AUTOMATED DETECTION OF ADVERSE DRUG EVENTS FROM OLDER INPATIENTS' ELECTRONIC MEDICAL RECORDS USING STRUCTURED DATA MINING AND NATURAL LANGUAGE PROCESSING.

SWISS monitoring adverse drug event

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CHALLENGES &GOALS

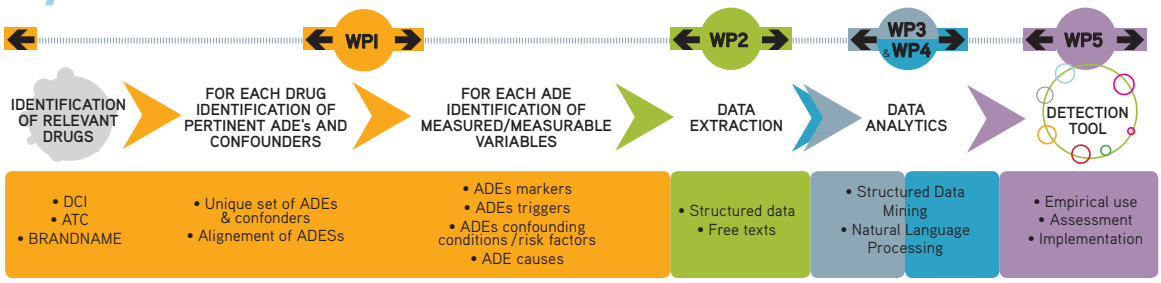
- Adverse drug events (ADEs) is the second most frequent complication in hospitalized patients; ADEs are linked to increased mortality, morbidity, hospitalization length, readmission, and cost and most of them are preventable (pADEs).
- Older inpatients are at particular risk of ADEs. Among drugs, antithrombotics are frequently used in this population and carry a substantial risk of hemorrhages and thrombosis.
- Reduction of ADEs in the older population has therefore become an important patient safety & public health issue.

Our research hypothesis is that the automated detection of ADEs related to antithrombotic drugs use from electronic medical records could significantly improve risk management and patient safety in older inpatients with multimorbidity, frailty and polypharmacy.

RESEARCH OBJECTIVES

1. To develop and validate an electronic application for the automated detection of ADEs related to antithrombotic drugs. The application will process data derived from electronic medical records (EMRs) by means of both structured data mining (SDM) and natural language processing (NLP);
2. To develop and adapt NLP tools for the specificities of the French and German medical languages;
3. To assess the performance of the ADE automated detection tool in terms of efficacy, reliability, reproducibility and implementation ability;
4. To implement strategies to improve ADE reporting and prevention through knowledge transfer.

METHODOLOGY



5 WORK PACKAGES

WP1. Identification of antithrombotic drugs, ADEs, ADE markers, triggers, confounding factors and causes

WP2. Data extraction from EMRs; structured data (patient administrative data, hospital unit, diagnosis and procedure codes, drug prescription orders, laboratory test orders and results, imaging and endoscopic test orders, and free texts (discharge summaries, pharmacological consultation notes and ADE reports, imaging reports).

WP3. Analysis of structured data (SDM). Computational algorithms based on logical rules will be developed for structured data to identify ADEs markers, triggers, confounding factors and causes.

WP4. Analysis of free text data (NLP). We will 1_ Build the lexico-semantic sources (text-based approach to detect the variables of interest) 2_ Tune the NLP pipeline modules (construct the lexical entities to be recognized in a text) and 3_ Design a service-oriented text-mining pipeline.

WP5. ADE detection tool assessment. The performance (sensitivity, specificity, positive and negative predictive values) of the ADE detection tool based on both SDM and NLP will be evaluated using a random sample of 600 hospital stays for ADE occurrence, type, causality, severity and preventability by means of a patient medical record review.

PARTICIPATING HOSPITALS: *University of Hospital of Lausanne (CHUV), University Hospitals of Geneva (HUG), Hôpital du Valais, Kantonspital Baden, University Hospital of Zürich*

EXPECTED RESULTS &IMPLEMENTATION

| DEVELOPMENT AND VALIDATION OF AN ELECTRONIC APPLICATION FOR THE AUTOMATED DETECTION OF ADES RELATED TO ANTITHROMBOTIC DRUGS | DIFFUSION OF ADE INDICATORS FOR HOSPITAL RISK MANAGEMENT OPTIMISATION AND INTERNAL SAFETY MONITORING OF ANTITHROMBOTIC DRUGS' PRESCRIPTIONS | SENSITIZATION AND TRAINING OF HEALTHCARE PROFESSIONALS AND PATIENTS ON ADES CAUSED BY ANTITHROMBOTIC DRUGS | KNOWLEDGE TRANSFER OF TOOLS AND METHODOLOGIES FOR AUTOMATED ADE DETECTION | DEVELOPMENT OF FEDERAL SURVEILLANCE AND IMPROVEMENT PROGRAMS FOR THE QUALITY AND SAFETY OF ANTITHROMBOTIC DRUGS' PRESCRIBING |

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