The FreeMedForms project
http://www.freemedforms.com

Free DDI Manager app

Create and use your own set of drug interactions

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    - creator, main developer
- Jérôme Pinguet (Fr)
    - today's speaker, contributor
- The FreeMedForms team

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The FreeMedForms project

- a suite of medical applications
  - Electronic Medical Record
  - prescription assistant (Computerized Physician Order Entry)
  - drug interactions checker
  - other coding assistants
- Free Software
- License GPLv3

The FreeMedForms community

- not-for-profit community
  - medical doctors
  - computer workers/scientists
  - pharmacist
- about 50 members (10 active members)
- from France, Canada, Germany, Austria, Australia, New-Zealand
- supported by OpenSuse Medical, Debian Med, Fedora Medical, Arch Linux
- collaboration with free software EMR projects: GNUmed, FreeMed, Care2X, SynapseEMR
- totally independent
  - from pharmaceutical industry
  - from proprietary software industry
- declarations of interests of active members available on website

The FreeMedForms project

- **GNU/Linux, FreeBSD, MacOs X, Win32, Win64**
- C++ using Digia's **Qt** libs
- documented using Doxygen
- massive usage of MVC architecture and **unit-tests**
- Built using dynamic libraries with **plugins architecture**
- database: SQLite and/or MySQL/MariaDb

Classifications to understand drug interactions

Some useful and sometimes problematic classifications

- Drugs

  - ATC Anatomical Therapeutical Chemical classification
  - INN International Non-Proprietary Name

- Diseases

  - ICD10 : International Classification of Diseases version 10

💊⚡ What is a drug interaction?

A drug can interact with

- another drug: **drug-drug interaction** (**DDI**)
- patient's conditions: **patient-drug interaction**
  - acute or chronic disease
  - allergy, intolerance
  - renal filtration
  - age
- food & alcohol: **food-drug interactions** (**FDI**)
- labtest-drug interactions: drug efficiency monitored by lab tests
- Potentially Inappropriate Medications **PIM** specific interactions regarding elderly

Drug interactions

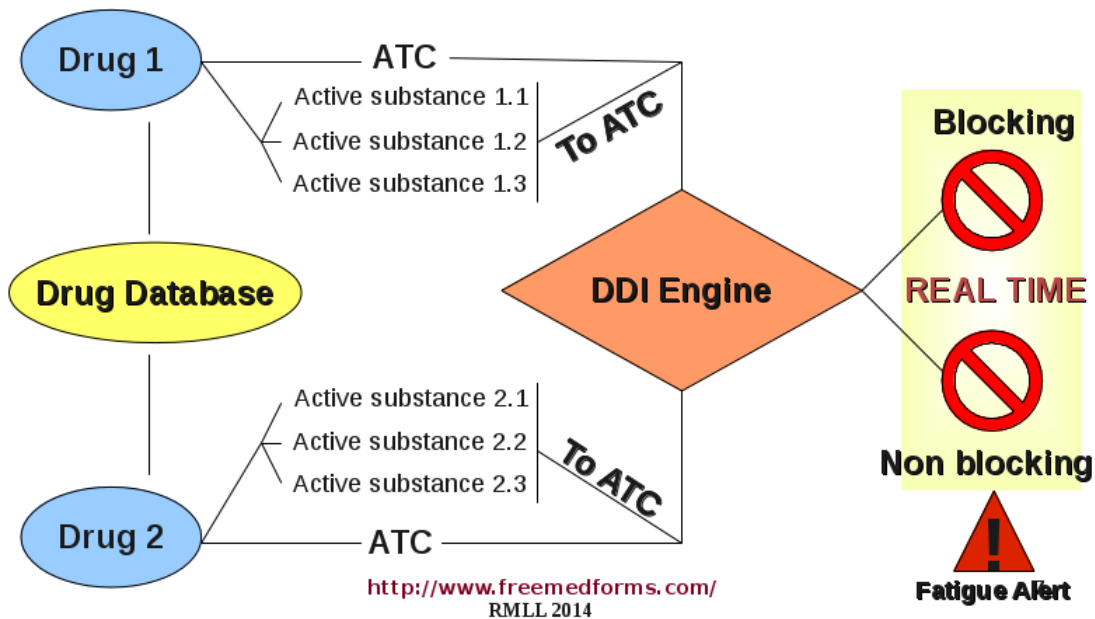**Drug interactions create severe even fatal adverse events**

- **Always growing**
  - Number of marketed drugs
  - Number of known drugs interactions
  - Number of prescribed drugs
  - Preventive treatment
- **Elderly are at increased risk**
  - many diseases means many therapies
  - many diseases means altered physiology

Drug Interactions alert system
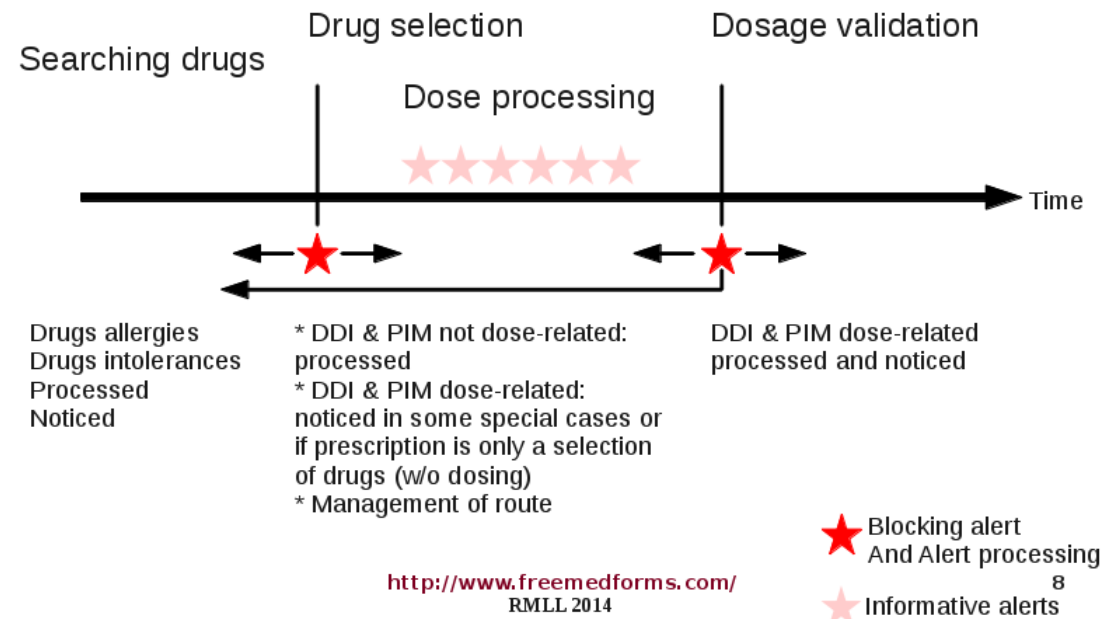

The drug Interactions alert system

Drug 1 — ATC
- Active substance 1.1
- Active substance 1.2 — To ATC
- Active substance 1.3

Drug Database

Drug 2
- Active substance 2.1
- Active substance 2.2 — To ATC
- Active substance 2.3
ATC

DDI Engine

Blocking
REAL TIME
Non blocking
Fatigue Alert

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Timing of the alert system

Searching drugs

Drug selection

Dose processing

Dosage validation

Time

Drugs allergies
Drugs intolerances
Processed
Noticed

* DDI & PIM not dose-related:
processed
* DDI & PIM dose-related:
noticed in some special cases or
if prescription is only a selection
of drugs (w/o dosing)
* Management of route

DDI & PIM dose-related
processed and noticed

★ Blocking alert
And Alert processing

★ Informative alerts

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8

Free DDI Manager

- **Motivation**

    - Allow users to **create** their own drug interaction set
    - Allow users to **share** their own drug interaction set
    - Facilitate the contribution process

- **Current status**

    - Beta version, some features still missing, but mainly usable
    - All FreeMedForms drug databases are created by Free DDI Manager

💊 Free DDI Manager workflow: drug database

This part allows users to prepare any drug database

- Get drug database raw source
  - France
  - USA
  - Canada
  - South-africa
  - Belgium
- Transform raw source into computable source
- Extract all drug components

Free DDI Manager workflow: prepare drug recognization

- Edit ATC classification (not required)
- Edit interactors
  - Interactors database is independant of the drug database
  - 1 interactor can be 1 ATC code, drug component, class/group of ATC/interactors/classes
- Edit all drug components
  - Link with an interactor or ATC code (partially by hand)
  - Check, review, comments: done by hand
- data can be shared between users

Free DDI Manager workflow: create a DDI

- Drug-drug interactions are currently limited to 2 interactors interactions
- DDI are defined using a risk model, a preventive/management message and bibliographic references from PubMed
- DDI must be checked and reviewed by hand
- FreeMedForms community wants to create a free and open source DDI database usable in any country
- We created an «Interactions Committee»
- Legal and medico-legal issues are not yet clearly defined and solved.

Interactions Committee

- Shah et al. 2006 [2]: "high user acceptance of ambulatory computerized prescribing alerts when using a selective knowledge base and minimizing workflow interruptions"
- commercial knowledge bases
  - highly inclusive
  - emphasis on breadth of coverage, not on clinical relevance or severity of adverse events
  - conflicts of interests: often directly or indirectly owned by pharmaceutical industry
- FMF Interactions Committee
  - Free & open source
  - 100% independent
  - review interactions
  - classify: relevance to setting, severity
  - Evidence Based Interactions: references (PubMed), levels of evidence, Summary of Product Characteristics
  - lobby academic, governmental, institutional interactions committees:
    -> publish under free licenses!
    -> use & contribute to Free DDI Manager!

Free DDI Manager workflow: manage datapacks

- Create a datapack and a "datapack server"
- Upload Packs
- Share server configuration
- Users only have to configure your server and select Packs to install

🔋 Alert philosophy[1]

- Two kinds of alerts:
    - **Non-blocking** → icon and tooltip
    - **Blocking** → blocking dialog, require user action
- Alert system provides three levels: low, medium, high
- And an infinite number of **categories** (DDI, PIM, drug duplication, dose checking, allergies, intolerances...)
- **Threshold** of alerts can be adapted by the user for each type of alerts
- Alerts can be **dynamic** (using scripting)
- We do our best to avoid alert fatigue

Alert philosophy

- **related to**
  - One or all users
  - Application (update notification, backup reminder)
  - One patient
  - All patients (eg: for medical prevention, cancer screening)
- « **one shot alerts** » or « **cycling alerts** »
- defined validity period
- edited by user or not
- **validated** / **overriden** & **commented** by user
- scripted

Alert packs

- Alerts can be shared via **alert packs**
- Alert packs are shared via the **datapack manager**
- Alert packs must contain
  - packdescription.xml (datapack description file)
  - All XML alerts
- When the user install an alert pack
  - All alerts are saved
  - All alerts are checked
  - All alerts are executed (if required)
- This is really useful to share medical prevention alerts

Future developments

- Include scripting in interaction processing
  - See roadmap of the VKA plugin (labtest-drug interaction)
- Include pregnancy data
  - [Australian governmental data](http://www.tga.gov.au/hp/medicines-pregnancy.htm)

    http://www.tga.gov.au/hp/medicines-pregnancy.htm
- Include dose / renal failure
  - dosing.de

    https://dosing.de
- Finish PIMs implementation

FreeMedForms needs you!

- A great community
- **Non-profit association** -> official support
  - http://asso.freemedforms.com
- **Wanted**: devs, testers, translators, medical doctors, pharmacists, articles, reviews, retweets
- Unfunded... **$**, **€**, **฿** welcome by the registered not-for-profit association
- Code on GitHub https://github.com/FreeMedForms/freemedforms
- Web http://www.freemedforms.com
- Mailing List freemedforms@googlegroups.com

References

- [1] Phansalkar, S., J. Edworthy, E. Hellier, D. L. Seger, A. Schedlbauer, A. J. Avery, and D. W. Bates. "A Review of Human Factors Principles for the Design and Implementation of Medication Safety Alerts in Clinical Information Systems." Journal of the American Medical Informatics Association 17, no. 5 (September 6, 2010): 493–501. doi:10.1136/jamia.2010.005264
- [2] Shah, Nidhi R, Andrew C Seger, Diane L Seger, Julie M Fiskio, Gilad J Kuperman, Barry Blumenfeld, Elaine G Recklet, David W Bates, and Tejal K Gandhi. "Improving Acceptance of Computerized Prescribing Alerts in Ambulatory Care." Journal of the American Medical Informatics Association: JAMIA 13, no. 1 (February 2006): 5–11. doi:10.1197/jamia.M1868.
- FreeMedForms complete bibliograpical references freely available on our Zotero group: https://www.zotero.org/groups/freemedforms

Thank you!

- Thank you for your attention
- Eric says "Kisses to my wife and children (who support my devs...)"
- Jerome says: "Thank you Eric for coding so fast & well, thanks to the FMF community for your contributions and for sticking with us despite our bad english! :)"

Now I will present a short video of the FreeDDIManager.

[FreeDDIManager video presentation](https://www.youtube.com/watch?v=LgmfcmyCrSU) https://www.youtube.com /watch?v=LgmfcmyCrSU

You will see how easy it is to build and share your own set of interactions.