

# EU-ADR

## Exploring and Understanding Adverse Drug Reactions by Integrative Mining of Clinical Records and Biomedical Knowledge

**EU-ADR aims to develop and use advanced ICT technologies for demonstrating new ways to exploit the existing wealth of clinical and biomedical data sources for the early detection of Adverse Drug Reactions.**

### Context and Objectives of the Project

Before launching a new drug to the market, it is tested on a few thousands of people, but adverse reactions may not be detected until many more patients have used the drug. Once the drug is on the market, doctors and pharmacists are responsible for recognizing and reporting suspected side effects, which are collected in so-called spontaneous reporting systems. However, a number of recent, highly publicized drug safety issues showed that adverse effects of drugs may be detected too late, when millions of patients have already been exposed.

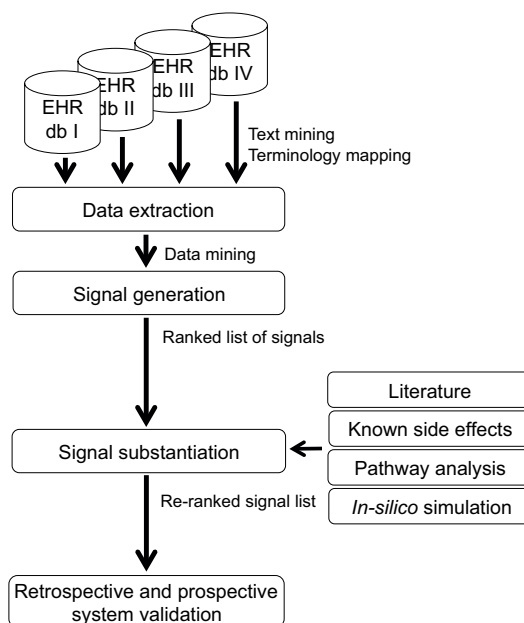
The EU-ADR project aims to develop an innovative computerized system to detect adverse drug reactions (ADRs), supplementing spontaneous reporting systems. To achieve this objective, EU-ADR will:

- Exploit clinical data from electronic healthcare records (EHRs) of over 30 million patients from several European countries.
- Use a variety of text mining, epidemiological and other computational techniques to analyze the EHRs in order to detect 'signals' (combinations of drugs and suspected adverse events that warrant further investigation).
- Discriminate between signals that indeed point to an ADR, and spurious signals, through a signal substantiation process.
- Develop *in silico* models and simulations of the behaviour of drug and biological systems to augment the understanding of ADRs and spurious signals.
- Rely on experimental screening to test the causal hypothesis generated during the substantiation of signals.
- Implement automated procedures to revise and monitor the conclusions with new patient data and the emerging medical, biological and molecular knowledge.

### Project Description

In this project, an alternative approach towards the detection of ADR signals is being developed to overcome the shortcomings of spontaneous reporting databases and to provide a solid basis for large-scale monitoring of drug safety.

In EU-ADR, a systematic calculation of the occurrence of disease (potentially ADRs) during specific drug use is based on data available in electronic patient records, with special attention to patient groups that are not routinely involved in clinical trials, for ethical or practical reasons.



#### CASE STUDY / PRACTICAL EXAMPLE / SCENARIO

Through the EU-ADR system, regulators may ask pharmaceutical companies to monitor signals related with their drugs in addition to the current spontaneous reporting systems. EU-ADR not only provides a list of safety signals, but it also puts these signals into context. The context contains information on the use of a drug in various European countries, concomitant drug use, background rates of the events in the population, information on biological plausibility and potential genetic susceptibility. Thereby it will allow for estimation of public health impact as well as provide background information on the assessment of causality, which will facilitate regulatory decision making.

Once generated, the signals are substantiated by applying causality criteria (biological plausibility, known reactions). The purpose of this substantiation process is to place the signals in the context of the current biomedical knowledge that might explain the signal.

**EU-ADR searches for evidence that supports casual inference of adverse drug reaction signals.**

## Expected Results & Impacts

The **main outcome** of EU-ADR is to demonstrate that an earlier detection of adverse side effects of drugs is possible by using modern biomedical informatics technologies to efficiently exploit both the massive amounts of available electronic health records (EHRs), and the ever-increasing biological and molecular knowledge.

The project intends to demonstrate that scientific and clinical evidence can quickly and directly be translated into patient safety and, thus, health benefit.

Importantly, in EU-ADR special attention is given to children and other patient groups that are not routinely involved in clinical trials, for ethical or practical reasons. For children, monitoring of adverse events is especially mandated because relatively little is known about ADRs in children. EU-ADR will therefore pay particular attention to the additional requirements posed by the paediatric population.

**EU-ADR seeks to demonstrate that an earlier detection of ADRs is possible.**



### EU-ADR

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- AstraZeneca AB (Sweden)
- Fundació IMIM (Spain)
- Health Search – Italian College of General Practitioners (Italy)
- IRCCS Centro Neurolesi “Bonino-Pulejo” (Italy)
- London School of Hygiene & Tropical Medicine (United Kingdom)
- PHARMO Coöperation UA (Netherlands)
- Società Servizi Telematici SRL (Italy)
- Tel-Aviv University (Israel)
- Università di Milano-Bicocca (Italy)
- Université Victor-Segalen Bordeaux II (France)
- University of Aveiro – IEETA (Portugal)
- University of Nottingham (United Kingdom)
- University of Santiago de Compostela (Spain)
- University Pompeu Fabra (Spain)

**Timetable:** from February 2008 to July 2011

**Total cost:** € 5,880,000

**EC funding:** € 4,500,000

**Instrument:** Collaborative Project

**Project Identifier:** FP7-ICT-2007-215847

### KEYWORDS

Adverse Drug Reactions, Electronic Patient records, Pharmacoepidemiology, Literature mining, Datamining, Machine Learning, Observational Databases, Medical Informatics, Bioinformatics