CemConnector: A RESTFul application programing interface and client library for the Common Evidence Model (CEM)

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Introduction

The Common Evidence Model (CEM) (1–3) is an increasingly useful tool for capturing relevant publicly available information that associates drugs and diseases. The utility combines freely available information in the form of spontaneous adverse event reports, clinical trials, product labels, and published literature.

The CEM has proven to be a valuable tool to the Observation Health Data Science Initiative (OHDSI) community for generating evidence, particularly for finding sets of negative controls required for robust empirical calibration of effect estimates (4). However, limitations in the usability of CEM within studies have arisen as programmatic accessibility is currently available through directly querying the data constructs. Consequently, we have developed *CemConnector*, a Web API and R library that provides a convenient way of accessing relevant information related to concept sets of interest.

Methods

We have developed an *R Plumber* application that is publicly available for any OHDSI users. Through this API, it is possible to query the CEM and retrieve an 'evidence exists' indicator based on the provided set of concepts from a concept set expression and how they map to a summary of all evidence collected inside the CEM. Furthermore, selection of negative controls can be formally filtered using rankings based on how frequently the concepts appear together in OHDSI Common Data Model compliant databases. In addition, we have provided an "evidence explorer" plug-in that can be used standalone or inside other Shiny applications to view the evidence associated with different concept sets.

This software is fully open source and is designed to be hosted anywhere (e.g., inside an organisation's firewall). The implemented API broadly follows a RESTFul design (5), allowing a universal programmatic interface. The provided R client library is an open-source tool that can be queried with concept sets of standard condition concepts (SNOMED terms) and ingredient concepts (RxNorm identifiers), mappings that are used across the OHDSI community, allowing most existing concept sets to be compatible with CemConnector.

Results

The developed infrastructure is highlighted in Figure 1, which outlines the design of the API. *CemConnector* is open source and freely available at *https://github.com/OHDSI/CemConnector*. This package can be installed in R and used in scripts, only requiring access to a publicly available API. For high throughput studies the package also supports an equivalent database interface.

Conclusion

It is crucial to note that information about the relationships between drug ingredients and conditions is updated continuously. Consequently, we predict an increased need to improve APIs such as this to provide evidence crucial to clinical decision making. We have presented a new framework for interfacing with the CEM, in line with the principles of Findability, Accessibility, Interoperability and Reusability (FAIR) (6). This approach can be used from within R via calls directly to a database, or through web requests in any programming language. We hope that this tool will provide use within the OHDSI community by combining normally disparate sources of information in a widely available manner. In future versions we hope to link more OHDSI resources and provide improvements to service the needs of real users of this tool.

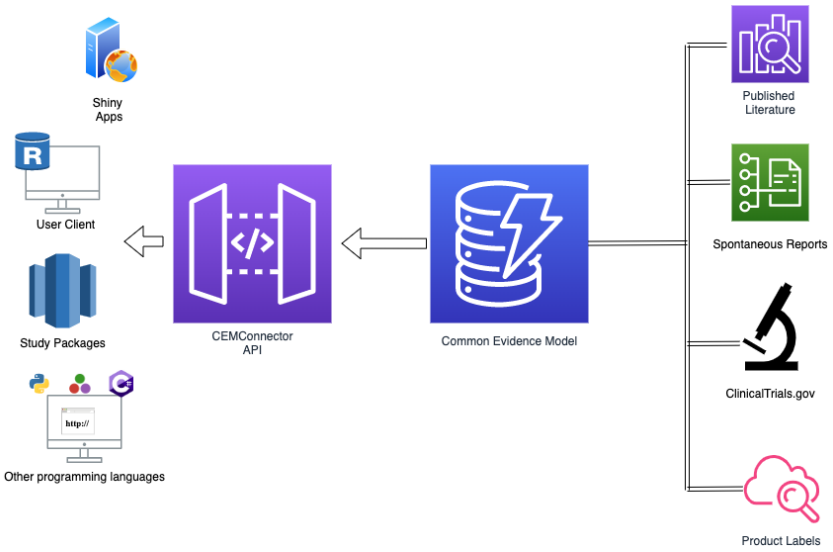

Figure 1. Architecture of the Common Evidence Model and CemConnector. CemConnector provides a convenient way of interfacing with evidence found in the CEM through a standard REST API. CemConnector is designed to provide an easy way to interface with shiny applications, study packages or any client-based interaction.

References

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