



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

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INTRODUCTION: Drug-drug interactions (DDI) can lead to severe health outcome and are all avoidable¹. Electronic medical record (EMR) managers can help to improve patient safety, as prescribers' and pharmacists' ability to recognize potentially interacting drug pairs is limited²⁻³. Unfortunately, many DDI software products are not optimal⁴⁻⁵.

THE PROJECT: The *FreeMedForms* project was started in October 2008 as a free and open source work. 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 framework⁶, running under Windows, OS X and Linux. The project is driven by a volunteer community of medical doctors, pharmacists and computer scientists. The code is released under the GPLv3 license²⁰. *FreeMedForms* is supported by open source medical teams like Debian Med⁷, OpenSuse Medical⁸ and Fedora Medical⁹.

DATA SOURCES: The drug databases are based on governmental free data, the DDI engine is based on a compilation of data sets mainly extracted from governmental web sites and scientific publications¹⁰⁻¹². The internationally recognized ATC classification¹⁹ is used to compute DDI and other patient-drug interactions. The main work consists of translating drugs components to their ATC equivalents. This is done using a specific application called *FreeToolBox* and has to be checked manually. There is no automated data-mining. Currently, the DDI engine can manage databases 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 pairs of components. Each component that can be translated to its ATC equivalent is analyzed. The DDI engine takes the route of administration into account, as some routes do not have any (or a weak) systemic passage. Two kinds of alerts are defined: *non-blocking alerts* are represented by an icon next to the drug inside the prescription view, and *blocking alerts* which require acknowledgement before the user moves on. The 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 alerts¹³. The timing of the alert system is also clearly defined and the engine analyzes prescriptions at three different moments: when user searches for a drug (warn allergies), when a drug is selected and when the posology is defined.

INTEROPERABILITY: *FreeDiams*, *FreeMedForms*' prescription module, 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 and some other EMR projects have already implemented this interface.

CURRENT AND FUTURE DEVELOPMENT: Some development is currently underway to implement more complex interactions (mainly patient-drug interactions) like potentially inappropriate medication¹⁵⁻¹⁸, renal failure detection, pregnancy-drug compatibility etc. A scientific validation of the DDI engine is required and should be done by independent scientists (to avoid competing interests or any conflict of interest).

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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 %

