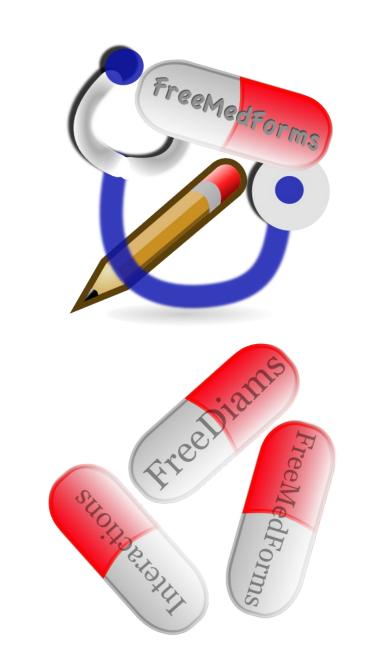


The FreeMedForms project: managing drug-drug interactions, an open source experimentation.



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INTRODUCTION: Drug-drug interactions (DDI) can lead to severe health outcome and are all 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 internationally 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).

Bibliography

- 1 : Committee on Identifying and Preventing Medication Errors. Preventing Medication Errors: Quality Chasm Series. Washington, DC: National Academies Press, 2007.
- 2. Ko Y, Malone DC, Skrepnek GH, et al. Prescribers' knowledge of and sources of information for potential drugedrug interactions: a postal survey of US prescribers. Drug Saf 2008;31:525e36.
- 3. Weideman RA, Bernstein IH, McKinney WP. Pharmacist recognition of potential drug interactions. Am J Health Syst Pharm 1999;56:1524e9.

 4. Saverno KR, Hines LE, Warholak TL, et al. Ability of pharmacy clinical decision-support software to alert users about clinically important drug-
- drug interactions. J Am Med Inform Assoc 2011;18:32e37
- 5. Rodríguez-Terol A, Caraballo MO, Palma D, et al. [Quality of interaction database management systems]. Farm Hosp 2009;33(3):134-46
- 6. The Qt project : http://qt-project.org
- 7. http://wiki.debian.org/DebianMed
- 8. http://en.opensuse.org/Portal:Medical9. http://fedoraproject.org/wiki/SIGs/FedoraMedical
- 10. ANSM, France. Thésaurus des interactions médicamenteuses.
- 11. Flockhart DA. Indiana University School of Medicine. Drug Interactions: Cytochrome P450 Drug Interaction Table.
- 12. Oesterheld Jessica. P-glycoprotein Table the Effect of Drugs and Foods.

 13. Shobha Phansalkar, Judy Edworthy, Elizabeth Hellier, et al. A review of human factors principles for the design and implementation of

consensus panel of experts. Arch Intern Med. 2003 Dec 8-22;163(22):2716-24.

- medication safety alerts in clinical information systems. JAMIA 2010 17: 493-501

 14. http://wiki.gnumed.de

 15. Fick DM, Cooper JW, Wade WE, et al. Updating the Beers criteria for potentially inappropriate medication use in older adults: results of a US
- 16. Holt S, Schmiedl S, Thürmann PA. Potentially inappropriate medications in the elderly: the PRISCUS list. Dtsch Arztebl Int. 2010 Aug;107(31-32):543-51
- 17. Laroche ML, Bouthier F, Merle L, Charmes JP. [Potentially inappropriate medications in the elderly: a list adapted to French medical practice]. Rev Med Interne. 2009 Jul;30(7):592-601.
- 18. McLeod PJ, Huang AR, Tamblyn RM, Gayton DC. Defining inappropriate practices in prescribing for elderly people: a national consensus panel. CMAJ. 1997 Feb 1;156(3):385-91.

19. Anatomical Therapeutic Chemical: http://www.whocc.no/atc

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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 %

Repartition of interactions according to their

level of risk



