Integrating and Using Siebel Analytics for AERS 4.6 Signal Detection

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Assumptions/Scope/Disclaimer

- Scope: Context is within the AERS/Siebel/BI product sets
- Assumption: audience is familiar with the Oracle AERS and its basic functionality

Agenda

- Background: What is Signal Detection
- Current State of Signal Detection in AERS
- Overview of Oracle Business Intelligence (formerly Siebel Analytics)
- Possible integration strategies for Oracle BI and AERS 4.6 for Signal Detection
- Suggestions for Future Steps

Background: What is Signal Detection?

- A process for identifying trends and correlations between Adverse Events and Drugs causing these AEs.

- The concept is to differentiate between AEs which occur coincidentally and those which are actually related to the treatment or medication being provided

- Usually, comparisons are made between existing known AEs and drug interactions, to determine if the AEs currently being reported are statistically significant

  - Well known databases of AE to Drug interactions are kept by the FDA, WHO and several other EU countries. These databases are generally made available for research and for Signal Detection purposes.

Background: What is Signal Detection? (2)

- As Signals are discovered, they must be analyzed to determine how they are related to AEs. This analysis can include:
  - Causality - What specifically caused the AE? Is it related to the some other factors or conditions of this patient? Could there have been another related medication?
  - Frequency – Did the AE occur because of a drug taken over a long time period, or was it related to a specific dose?
  - Specificity vs. Sensitivity – Is the AE directly related to a specific drug, or is it more generally related?
- To determine whether or not a Signal is valid, a threshold must be defined. This is a mathematical formula to determine whether or not an AE should be counted as part of a Signal.

What is Signal Detection? (3)

- The analysis of the AE data and its comparison to other known comparative AE groups, along with the application of the threshold criteria is a sophisticated statistical modeling exercise

- There are many types of statistical models which are used in Signal Detection analysis, but three of the most common are:
    - Proportional Reporting Ratio [PRR]
    - Bayesian Confidence Propagation Neural Network [BCPNN]
    - multi-item gamma Poisson shrinker [MGPS]

- PPR is used in the EurdraVigiliance system

- BCPNN is used by the WHO

- MGPS is used by the FDA

- Due to the numbers of Adverse Event reports and the volume of the comparison reference data, some analytical method is required. Manual comparison is not feasible

- ROR or Reporting Odds Ratio is also commonly used

Current State of Signal Detection in AERS 4.6

- AERS 4.6 has some built-in functionality for Signal Detection and Reporting:
  - Built in Folder Queries under the Pharmacovigilance Folders
  - Built in Reports such as the Signal Identification Report

- According to AERS 4.6.1 Users Guide, pg 9-4, "the Signal Identification Report is designed to compare safety profiles between date periods to help identify potential changes in a product's safety profile."
  - Implication that there is not a comparative method against other external data sources.

- According to the AERS 4.6.1 Release Content Document, pg 15, "AERS 4.6 has been integrated with the Druglogic's Qscan. You are now able to pass a set of cases into Qscan for further analysis and visualization, then identify and review the cases of interest within AERS."

Current State of Signal Detection in AERS 4.6

- Several 3rd party tools also exist for Signal Detection with AERS data

- SAS is also widely used for this Signal Detection analysis in general

Overview of Oracle Business Intelligence (formerly Siebel Analytics)

- Set of tools to summarize data into representative Datamarts or Data Warehouses

- Provides pre-defined aggregate reporting capabilities and executive "dashboard" views of summarized data, with the ability to drill down into specific detailed records

- Useful for identifying trends and patterns

- Ability to scale and process large amounts of data through daily processing cycles, called ETLs (Extract-Transform-Load), built-in with Informatica

- Runs on either Oracle RDBMS or MS-SQLServer backends

Possible Integration Strategies for Oracle BI and AERS

- The Informatica ETL can perform a direct extraction from an Oracle AERS instance, using the same queries which drive the Signal Identification Report

- Additionally, external source data can be loaded from XML files from FDA, WHO or EU

    - Data must be uploaded or available to an Informatica daemon process

- Schedule a daily ETL job to process summarizes of the case data and AEs

Possible Integration Strategies for Oracle BI and AERS (2)

- Summarize across the entire time region of the case per drug, with indexing on timepoints

- Summarize AEs across drugs, or drill down to ingredients for drugs for individual and combination based aggregation

- Map the analysis method directly into the Oracle BI (Siebel Analytics) engine

  - Since the SAS functions for each of the three methods of Signal Detection analysis are well known, a direct mapping can be made into the formula summaries within Oracle BI

  - Allows for ETL to also create the computations for the actual analysis

Possible Integration Strategies for Oracle BI and AERS (3)

- Develop a BI Dashboard with the actual threshold parameters as well as specificity and sensitivity percentages

  - Since the ETL can do the "heavy" work of making the base computations for the PPR, BCPNN, MGPS analysis, the dashboard can retrieve dynamic results in close to real-time

  - Users can then tune the threshold and then evaluate what Signals are returned, along with their statistical sensitivity and specificity

- Each analysis can be stored and replayed in scenarios. This makes longer-term signal detection possible with very little effort to recompute the base calculations for comparison

[X] Extending Oracle BI for AERS Data with Informatica

- In the Repository Manager application, create a new CUSTOM_ETL folder, then switch into the Design application to import in the new source tables, including a new one from the AERS dataset and a staging table from the warehouse schema.

- Add a new mapping for the source table together with a "Source Qualifier" transformation. The Source Qualifier is a SELECT list of all the columns for a particular table , the source data, where the extract comes from. The source qualifier lets you customize the SELECT statement so that you can add a filter or otherwise modify the source data before it's processed.

[X] Extending Oracle BI for AERS Data with Informatica

- After executing the ETL package created in Informatica, Define the presentation layer with the appropriate dimensions

- Once the Presentation Layer is defined you are ready to move on to Answers to build your Siebel Analytics Reports

- Click on Answers > Answers to build your web interface to building Reports.

- This will generate Subject areas with AERS SD listed.

- Reports created in Answers can be saved as Dashboards.

Future Suggestions

- Direct integration between AERS and Oracle BI is possible if a pre-loaded ETL were made available. This is relatively straightforward since both the analysis methods and the current reporting queries are known.

- AERS should optionally be able to load comparative data in the future. In this way, if there is a specific set of AE case references, they can be retrieved in real-time from AERS.

Additional Questions?

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