

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

Aline Fuchs (1), Chantal Csajka (1) (2), Yann Thoma (3), Thierry Buclin (1), Nicolas Widmer (1)

(1) Division of Clinical Pharmacology, Centre Hospitalier Universitaire Vaudois and University of Lausanne (2) Section of Pharmaceutical Sciences, University of Geneva and Lausanne, (3) Reconfigurable and Embedded Digital Systems Institute, School of Business and Engineering Vaud, University of Applied Sciences Western Switzerland, Yverdon-les-Bains

CHUV Centre hospitalier universitaire vaudois

Ecole de Pharmacie
EPGL
Genève - Lausanne

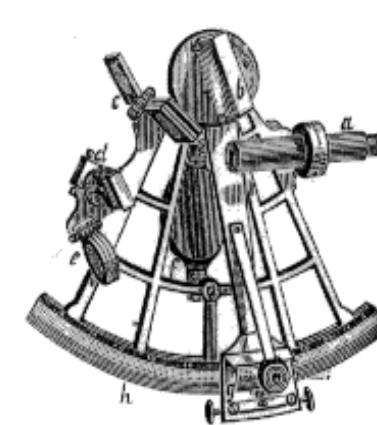
heig-vd
Haute Ecole d'Ingénierie et de Gestion
du Canton de Vaud

Background

- Therapeutic drug monitoring (TDM) aims at predicting treatment success, failure or toxicity, and to adjust prescription in consequence¹.
- Treatment is optimized by individualizing dosage regimen based on the measurement 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 assistance².
- In the last decades computer programs have been developed to assist clinicians in this assignment³.
- The development of miniaturized drug measurement methods will require embarked software to assist clinicians in dosage individualization

Concentration

What can I observe?



Pharmacokinetics



Where do I stand?

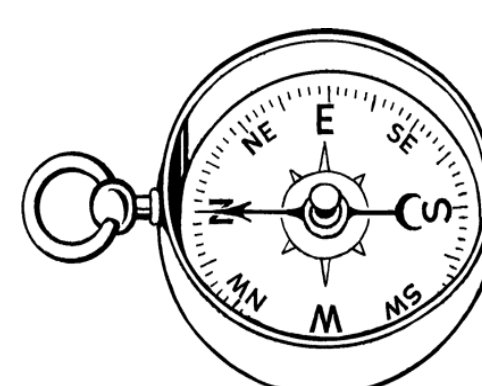
Therapeutic interval

Where should I go?



Dosage adjustment

How do I go there?



Objective

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

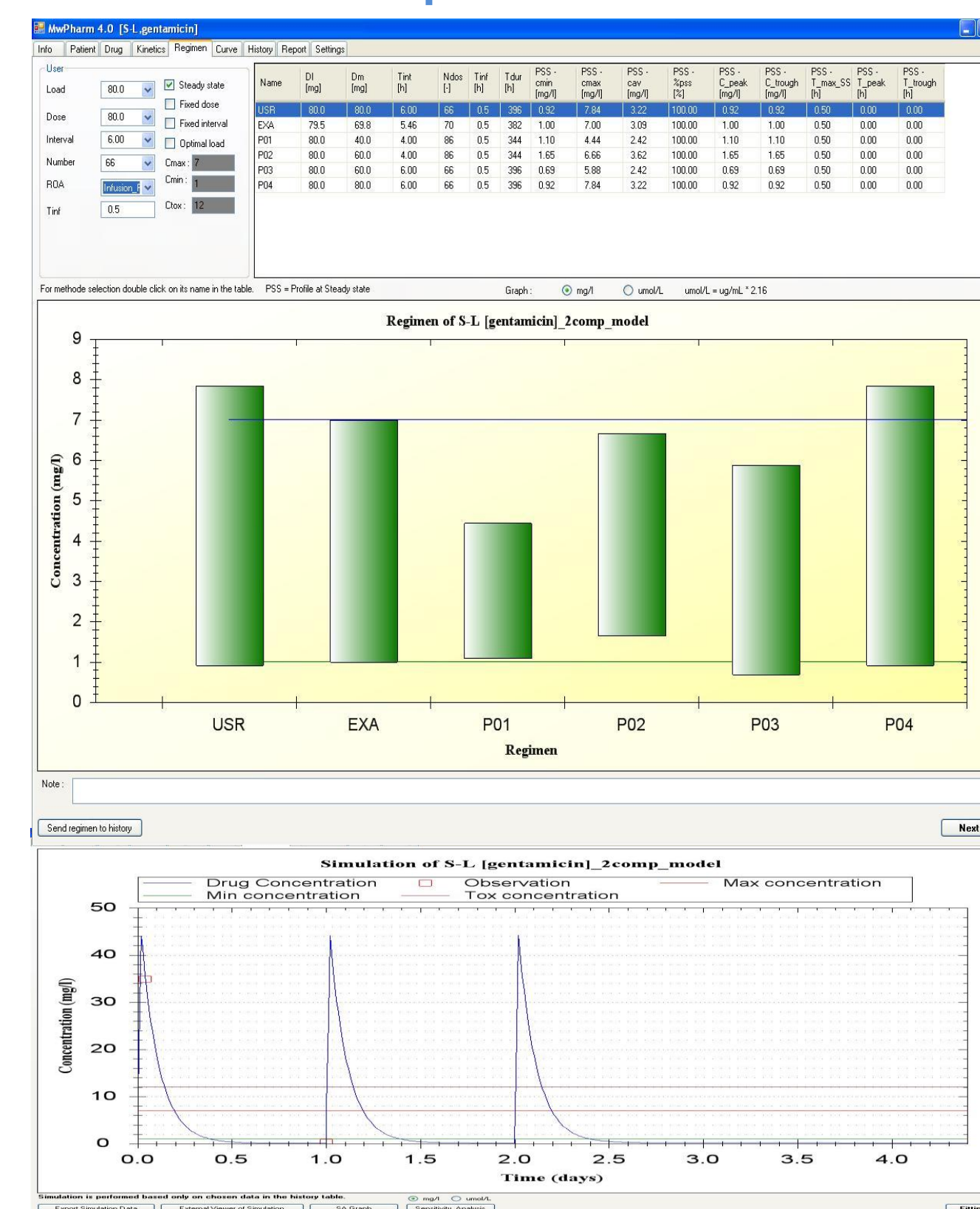
Method

- Literature and Internet were searched to identify software
- Each program was scored against a standardized grid covering pharmacokinetic relevance, user-friendliness, computing aspects, interfacing, and storage
- A weighting factor was applied to each criterion of the grid for its relative importance
- To assess the robustness of the software, six representative clinical vignettes were processed through each of them

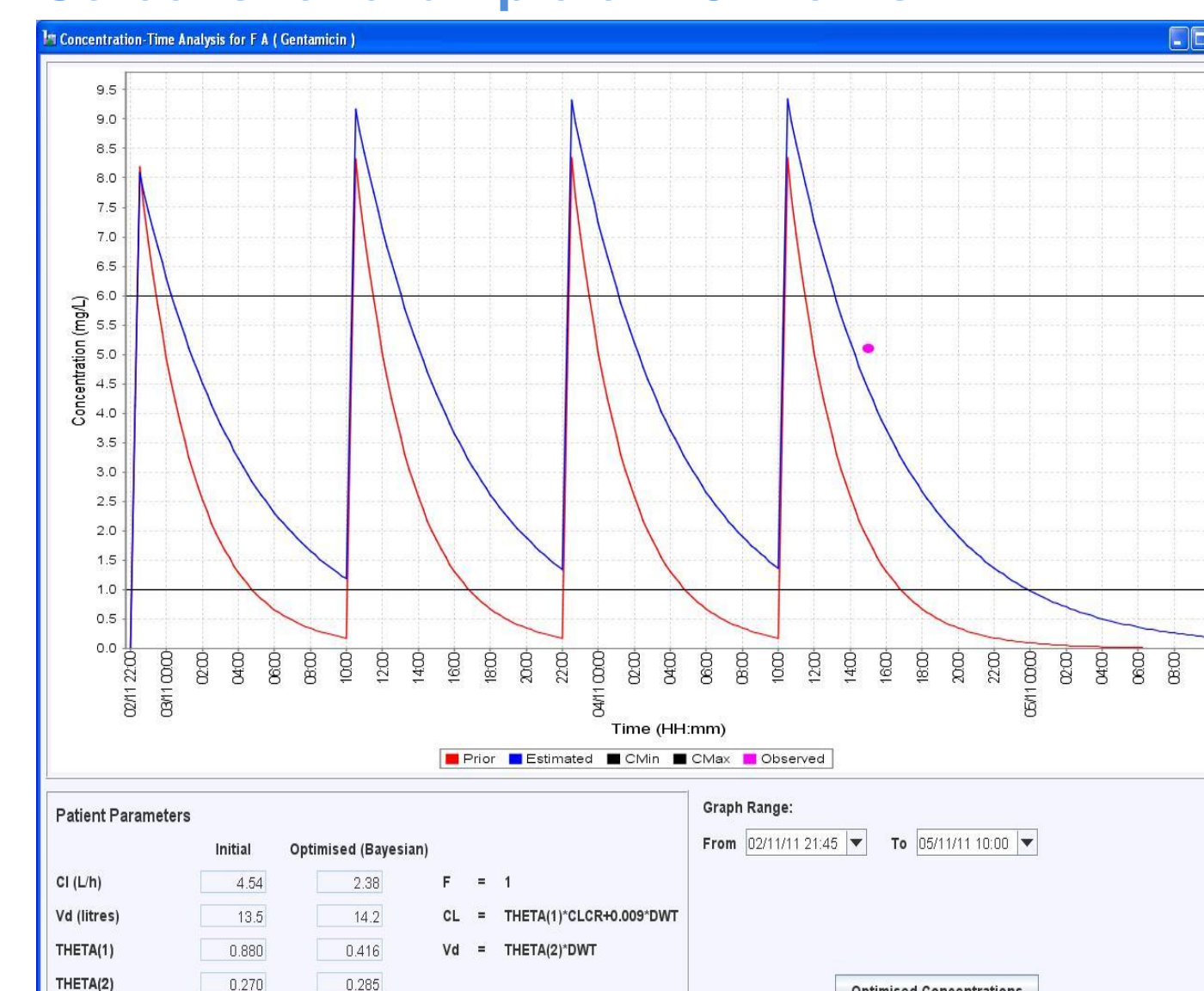
Table I : Category's and overall category's ranking (the top three programs in blue)

	MM-USC *Pack	Mw Pharm	TCI Works	JPKD	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	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												
Population and drug	7	1	6	2	11	9	3	8	5	4	10	12
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 SCORE	6	1	2	9	11	8	3	4	7	5	10	12

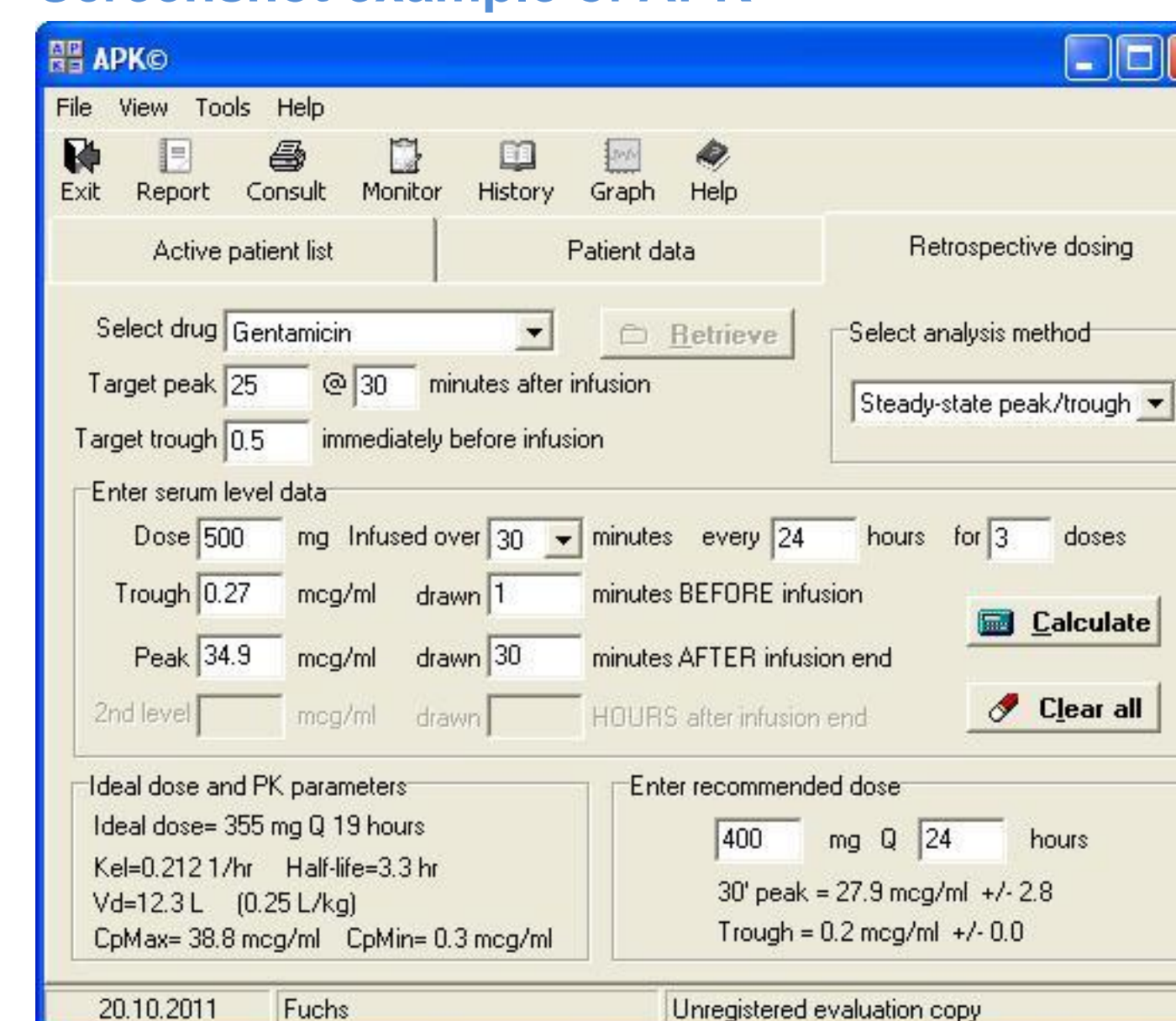
Screenshot example of MwPharm



Screenshot example of TCIWorks



Screenshot example of APK



Results & Perspective

- 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 possible to process).
- 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**.
- This review will support the rational elaboration of a **modern TDM software** in the context of the **ISyPeM project**⁴.

Contact

Aline Fuchs
Division de Pharmacologie Clinique
Centre Hospitalier Universitaire Vaudois (CHUV)
1011 Lausanne, SWITZERLAND
e-mail: aline.fuchs@chuv.ch

References

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