# The FreeMedForms project: managing drug-drug interactions, an open source experimentation.

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**freemedforms.com**

**INTRODUCTION:** Drug-drug interactions (DDI) can lead to severe health outcome and are all avoidable [1]. Electronic medical record (EMR) manager can help to improve patient safety as prescribers' and pharmacists' ability to recognize potentially interacting drug pairs is limited [2-3]. Unfortunately, many DDI software are not optimal [4-5].

**THE PROJECT:** The FreeMedForms project was started in October 2008. The main objective is to provide a full EMR and an open source DDI software for practitioners and pharmacists. The project is coded using C++ and the Qt framework [6]. The project is driven by a volunteer community of medical doctors, pharmacists and computer scientists. The code is released under the GPLv3 license. FreeMedForms is supported by open source medical team like Debian Med[7], OpenSuse Medical[8] and Fedora Medical[9].

**DATA SOURCES:** The drug databases are based on governmental free data and the DDI engine is based on a compilation of data sets (mainly extracted from governmental web sites and scientific publications [10-12]). The internationaly recognized ATC classification[19] is used to compute DDI and other patient-drug interactions. The main work consists in translating drugs components to their ATC equivalents. This is done using a specific application called FreeToolBox and have to be checked « by-hand ». There are no automated data-mining. Actually, the DDI engine can manage database for the following countries: France, USA, Canada, South Africa and Belgium.

**THE DDI ENGINE:** As drugs can contain multiple components, the DDI engine analyzes prescriptions by pair of components. Each component that can be translated to its ATC equivalent is analyzed. The DDI engine take the route of administration into account as some does not have any (or a weak) systemic passage. Two kind of alerts are defined: non-blocking alerts are represented by an icon next to the drug inside the prescription view, and blocking alerts require an user validation to pass throught. Threshold of each kind of alert can be defined separately to avoid alert fatigue. Alert fatigue is well known and defined as a phenomenon caused by excessive warnings including irrelevant, non-significant, or repetitious alerts [13]. The timing of alert system is also clearly defined and the engine analyses prescriptions during three different moments: when user search for a drug (warn allergies), when a drug is selected and when the posology is defined.

**INTEROPERABILITY:** FreeDiams, the DDI software of the project, can be connected to any EMR that wishes to take advantage of its expertise using an interoperability interface. This interface uses simple XML files. The GnuMED [14] and some other EMR projects already implement this interoperability.

**CURRENT AND FUTURE DEVELOPMENTS:** Some developments are actually started to implement more complex interactions like potentially inappropriate medication [15-18], renal failure detection. A scientific validation of the DDI engine is required and should be done by independent scientists (to avoid competing conflict and any conflict of interest).

**Repartition of interactions according to their level of risk**

| | | |
|---|---|---|
| **Contra-indication** | **10880** | **2%** |
| **Unadvised** | **25316** | **6%** |
| Glycoprotein P interaction | 40936 | 10% |
| P450 cytochrome interaction | 25900 | 6% |
| Take into account | 216718 | 55% |
| Precaution for use | 79882 | 20% |
| Information | 1722 | < 1 % |
| Undefined | 398 | < 1 % |
| Total DDI per INN | 390376 | 100 % |

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