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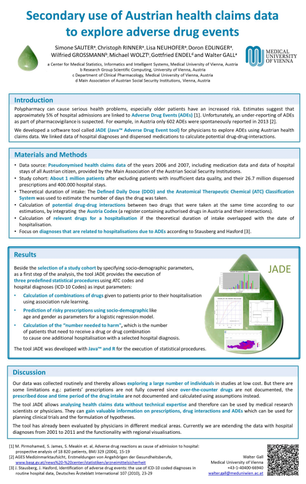

Secondary use of Austrian health claims data to explore adverse drug events

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Introduction

Polypharmacy can cause serious health problems, especially older patients have an increased risk. Estimates suggest that approximately 5% of hospital admissions are linked to **Adverse Drug Events (ADEs)** [1]. Unfortunately, an under-reporting of ADEs as part of pharmacovigilance is suspected. For example, in Austria only 602 ADEs were spontaneously reported in 2013 [2].

We developed a software tool called **JADE (Java™ Adverse Drug Event tool)** for physicians to explore ADEs using Austrian health claims data. We linked data of hospital diagnoses and dispensed medications to calculate potential drug-drug-interactions.

Materials and Methods

- Data source: **Pseudonymized health claims data** of the years 2006 and 2007, including medication data and data of hospital stays of all Austrian citizen, provided by the Main Association of the Austrian Social Security Institutions.
- Study cohort: **About 1 million patients** after excluding patients with insufficient data quality, and their 26.7 million dispensed prescriptions and 400.000 hospital stays.
- Theoretical duration of intake: The **Defined Daily Dose (DDD) and the Anatomical Therapeutic Chemical (ATC) Classification System** was used to estimate the number of days the drug was taken.
- Calculation of **potential drug-drug interactions** between two drugs that were taken at the same time according to our estimations, by integrating the **Austria Codex** (a register containing authorised drugs in Austria and their interactions).
- Calculation of **relevant drugs for a hospitalisation** if the theoretical duration of intake overlapped with the date of hospitalisation.
- Focus on **diagnoses that are related to hospitalisations due to ADEs** according to Stausberg and Hanford [3].

Results

Beside the **selection of a study cohort** by specifying socio-demographic parameters, as a first step of the analysis, the tool JADE provides the execution of **three predefined statistical procedures** using ATC codes and hospital diagnoses (ICD-10 Codes) as input parameters:

- **Calculation of combinations of drugs** given to patients prior to their hospitalisation using association rule learning.
- **Prediction of risky prescriptions using socio-demographic** like age and gender as parameters for a logistic regression model.
- **Calculation of the "number needed to harm"**, which is the number of patients that need to receive a drug or drug combination to cause one additional hospitalisation with a selected hospital diagnosis.

The tool JADE was developed with **Java™ and R** for the execution of statistical procedures.

JADE

Discussion

Our data was collected routinely and thereby allows **exploring a large number of individuals** in studies at low cost. But there are some limitations e.g.: patients' prescriptions are not fully covered since **over-the-counter** drugs are not documented, the **prescribed dose and time period of the drug intake** are not documented and calculated using assumptions instead.

The tool JADE allows **analysing health claims data without technical expertise** and therefore can be used by medical research scientists or physicians. They can **gain valuable information on prescriptions, drug interactions and ADEs** which can be used for planning clinical trials and the formulation of hypotheses.

The tool has already been evaluated by physicians in different medical areas. Currently we are extending the data with hospital diagnoses from 2001 to 2013 and the functionality with regional visualisations.

[1] M. Pirmohamed, S. James, S. Meakin et. al. Adverse drug reactions as cause of admission to hospital: prospective analysis of 18 820 patients, BMJ 329 (2004), 15-19
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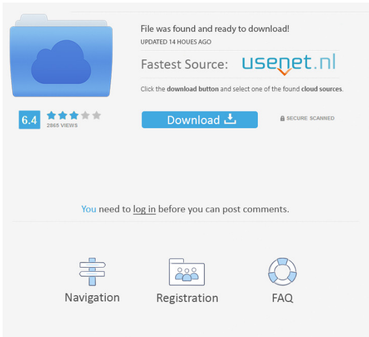

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