Drug-drug interactions (DDIs) are defined as clinically meaningful alterations in the exposure and response to a drug (called object drug) that has occurred as a result of the co-administration of another drug (called precipitant drug). According to a 2011 study, drug-drug interactions (DDIs) are responsible for roughly 220,000 hospital admissions per year (Percha and Altman 2013). However, this number is possible to be an underestimate due to the uncertainty of the impact of DDI on adverse patient outcomes (Becker et al. 2007).

In this study, a system for allowing combination of text mining and crowdsourcing of annotation approaches for detection of DDIs from drug package inserts is presented. Our hypothesis was that a well-designed task for the curation of DDI data extraction from drug product labels using NLP assistance, can help for non-experts annotators to achieve comparable quality to expert annotation for some part of the DDI knowledge curation task. Therefore, non-experts, assisted by machine learning algorithms, might be able to assist experts in curating large corpora. This is the first step in order to evaluate the feasibility of crowdsourcing DDI extraction. For testing our hypothesis, an annotation study was designed to evaluate expert versus non-expert curation performance, and the impact of NLP pre-annotation on precision and recall on both groups.

The design and development of the system and annotation study, consisted of three stages. First, our existing NLP pipeline for DDI extraction was improved, and it was used to preannotate 208 drug product labels with drug mentions and DDIs (Boyce, Gardner, and Harkema 2012). This dataset contained a representative sample of sections that have unambiguously interacting, non-interacting drug pairs, and also no mention of interactions. Secondly, a DDI machine readable representation scheme was created using the Annotation Ontology (OA) (Ciccarese et al. 2011). This model allowed us to load the NLP preannotated drug label sections into our plugin for human curation created using the Annotation tool DOMEO (Ciccarese, Ocana, and Clark 2012). Finally, the annotation study was performed along with usability questionnaires for collecting qualitative feedback from annotators.

To our knowledge, this is the first study in comparing experts and non-experts for pharmacokinetic DDI annotation. Results showed lower performance on non-experts compared with expert annotation without the use of NLP, and an improvement of non-expert annotation performance using the NER module of the NLP assistance. Annotators reported that our tool is useful in assisting DDI extraction. However, complete NLP assistance including drug mentioned and DDIs identification is still too complex for practical applications and could impact negatively the annotation performance. Simplification of the workflow for NLP assisted annotation is necessary for scaling our approach.

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