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Complex Analyses on Clinical Information Systems Using Restricted Natural Language Querying to Resolve Time-Event Dependencies

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ABSTRACT

Purpose: This paper reports on a generic framework to provide clinicians with the ability to conduct complex analyses on elaborate research topics using cascaded queries to resolve internal time-event dependencies in the research questions, as an extension to the proposed Clinical Data Analytics Language (CliniDAL).

Methods: A cascaded query model is proposed to resolve internal time-event dependencies in the queries which can have up to five levels of criteria starting with a query to define subjects to be admitted into a study, followed by a query to define the time span of the experiment. Three more cascaded queries can be required to define control groups, control variables and output variables which all together simulate a real scientific experiment. According to the complexity of the research questions, the cascaded query model has the flexibility of merging some lower level queries for simple research questions or adding a nested query to each level to compose more complex queries. Three different scenarios (one of them contains two studies) are described and used for evaluation of the proposed solution.

Results: CliniDAL's complex analyses solution enables answering complex queries with time-event dependencies at most in a few hours which manually would take many days.

Conclusion: An evaluation of results of the research studies based on the comparison between CliniDAL and SQL solutions reveals high usability and efficiency of CliniDAL's solution.

Key words: Data analytics, time-event dependency, scientific experiment.

1. Introduction

Data analytics plays an essential role in extracting knowledge in many areas such as clinical research. Especially hypothesis testing is a well-known method for researchers to establish a new clinical knowledge and it requires applying appropriate tools.

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