
Oral Presentations

O.11 Terminological Reasoning and Signal Detection: Past, Present and Future

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Background: The manual detection of potential signals of adverse drug reactions (ADR) depends on a review by an expert who compares drugs and ADRs to find common patterns between case reports. We assume that automated grouping of ADRs related to the same medical condition can help identification and retrieval of similar case reports and improve signal detection. From 2002 we applied knowledge engineering techniques to describe WHO-ART and MedDRA terms and implemented terminological reasoning techniques that process these descriptions in order to build clusters of case reports. Although we published several articles in medical informatics journals, our current state of advancement does not allow an efficient deployment in real settings.

Objective/aim: To describe our implementation of tools and knowledge bases, current state of advancement and future developments for terminological reasoning and signal detection.

Methods: WHO-ART and MedDRA terms were described using knowledge engineering techniques. Terminological reasoning was performed with the Racer inference engine for ontological subsumption and we developed a customised version of semantic distance for similarity measures between ADRs.

Results: Our current knowledge base contains 87% of WHO-ART terms and 47% of MedDRA terms described according to four axes (Topography, Morphology, Function and Causal agent). The PharmaMiner tool implements signal detection measures (PRR, ROR, Chi-square, Information component and EBGm) and connects to the Racer engine to perform terminological reasoning. The ADR-Xplore tool computes large distance matrices and implements non supervised learning algorithms (K-Means, Pvcust) to build clusters of ADR terms. The PharmARTS tool helps to browse case reports using knowledge descriptions of ADR terms. PharmaMiner benefits from a user interface for personal computers; ADR-Xplore and PharmARTS propose a web based graphical interface.

Conclusion: We currently implement three tools that present different stages of advancement and evaluation. Improved communication and interoperability between these tools is necessary in order to build an advanced software platform for signal detection. Although we own the necessary skills to perform terminological reasoning, knowledge description of the WHO-ART and/or MedDRA terms is a limiting step due to the large amount of terms in these terminologies. We were able to extract knowledge from the UMLS semantic network and using natural language processing techniques but many ADR terms still have to be described manually. We plan to deploy an operational version of the platform dedicated to WHO-ART terms for evaluation in real life pharmacovigilance in 2008.