

Clinical Trender: Tracking clinical variables of a user-defined cohort in i2b2

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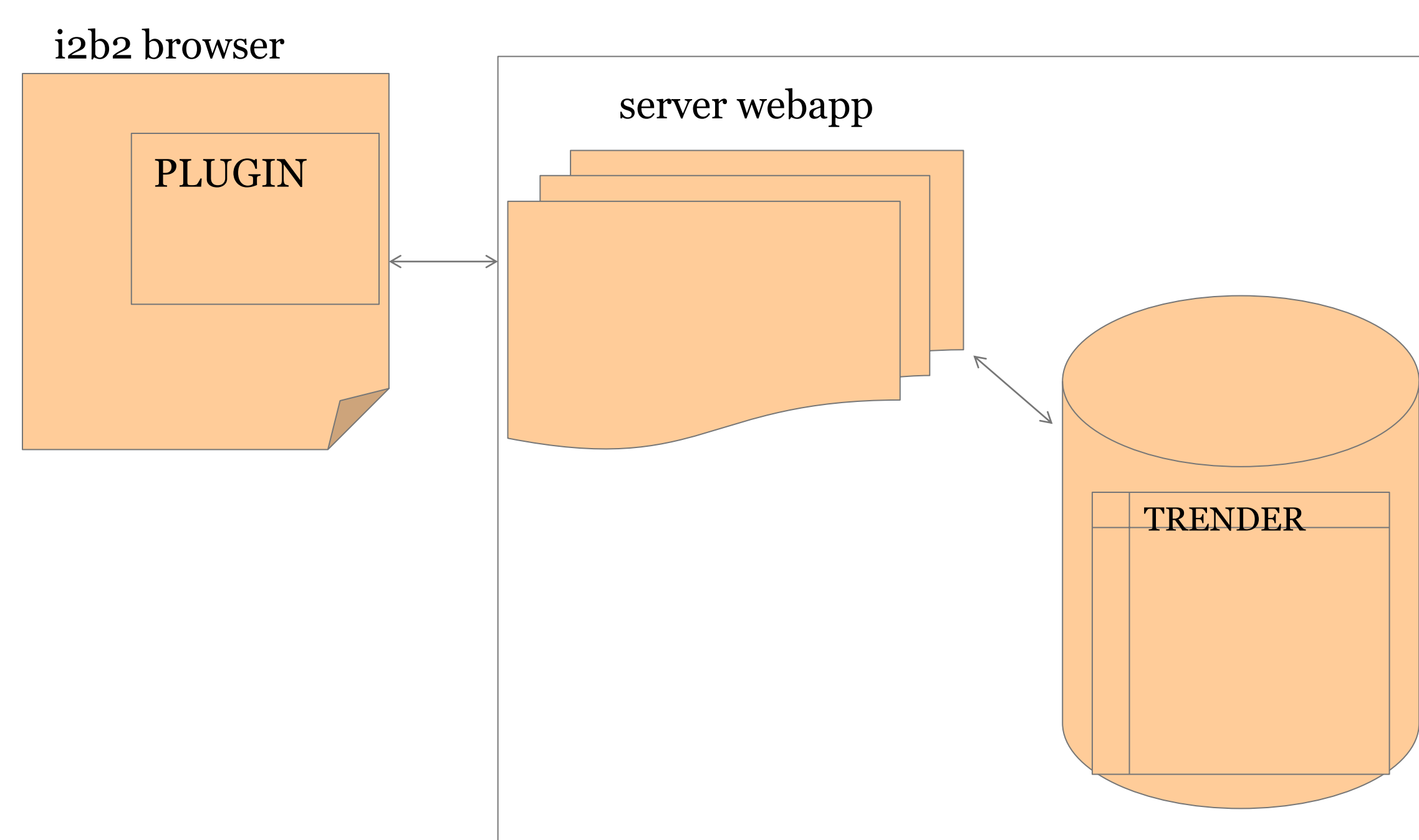
Introduction

Current i2b2 platform provides powerful tools for researchers to query patient cohorts that satisfy certain inclusion and exclusion criteria. However, tools for analyzing and visualizing selected cohorts are limited at present. We believe the open source community has the opportunity to make i2b2 into a truly comprehensive platform for clinical data analytics by collectively extending its capabilities for analysis, mining, and visualization.

The Clinical Trender is one of the analysis tools developed at WFUHS. This module aims to allow researchers to track and visualize certain clinical variables related to a selected patient cohort in order to understand the longitudinal changes of the cohort and potentially identify early signs of significant deviates in these variables. This function is inspired by the work of Brownstein¹ et al., which demonstrated the potential of elucidating important temporal trends using healthcare databases.

Methods

The Clinical Trender is developed as an analysis plug-in to the i2b2 web client. It communicates with a custom server web app to generate trend data and stores results in a custom TRENDR table in the i2b2 data schema. The charts are displayed using the RGraph API². To compute patient counts in each month as trend data points, a date constraint for that month is added as a where clause to each individual query against the observation fact table.



Results

The following examples illustrate major use cases that are supported by the current implementation:

Example Question 1: Will the currently too small cohort grow to sufficient size soon?

The researcher first identifies the cohort with the standard i2b2 Patient Set query mechanism. After the Patient Set is returned from i2b2, the researcher drags it to the plug-in, names the trend properly, and choose to watch number of patients (see Figure 1).

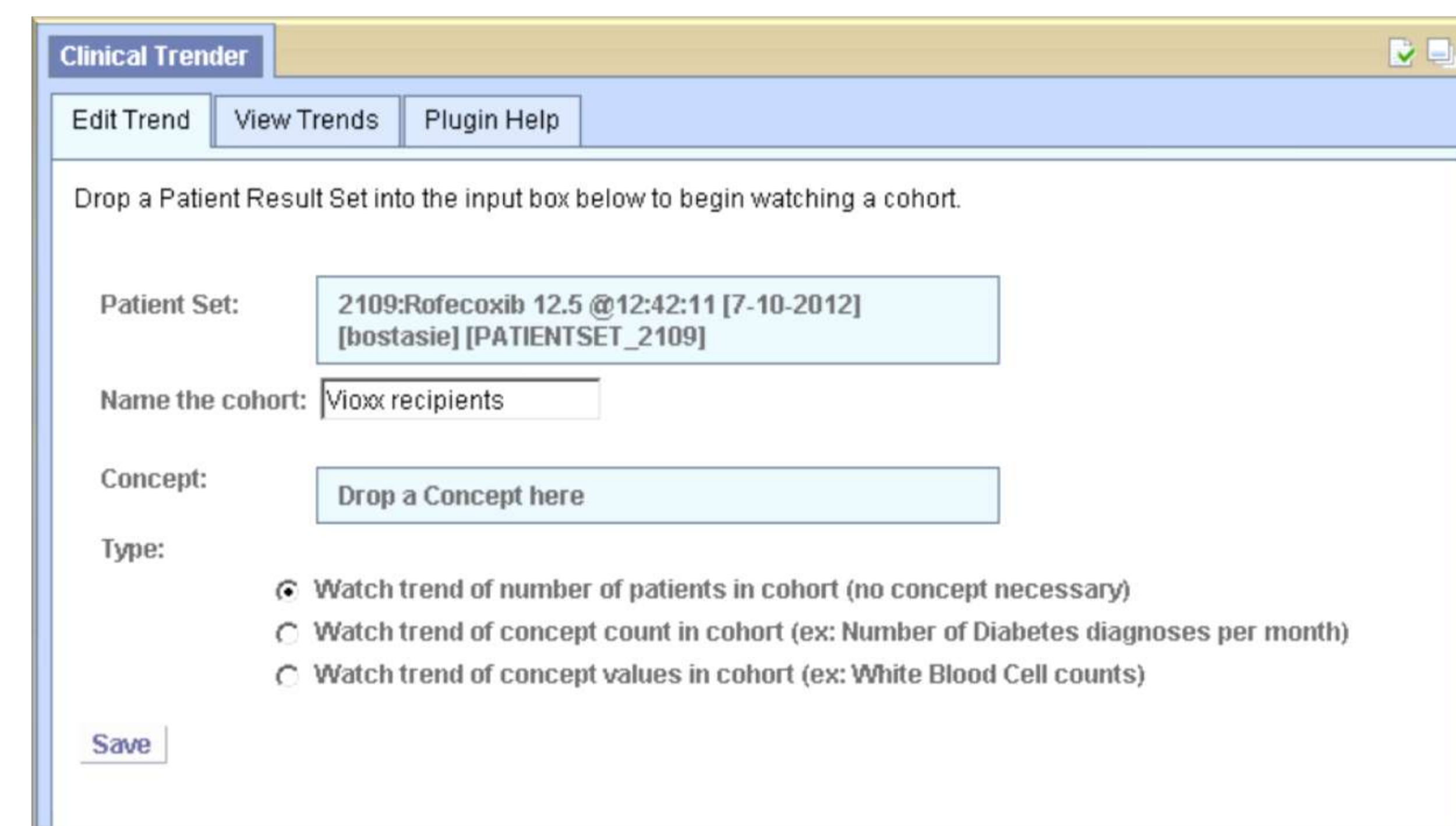


Figure 1. Clinical Trender plug-in

Upon saving the Edit Trend parameters, modified i2b2 queries will be run in the background effectively mimicking a user having run the same query every month in the past.

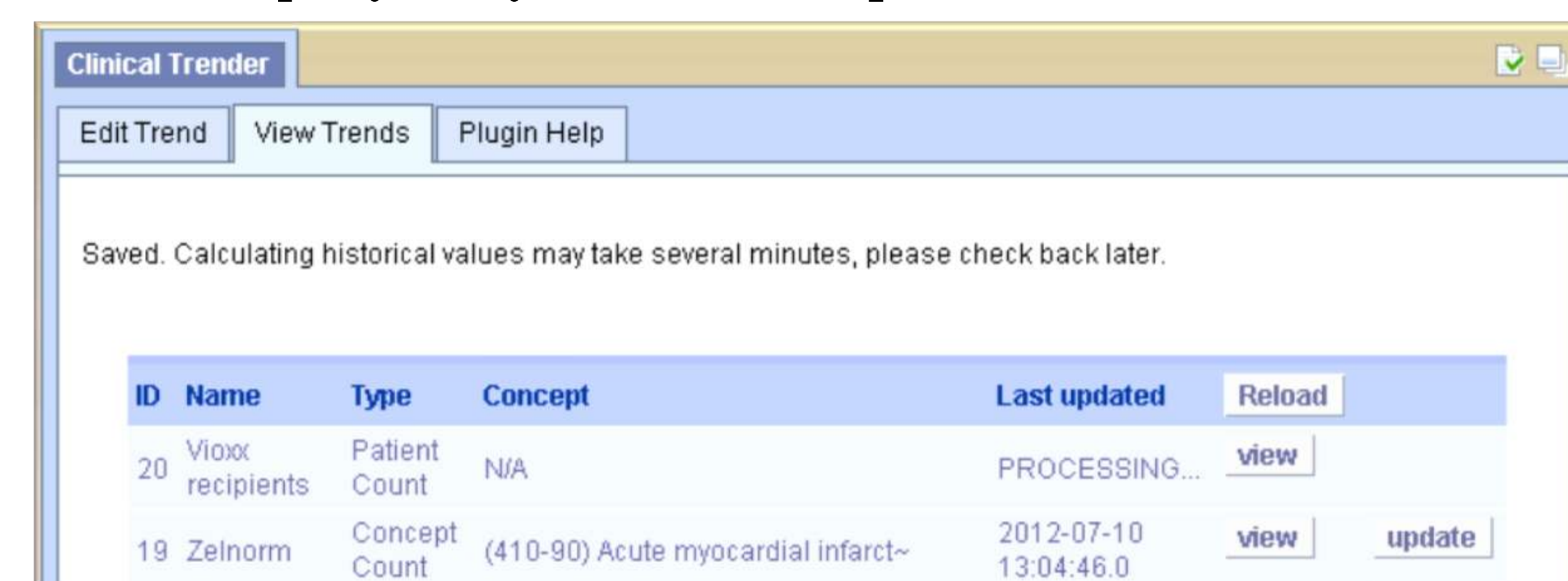


Figure 2. Trend watch creation

After the processing completes, the researcher can click the "View" button to display the trend of the size of this patient cohort. In the following figure (Figure 3), the left view is a cumulative plot while the right view is the monthly changes. Notice that in this particular example, the cohort (patients who were prescribed Cox-2 inhibitors) has stopped growing since 2005 because the drug was taken off the market.

Note that, once a trend request is set up by a researcher, it can be automatically updated each time new data is loaded; allowing researchers to track the trend of this cohort.

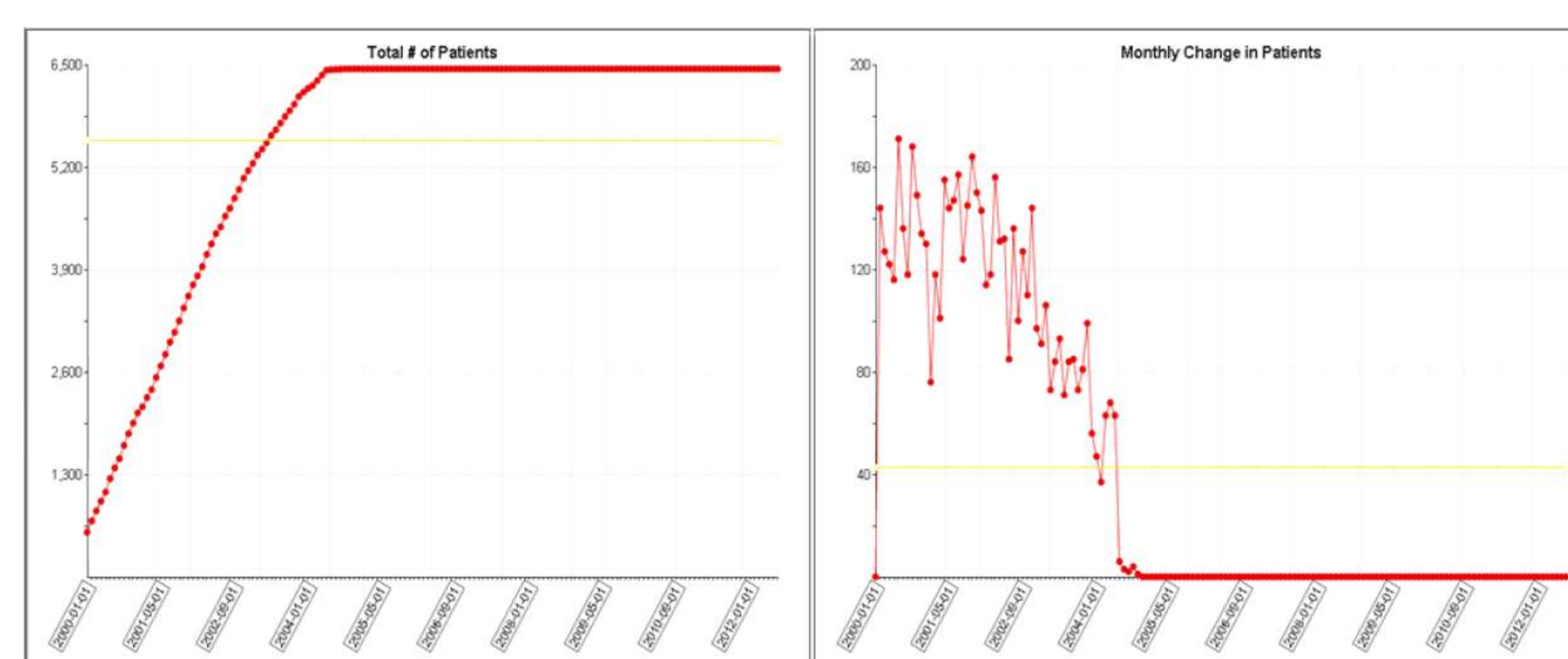


Figure 3. Trend of number of patients in cohort

Example Question 2: Is there a correlation between a pair of concepts in this cohort?

For the example of Cox-2 inhibitor prescription vs. myocardial infarction, the researcher uses the cohort in the previous example and drags the myocardial infarction concept to the plug-in and selects to watch the concept count. As shown in the resulting graph there appeared to be increased MI incidence (bulge in the middle) among Cox-2 users until such time it was taken out of usage.

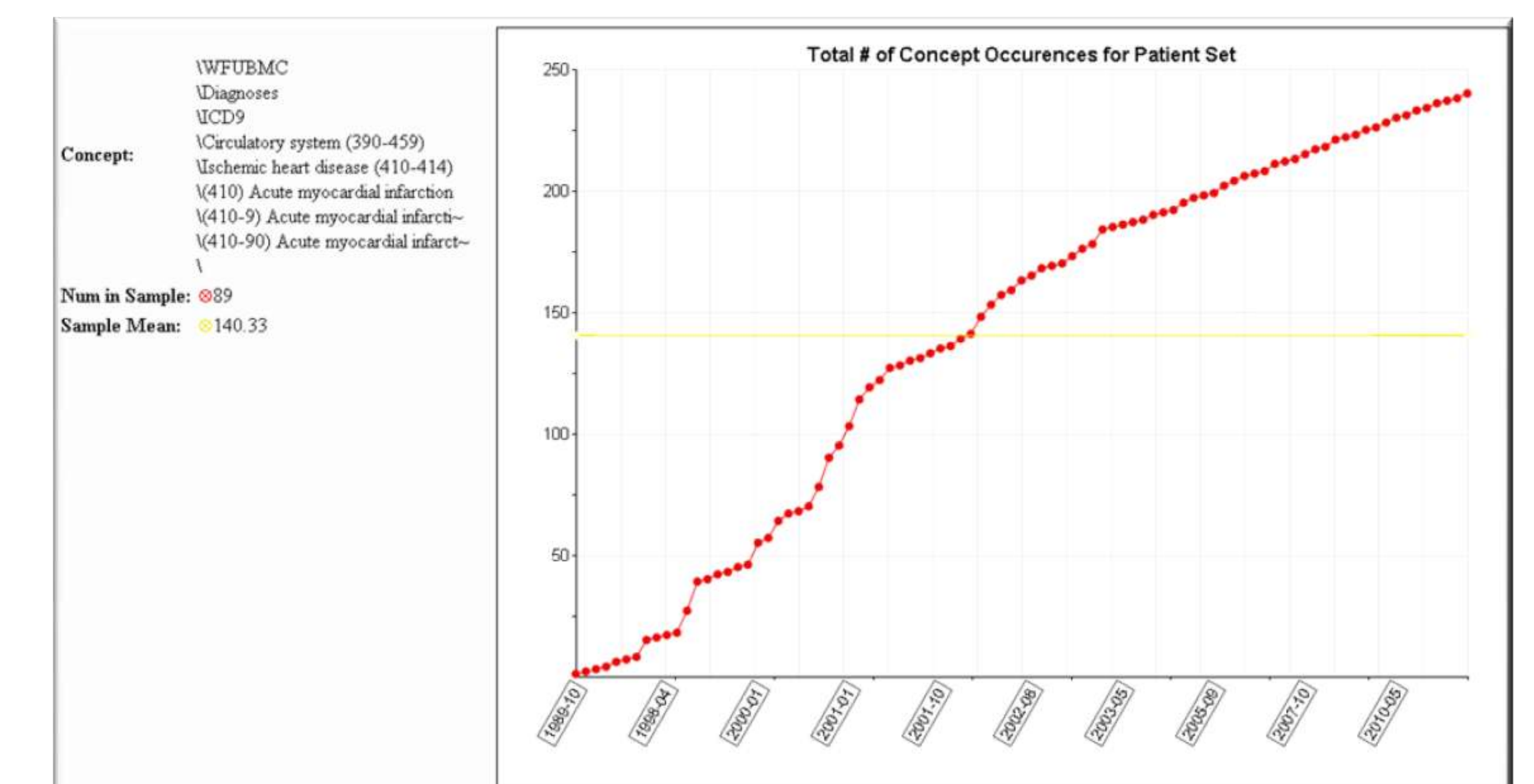


Figure 4. Trend of number of concepts in cohort

Example Question 3: Does the cohort differ from the rest of the population regarding the value of a concept?

The trend of a concept's value is displayed as a scatter plot of measured numeric values. Cohort vs. hospital population mean and standard deviation are compared. For this example, the Troponin levels of a myocardial infarction cohort were chosen.

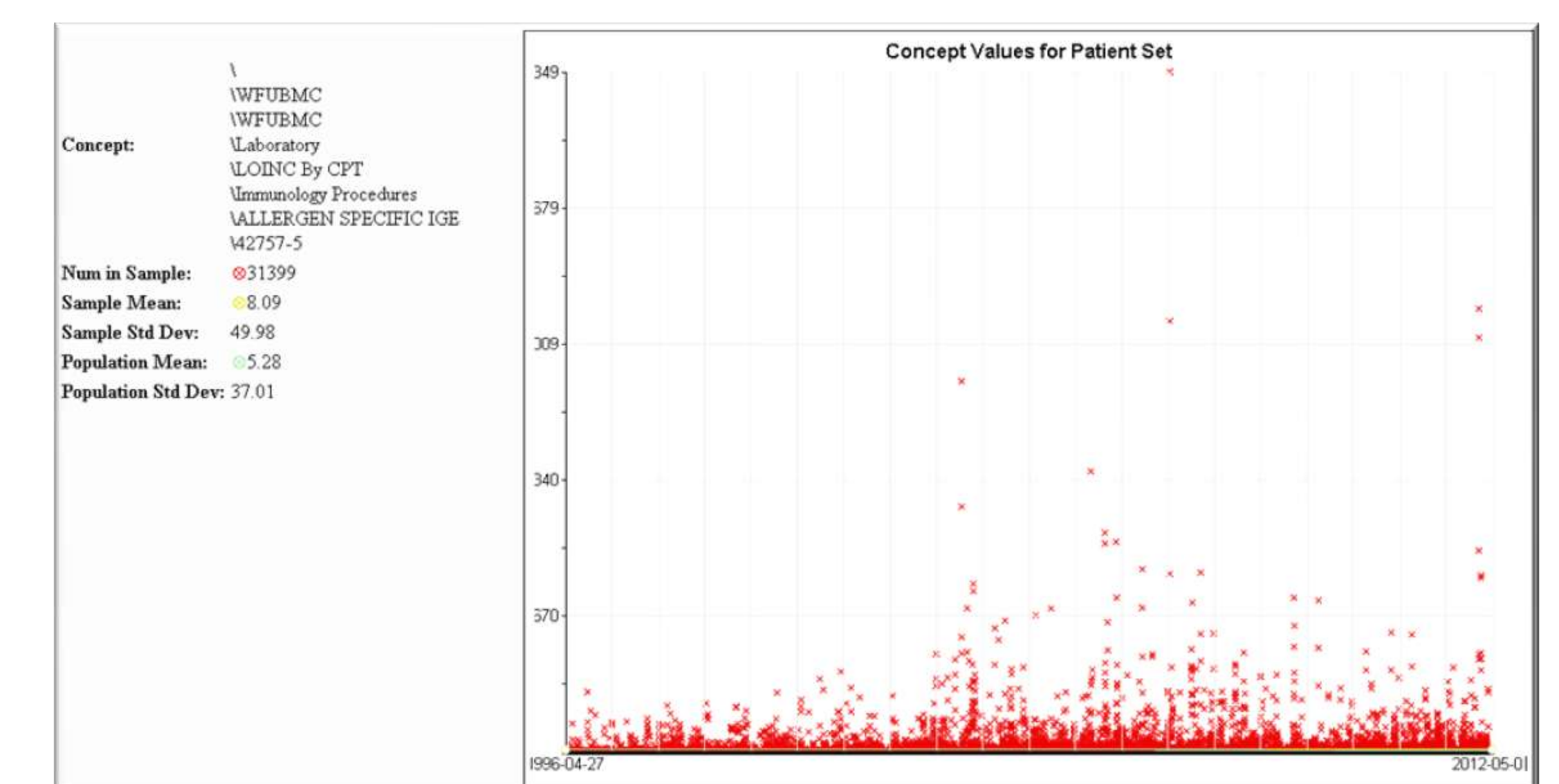


Figure 5. Trend watch of concept values in cohort

Conclusion

The current Clinical Trender allows researchers to explore basic trends about their cohorts of interest. More advanced trends such as CUSUM and normalized rates are under development.

References

1. Brownstein, JS et al. "The Tell-Tale Heart", PLoS One, 19, e840, 2007
2. RGraph JavaScript graphing API available at: <http://www.rgraph.net/>
3. Clinical Trender inquiries to bostasie@wakehealth.edu