ConceptQL

An open source, high-level language that allows researchers to unambiguously define their research algorithms.

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Disclosure

 Ryan, and his wife, are blissfully employed by Outcomes Insights, Inc, a research and consulting company that provides services for a wide variety of clients in the pharmaceutical industry and government.



- Clinical trial protocols are generally provided in natural language, with some indication of the general structure of the protocol
 - Population, inclusion criteria, exclusion criteria, study outcomes
 - <u>www.clinicaltrials.gov</u>
- The ability to derive the key study design features and represent them in machine readable form may facilitate
 - Feasibility assessments which identify
 - Selection criteria that may limit study implementation
 - Criteria that are not specific enough
 - Inputs to support power and sample size calculations
 - Identification of relevant patients for trial recruitment

Tools for Researchers - Jigsaw





Jigsaw Introduction Copyright 2014, Outcomes Insights, Inc.

Example Trial

- <u>NCT01730534</u>
- Assume NLP extracts criteria
- Match criteria against Jigsaw Algorithm Repository (JAR)
- Use Jigsaw Study Builder to design and visualize protocol
 - Assembles individual algorithms into a study
 - Generates analysis ready dataset and documentation

ConceptQL

- Visual
- Composable
- Flexible
- Open Source
- Compatible with
 - PostgreSQL
 - SQL Server
 - Oracle
 - RedShift
- Easily represented in JSON, YAML, etc.



Pulling Results from CDM

- Criterion operations pull information from a CDM database
- Generate a set of "result" rows
- Generally a code list or demographic info



Set Operations > Boolean Logic

- Set operations seem easier to reason about than Boolean logic
- ConceptQL supports
 - Union
 - Intersect
 - Except
 - Complement

Old MI Reported in Inpatient Setting



ConceptQL Does Time

- Many algorithms have a temporal component
 - Drug A administered at most 30 days before Event B
 - Find the second occurrence of Event A
- ConceptQL has two types of time-based operations
 - Nth Occurrence
 - Relative
- TimeWindow shifts the start and end dates



Composability Requires Flexibility

- Inspired by Unix "pipes"
 grep 'happy' file.txt | wc –l
- Algorithms involve mixtures of different types of events
 - E.g. Studies have composite end points





Roadmap

- Jigsaw Algorithm Maker (JAM)
 - UI to build ConceptQL algorithms
 - Essentially make the diagrams you've seen today editable
 - Will allow crowd-sourcing of algorithms for the JAR
- Tie output of ConceptQL into OHDSI's toolset
- Create a set of projection operators
- Apply ConceptQL to other data sets/models
- Make it so my researchers never have to reach for SAS or SQL to cut their data ever again

More Information

- Email
 - ryan@outins.com
- GitHub Repo
 - <u>https://github.com/outcomesinsights/conceptql</u>
- ConceptQL Sandbox
 - http://sandbox.jigsawanalytics.com/
- Jigsaw Demonstration
 - <u>http://jigsawanalytics.com</u>
- OMOP Common Data Model
 - <u>http://omop.org/CDM</u>
 - <u>http://www.ohdsi.org/web/wiki/doku.php?</u> id=documentation:cdm

Thank You!

Questions?