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# Benchmarking therapeutic drug monitoring software A systematic evaluation of available computer tools

# Background

• Therapeutic drug monitoring (TDM) aims at predicting treatment success, failure or toxicity, and to adjust prescription in consequence<sup>1</sup>.

Treatment is optimized by individualizing dosage regimen based on the measurement



## **Objectives**

- 1. To asses and compare computer tools developed to assist clinicians in the routine individual TDM-guided dosage adjustment.
- 2. To identify suitable specifications for the development of a novel tool designated for microplatforms.

of blood concentrations.

• To maintain concentrations within a target range requires pharmacokinetic and clinical capabilities. Bayesian calculation represent a gold standard TDM approach, but requires computing assistance<sup>2</sup>.

• In the last decades computer programs have been developed to assist clinicians in this assignment<sup>3</sup>.

• The development of miniaturized drug measurement methods will require embedded software to assist clinicians in dosage individualization.

stand ?



Where should I go ?



How do I go there?

Method

• Literature and Internet were searched to identify software.

• Each program was scored against a standardized grid covering aspects such as pharmacokinetic relevance, user-friendliness, computing aspects, interfacing, and storage.

• A consensual weighting factor was applied to each criterion of the grid for its relative importance.

• Six representative clinical vignettes were processed through each of them to assess the robustness of the software.

## Results

- 12 software tools were identified, tested and ranked, representing a comprehensive review of available software.
- MwPharm (1250 € per license) and TCIWorks (free) were best ranked tools but represent sophisticated programs.
- Numbers of drugs handled by the software vary widely (from 2 to 180).

• 8 programs offer the possibility to add new drug models based on population pharmacokinetic data.

• Bayesian computation to predict dosage adaptation based on a blood concentration (*a posteriori* adjustment) is performed by 10 tools, while 9 are also able to propose *a priori* dosage regimens, only based on individual patient covariates such as age, gender, and weight. They mostly converge to similar predictions (when clinical vignette were able to be processed).

 Table I : Categories and overall ranking (top three highlighted in blue)

	MM-USC *Pack	Mw Pharm	TCI Works	DAAL	TDM for R	Antibiotic Kinetics	APK	Kinetics	Kinetidex	TDMS 2000	Data Kinetics	RAD Kinetics
General characteristics												
User interface	10	4	7	6	11	3	1	2	5	9	8	12
Interfacing	5	1	5	5	5	2	2	<sup>3</sup> 2	5	5	5	5
Storage	7	2	8	10	10	10	3	1	5	6	4	9
Report	10	1	7	8	12	9	2	2	6	5	4	10
Cost	4	8	3	6	6	5	1	1	12	8	10	11
Computational aspects	10	3	1	2	11	6	6	6	9	5	4	12
Total	10	3	4	9	11	8	1	2	6	7	5	12
Pharmacokinetic aspects	3											
Population and drug	7	1	6	2	11	9	3	8	5	4	10	12



Time (days)

 Export Simulation is performed based only on chosen data in the history table.
 Orang/L

 Export Simulation Data
 Extensil Viewer of Simulation
 SA Graph
 Sensitivity Analysis

 Export Simulation Crash Points
 Import Graph Points
 Export graph to mage
 Sensitivity Analysis

Screenshot example of MwPharm



#### Screenshot example of TCIWorks



Models	1	3	2	9	10	8	7	6	4	5	11	12
Modularity	7	8	1	1	11	4	4	4	3	9	11	10
Plot	1	3	2	10	11	6	6	6	3	3	6	11
Various	10	3	1	5	12	7	7	9	6	4	2	11
Total	3	2	1	8	11	9	6	7	4	5	10	12
Authors												
Expertise of authors	1	3	2	9	9	6	6	6	12	5	4	9
GLOBAL RANK	6	1	2	9	11	8	3	4	7	5	10	12

## Perspective

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- Computer-assisted therapeutic monitoring gains growing interest and should further improve, especially in terms of user-friendliness, institutional information system interfacing, data storage capacity and report generation.
- It will represent an important component of future microplatforms for point of car drug concentration monitoring.

Ideal dose and Ideal dose= 35 Kel=0.212 1/h	PK parameters 5 mg Q 19 hours r Half-life=3.3 hr	400 mg Q 24 hours
Vd=12.3 L (( CpMax= 38.8 r	0.25 L/kg) ncg/ml CpMin= 0.3 mcg/ml	30' peak = 27.9 mcg/ml +/- 2.8 Trough = 0.2 mcg/ml +/- 0.0
20.10.2011	Fuchs	Unregistered evaluation copy

Screenshot example of APK

## Contact

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### References

Support

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[2] Widmer N et al. Rev Med Suisse 2008
[3] Buffington DE et al. Clin pharmacokinet 1993

