

POSTER PRESENTATION

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Identifying potential drugs that induce QT prolongation using electronic medical records

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From UT-ORNL-KBRIN Bioinformatics Summit 2010
Cadiz, KY, USA. 19-21 March 2010

Background

A prolonged QT is a major risk factor for developing Torsades de Pointes, a potentially fatal cardiac dysrhythmia. The prolongation of QT interval may be due to adverse drug reactions. Many drugs such as haloperidol and methadone are known to prolong the QT interval. In effect, it is one of the most common reasons for drug withdrawal from the market [1]. Here, we propose to identify drugs that may promote QT prolongation using electronic medical records.

Materials and methods

As an ongoing effort in studying drug effects, Vanderbilt University Medical Center has constructed an anonymized database of medication orders and ECGs of all inpatients admitted for 2 to 30 days from 1999 to 2003. QT prolongations were detected from cardiologist-generated, free-text ECG impressions by combining negation detection and the natural language processor, KnowledgeMap concept identifier (KMCI) [2]. From this dataset, we designed our study to identify potential drugs that promote QT prolongations as their side effects by examining medications taken prior to the events. For instance, when QT prolongation is detected for a patient, drugs administered 72 hours prior are retrieved for further analysis. To determine which drug is more likely to be associated with the QT prolongation, we applied the chi-square (X^2) statistic.

Results

With a predefined level of significance at 0.001 (i.e. $X^2 \geq 10.827$), 8 drugs showed significant signals, table 1. Among them, 3 drugs have FDA-approved labels of QT prolongation as their known actions [3].

Table 1 Potential drugs that prolong QT interval with significance level of 0.001

Drug	Chi-square	Evidence
Amiodarone	39.21	Known reaction
Potassium supplements	24.78	Treatment – typically given to people with long QT intervals to keep it normal
Procainamide	22.11	Known reaction
Sotalol	21.62	Known reaction
Warfarin	18.42	No evidence found
Meperidine	18.13	No evidence found
Oxycodone	17.08	No evidence found
Promethazine	12.90	No evidence found

False positive predictions may be due to the fact that our study was based on hospitalized patients with acute diseases. Those patients may be taking a long list of medications and some drugs may interact with each other to contribute to the outcome.

Conclusions

The preliminary results showed that we are able to use inpatient medical records to detect drugs known to prolong QT intervals. For future study, it is crucial to consider patient existing conditions, health history, and contributions of other medications.

Acknowledgements

This study was partially supported by NLM-NIH training grant 3T15LM007450-08S1 and grants from the NLM R01-LM007995-05 and NCI R01CA141307-01.

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Published: 23 July 2010

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doi:10.1186/1471-2105-11-S4-P2

Cite this article as: Liu *et al.*: Identifying potential drugs that induce QT prolongation using electronic medical records. *BMC Bioinformatics* 2010 **11**(Suppl 4):P2.

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