Using SemRep to Detect Adverse Drug Events in Biomedical Abstracts

Ting He, MSc,1 Kory Kreimeyer, MSc,1 Taxiarchis Botsis, PhD1
1Johns Hopkins University School of Medicine, Baltimore, Maryland, USA

Abstract

Our objective was to determine whether automated tools might efficiently support the retrieval of Adverse Drug Event (ADE) information from biomedical abstracts. We used SemRep and own code to process PubMed abstracts and retrieve the full ADE information for Aliskiren, a hypertension drug withdrawn from the market in 2011 due to angioedema. We found 1,203 PubMed abstracts and were able to detect the safety issue associated with Aliskiren.

Introduction

Adverse Drug Event (ADE) information can be found in multiple sources, including federal repositories and biomedical literature. It is challenging though to retrieve and process this information due to data quality and access issues. Here, we examine the ability of automated methods to support the processing of PubMed abstracts and retrieve the ADE information for a drug product associated with a serious safety signal.

Methods

Aliskiren was the first in a class of renin inhibitors indicated for hypertension and was withdrawn in 2011 due to increased reporting of angioedema.1 We initially ran a PubMed query on Jan. 20, 2019 and retrieved all abstracts for Aliskiren. We subsequently processed the abstracts with SemRep, a Natural Language Processing tool that extracts semantic relations between entities, and developed code in Python 3.6.4 to post-process the SemRep output (code is publicly available at https://github.com/tinghe14/ADE.git). Our focus was the detection of the DRUG and SYMPTOM “super-types” (composed of Unified Medical Language System semantic types) and the association of the underlying entities with Aliskiren towards the identification of the aforementioned safety signal (Figure 1).

Results

We found 1,203 abstracts for Aliskiren and processed them with SemRep and our code. This resulted in the identification of 127 unique drugs and 809 unique symptoms. Aliskiren was associated in the same sentence with 38 drugs and the most common were Losartan (N=33), Hydrochlorothiazide (N=29), and Ramipril (N=29). Hypertensive disease (N=1,045) was the most frequent symptom associated with Aliskiren followed by systemic arterial pressure (N=898) and heart failure (N=311). The Aliskiren-Angioedema association was confirmed in 6 abstracts. Interestingly, three of these abstracts were published before Aliskiren’s withdrawal from the market.

Discussion and Conclusion

Our work shows that SemRep may automatically support the extraction of ADEs from biomedical literature and agrees with similar previous approaches that relied on SemRep.2 Although automated approaches are of paramount importance in safety surveillance, further investigation on the achieved accuracy is required. We plan to refine and validate our approach using larger datasets for other drug products.

References