

## PSIP

### Patient Safety through Intelligent Procedures in Medication



**What is an Adverse Drug Event?** The Institute of Medicine (IOM) definition of an Adverse Drug Event is: “an injury due to medication management rather than the underlying condition of the patient”. Adverse Drug Events harm patients and generate unproductive extra healthcare costs. It is a major public health Issue.

**The PSIP project aimed at developing innovative computer-based applications able to automatically detect situations at risk and to deliver healthcare professionals and patients’ relevant “ad hoc” information helping them to prevent Adverse Drug Events.**

**First challenge: identification of Adverse Drug Events:** There are few statistics available about Adverse Drug Events. In Europe, it is estimated that more citizens die from Adverse Drug Events than from car accidents, the risk being more important for ageing patients suffering from multiple pathologies. The first goal of the PSIP project was to automatically generate knowledge about Adverse Drug Events. As most of patients’ medical information is now available in electronic format and stored in large healthcare repositories, it is possible to exploit these databases to automatically identify Adverse Drug Events.

**Achievements and results:** The project has developed innovative tools to search hospital databases and provide reliable numbers about Adverse Drug Events per country, hospital or medical unit, describing their type, consequences and probable causes. This knowledge about Adverse Drug Events identifies situations at risk in each context of care, depending on the patients’ characteristics and on the place of care. A web tool, the “Adverse Drug Events

scorecards” provides an overview of the frequency of Adverse Drug Events in a hospital (or a medical unit), describing the 56 different Adverse Drug Events identified through a set of 236 rules.

**Statistical results: the incidence of Adverse Drug Events:** One of the expected results of the PSIP Project was the ability to detect potential ADE cases and to compute related statistics. For illustration purpose, the example of hyperkalemia is presented in Table 1. Hyperkalemia is the increase of the potassium ion concentration over 5.3mmol/l, which may lead to lethal cardiac rhythm disorders.

**Table 1: Statistics of hyperkalemia in the PSIP databases**

	Potential ADEs (automated detection)	Confirmed ADEs (expert review)
<b>Hyperkalemia</b>	507 2.05%	271 1.1%

In a sample of 24,753 records extracted from six hospitals, 703 hyperkalemia have been observed. 507 of these hyperkalemia are associated with certain medication (Potential ADEs in table 1). Through an expert review, 271 were confirmed as actual Adverse Events related to the medication. In this sample of medical records, for the 56 different types of Adverse Drug Events, a total of 997 Adverse Drug Events in relation to medications have been detected corresponding to 4% of the hospitalizations.

**As results:**

**• 4% of hospitalization stays may encounter an ADE during the hospitalization, this figure is consistent with the literature**

- The accuracy of the PSIP methods for automated ADE detection is around 50%, which is much better than other automated methods presented in the literature (generally between 5 and 15%).

All the PSIP prototypes are available through a Web portal accessible via the PSIP Web site at : <http://psip.univ-lille2.fr/prototypes/public/>

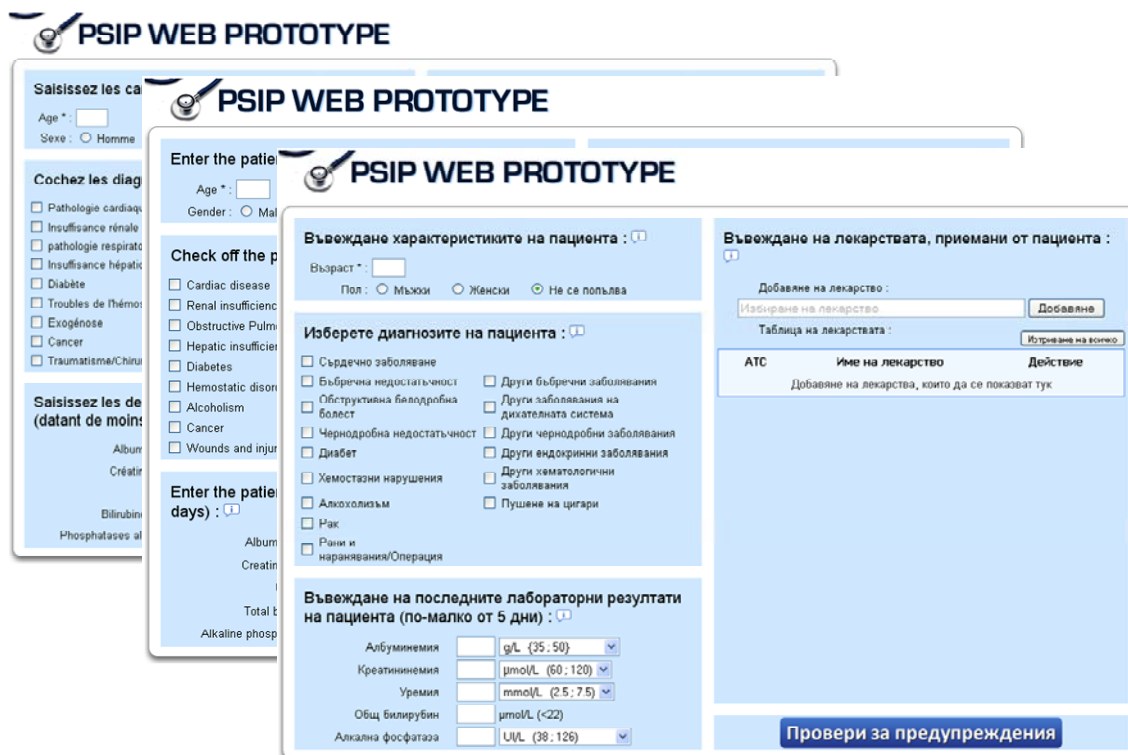


Figure 1: Screenshot of the web prototype user interface translated in French, English and Bulgarian

## Second challenge: the prevention of ADEs

The second PSIP objective was to deliver to the Healthcare Professionals contextual knowledge that can help them characterize a situation and adapt the treatment to avoid potential Adverse Drug Events. To reach this goal, Computerized Decision Support Systems (CDSS) have been designed using the set of 236 rules. When a physician enters a drug prescription, the data related to the patient are extracted and an instant screening is performed. If a risky situation is detected, alerts are produced and displayed to the physician. The Computerized Decision Support Systems are contextualized according to the probability of occurrence of Adverse Drug Events in the environment. Results are provided in the language of the user, currently in French, Danish, English or Bulgarian, as shown in Figure 1.

**User-centered design:** The project adopted a user-centered strategy to the design of prototypes and services to ensure their usability, their adoption by healthcare professionals, and ultimately their efficiency in terms of improvement of patient safety.

**Conclusion:** To date the prototypes are used routinely in different hospitals. The continuous evaluation of their impact on ADE rates is ongoing and has already provided promising and positive preliminary results.

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