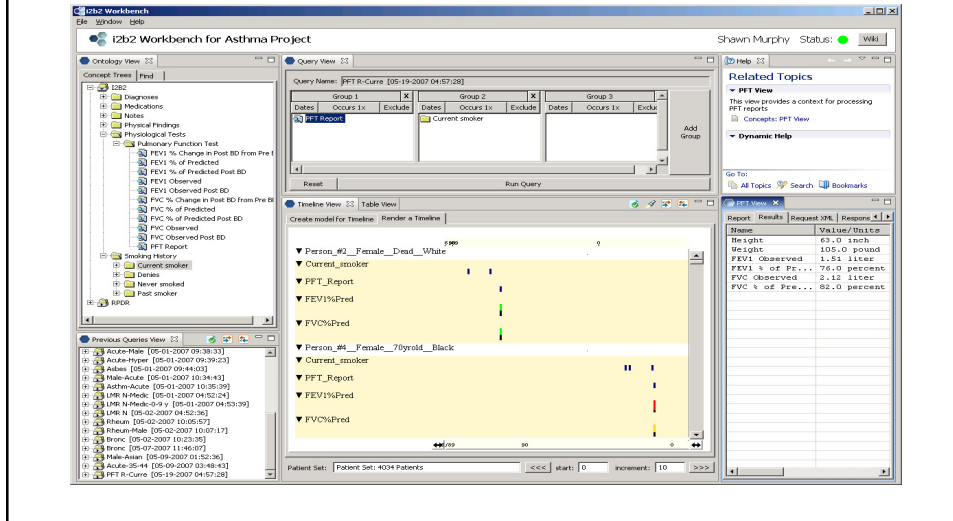
Create a model for the Timeline

The screenshot shows the i2b2 Workbench interface for an Asthma Project. The main window is titled 'Timeline View' and displays a table with columns: Row #, Value, Value Text, Height, and Color. The table contains the following data:

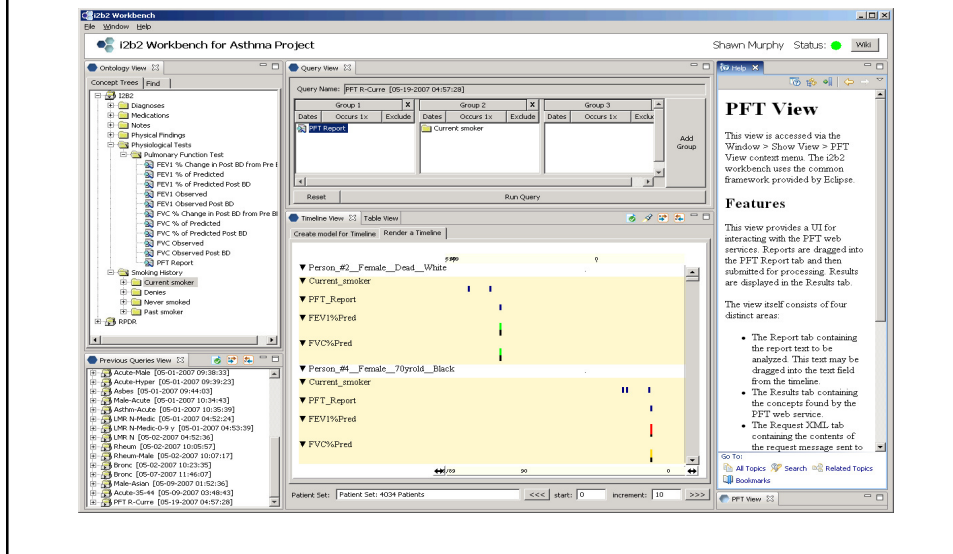
Row #	Value	Value Text	Height	Color
1	Current smoker	N/A	N/A	Medium
2	PFT Report	PFT	100	Medium
3	FEV1 % of Predicted	NVAL_NJM	> 80	Medium
3	FEV1 % of Predicted	NVAL_NJM	between 55 and 80	Low
3	FEV1 % of Predicted	NVAL_NJM	< 55	Very Low
4	PFC % of Predicted	NVAL_NJM	> 80	Medium
4	PFC % of Predicted	NVAL_NJM	between 55 and 80	Low
4	PFC % of Predicted	NVAL_NJM	< 55	Very Low

The 'Concept Trees' on the left side of the interface show a hierarchy of concepts, with 'Current smoker' and 'PFT Report' highlighted by arrows pointing to their respective positions in the timeline view.

Parse the text report

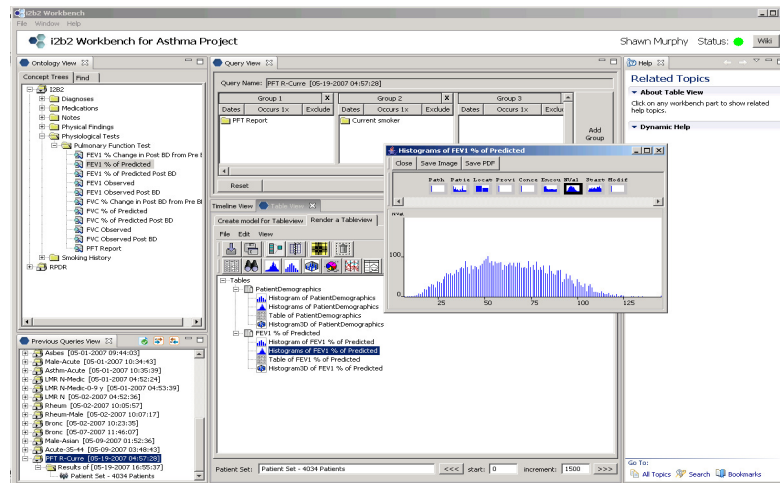


HELP



Add another plug-in: TableView

<http://ccgb.umn.edu/software/java/apps/TableView/>



The workbench and timeline allow users to:

- survey the data to see what is available
- check data integrity for obvious anomalies
- compare data coming from different sources
- display data concisely on single patients
- drill down in term hierarchies
- perform time-oriented queries
- Show time-oriented averages (trends) within the data using sentinel events to synchronize the starting points.

What are we going to do with it?

- Extend phenotypic data collection
- Add anonymous specimen repository
- Add a Bayesian inference engine
- Predictive modeling
- Perform clinical trials in-silico
- Discovering correlations within data (relationship networks)
- Pharmacovigilance
- Genomic studies
- Geographic Information Systems (GIS) studies

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Thanks!

HCIL

i2b2

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