Considerations and Future Directions for the Development of Open-Source, Public License, Pharmacometric Software

Marc R. Gastonguay, Ph.D.

Metrum Research Group

Free Software?

"***Free software*** is a matter of liberty, not price. To understand the concept, you should think of ***free*** as in ***free speech***, not as in ***free beer***."

- Richard M. Stallman

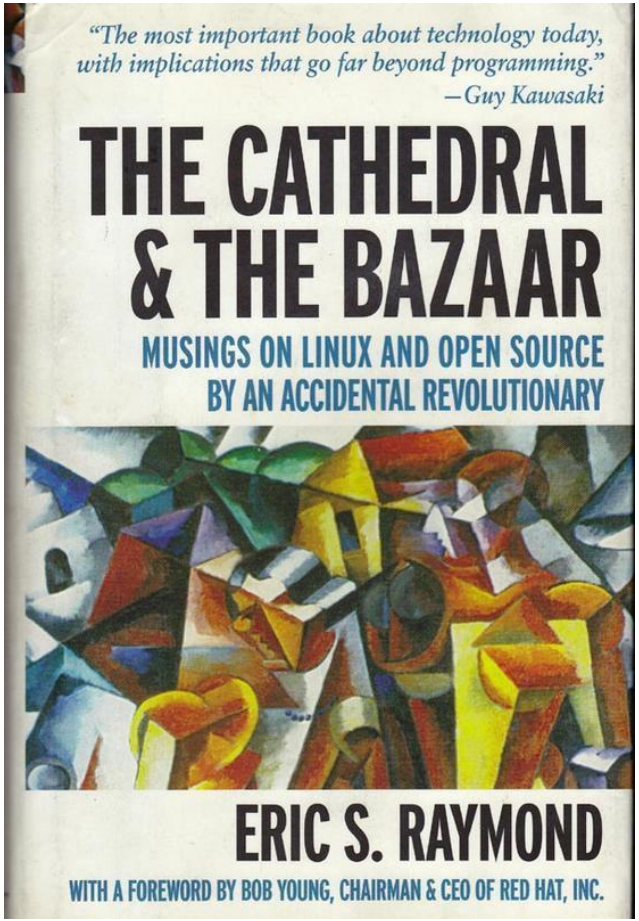
Free Software, Free Society:
Selected Essays of Richard M. Stallman

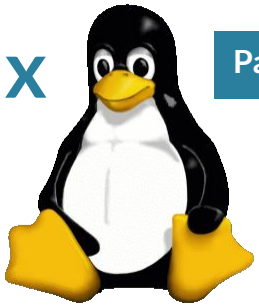
1983 - GNU (GNU's Not UNIX) project
1989 - GPL (General Public License), copyleft

Introduction by Lawrence Lessig

Edited by Joshua Gay

GNU Press
www.gnupress.org
Free Software Foundation
Boston, MA USA





The Cathedral

- Source code is available at each software release, but between-release code is restricted to an exclusive group of software developers (e.g. GNU Emacs and GCC).

The Bazaar

- Source code is developed over the internet in view of the public. Linus Torvalds, leader of the Linux kernel project, considered the inventor of this process.

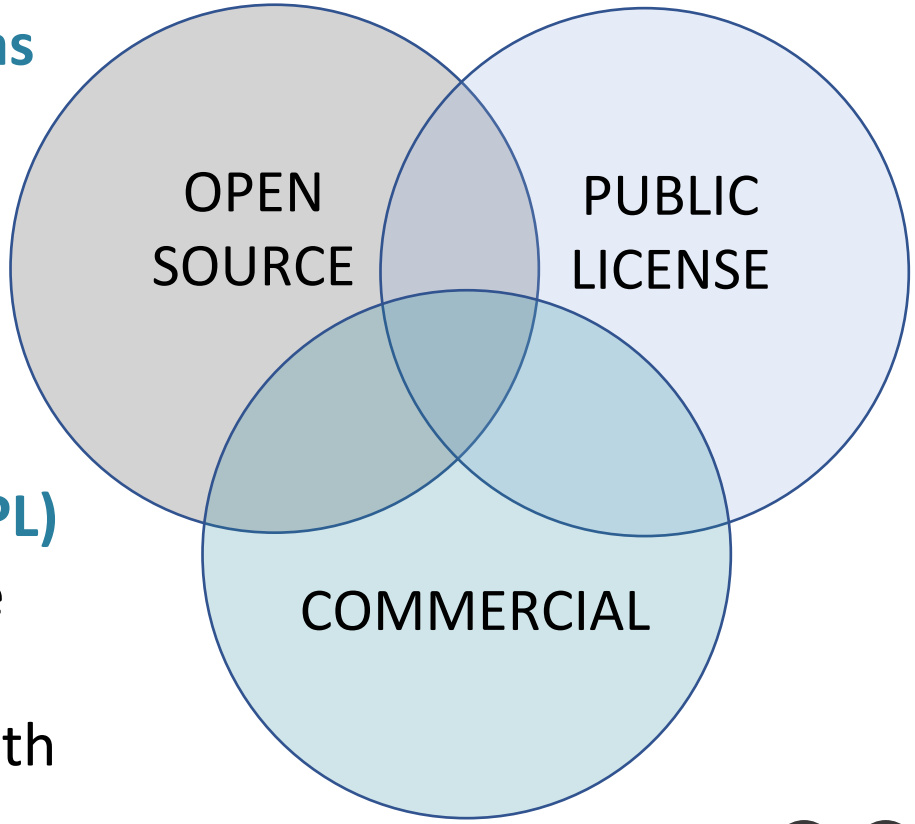
Source Code and Licensing Matter

Commercial software distributed as Open Source code

- Intellectual and practical value for end users
- Limited liberty

Open Source & Public License (OSPL)

- Extends the value across entire community and future tools
- Fosters liberty, creativity, growth



Factors Driving OSPL Software

- Community needs (features, urgency, direction) not met by commercial developers

- Commercial license limits freedom:

"Freedom to use, study, distribute, and modify software" – RMS

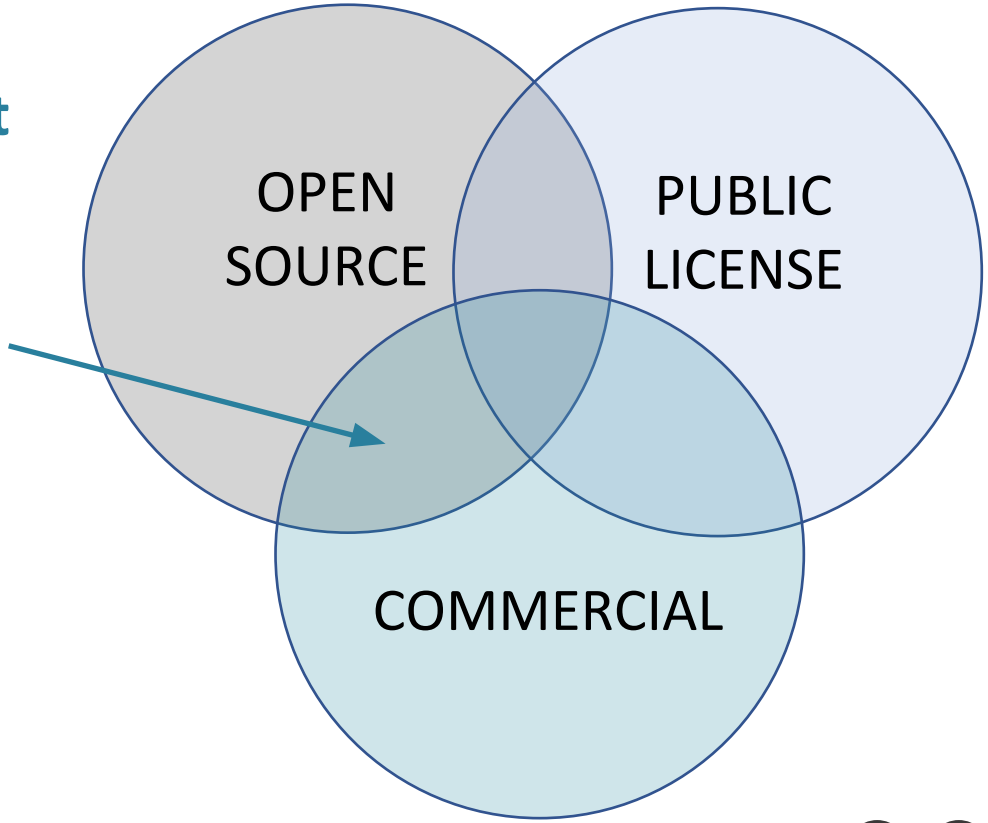
- Full transparency and community involvement leads to more useful software

- OSPL fosters growth of science & technology

A Motivating Example: NONMEM® V 1.1.

Commercial software, copyright UCSF, Distributed by GloboMax

Open Source but not Public License



Fix data truncation bug (use WIDE option on $DATA) and make source code changes:

In C:\NMV\TR\:

Locate this line in READ3.FOR:

```
ELSEIF (VALUE(KK+J).GE.1000.0.AND.WIDE.NE.'Y') THEN
```

Replace with:

```
ELSEIF (VALUE(KK+J).GE.1000.0.AND.WIDE.NE.'Y'.AND.NSP.EQ.1)
THEN
```

Locate and delete the following statement in READF.FOR:

```
    IF (INOBS.GT.9999.AND.WIDE.EQ.'Y') CALL ERRMSG(283,'
',1)
```

https://cognigencorp.com/nonmem/nm/99feb102004.html

An OSPL Solution: NMQual

NMQual:
A Tool to Automate Installation and Facilitate Qualification of NONMEM

PAGE 2005 Meeting
Pamplona, Spain
June 16-17, 2005

Bill Knebel[1], Tim Bergsma[2], Leonid Gibiansky[1], Jeffrey T. Hane[1], Marc R. Gastonguay[1]

PAGE 14 (2005) Abstr 779 [www.page-meeting.org/?abstract=779]
https://bitbucket.org/metrumrg/nmqual/wiki/Home

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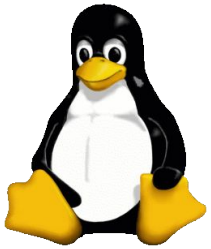
OSPL & Commercial Products/Services



Open Source & Public License Software

- Full functionality for all users

Commercial Products Built Around OSPL

- Value-added solutions

Open Source Software Quality

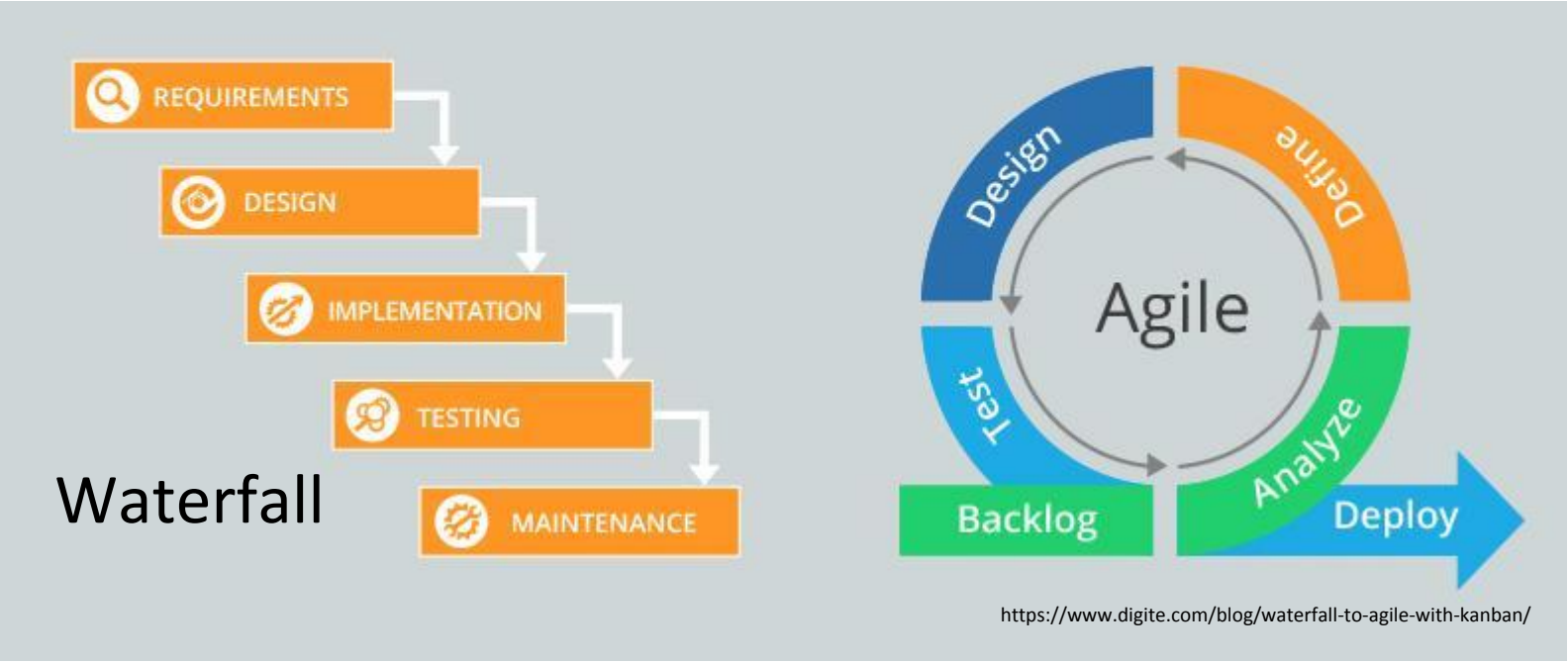
- Professional and Regulatory Standards
  - Software Development Life Cycle (SDLC)
  - Quality documentation

- Full transparency to community (e.g. the Bazaar)

"Given enough eyeballs, all bugs are shallow." - E.S. Raymond

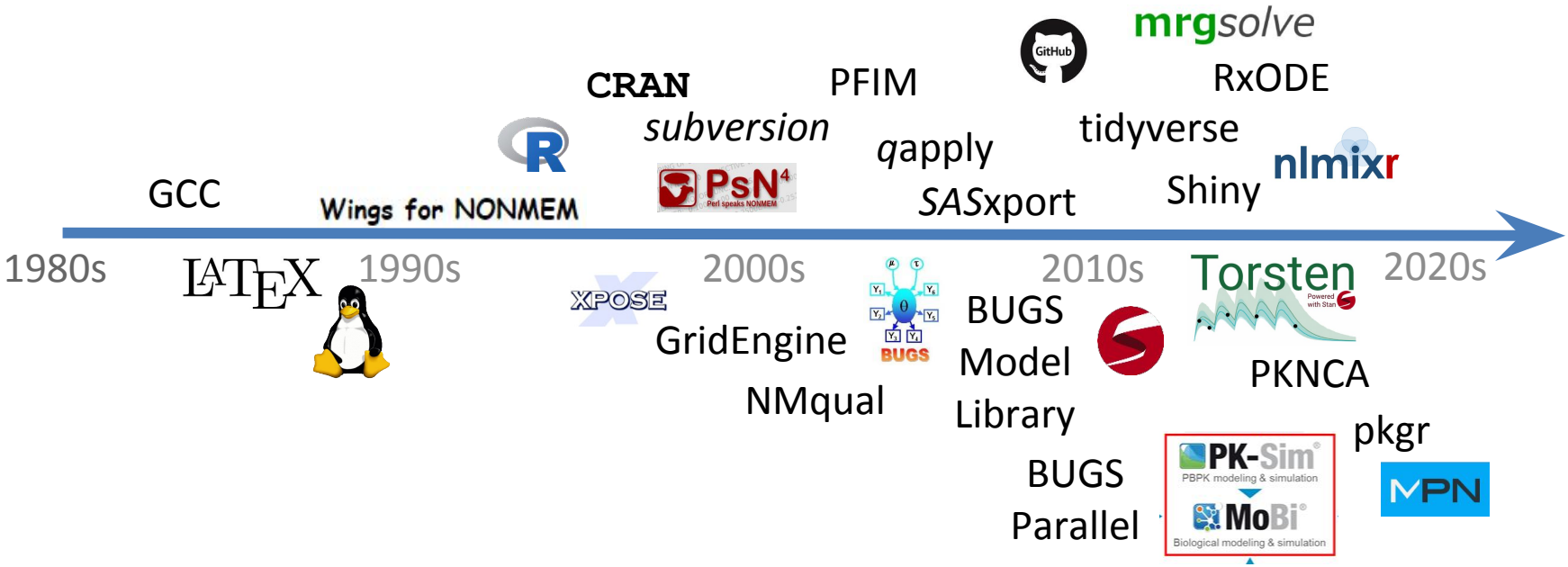
"In the open-source software world, bug reports are welcome." – A. Gelman

Software Development Life Cycle



Open SDLC - https://github.com/metrumresearchgroup/open-sdlc

OSPL Software in Pharmacometrics

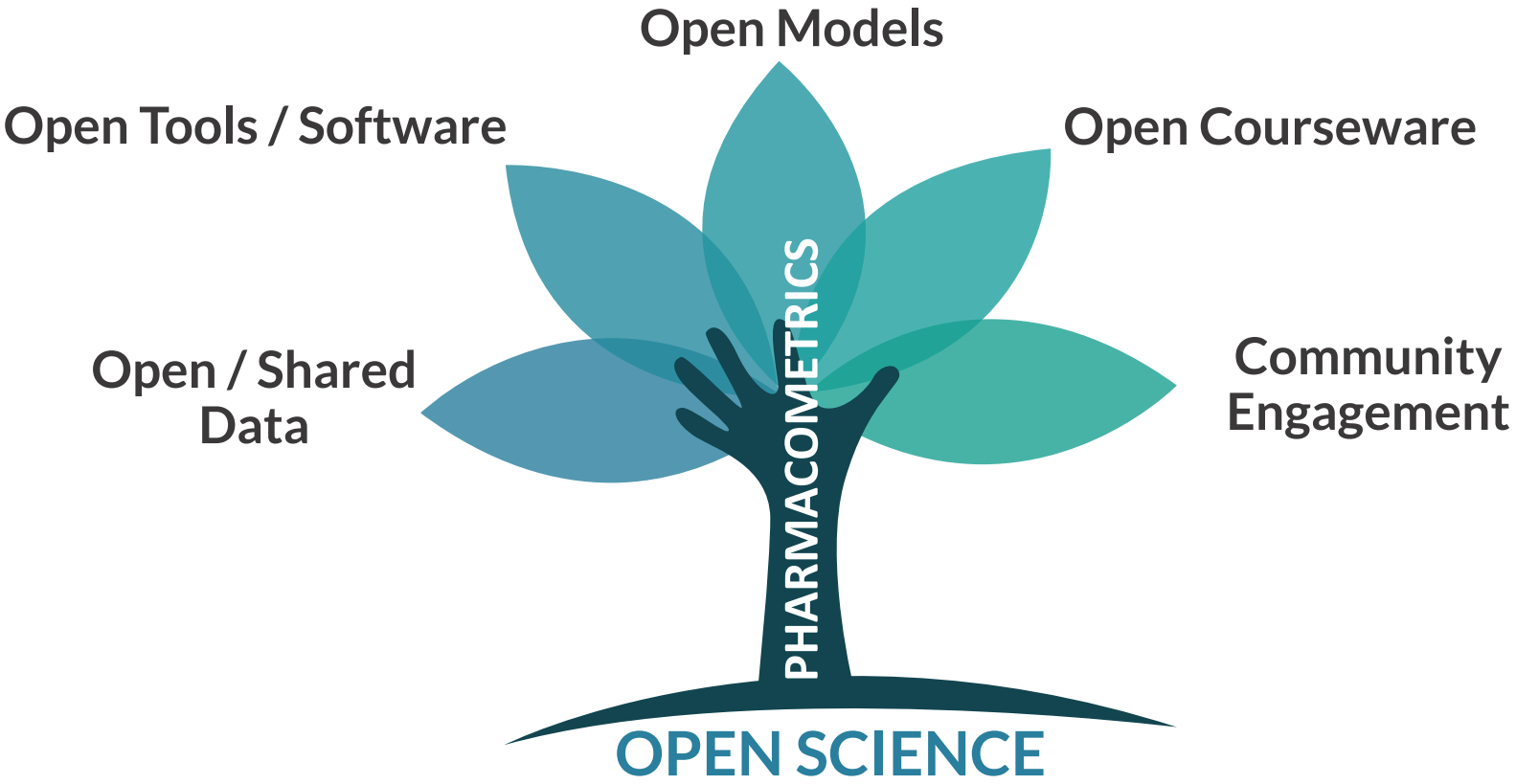


Adapted from: Brian Corrigan, ACoP 2016.
Display may not be inclusive of all open source, public license software used in pharmacometrics.
Suggestions for additions welcome. Send software name, url, and license type to marcg@metrumrg.com.

Which Tools to Select for an Organization

- Tools that meet end-user needs
- Well-supported and well known language or platform
- Quality development practices
- Well organized development team
- Strong community involvement
- Sustainable development project

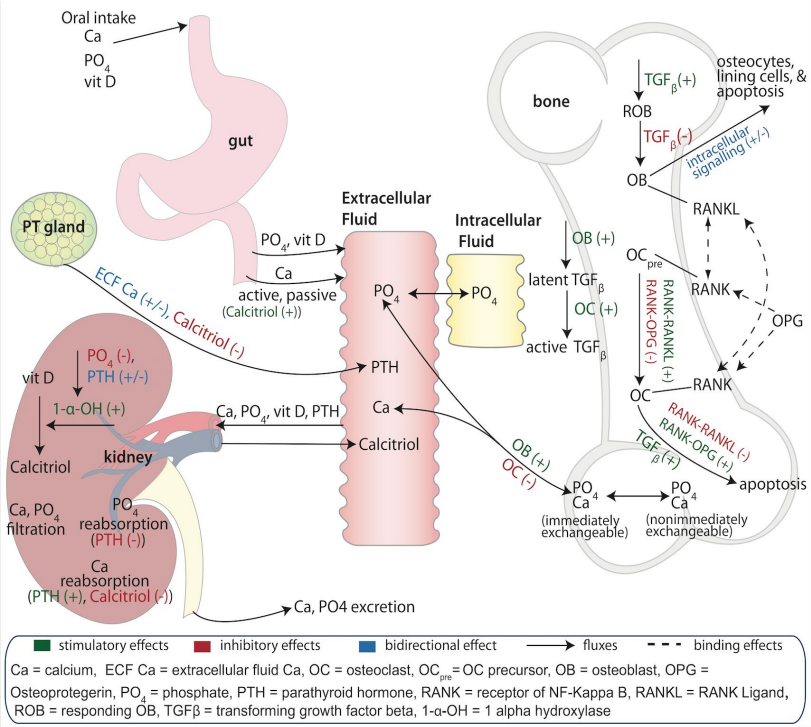
Growing the Science: A Community Responsibility



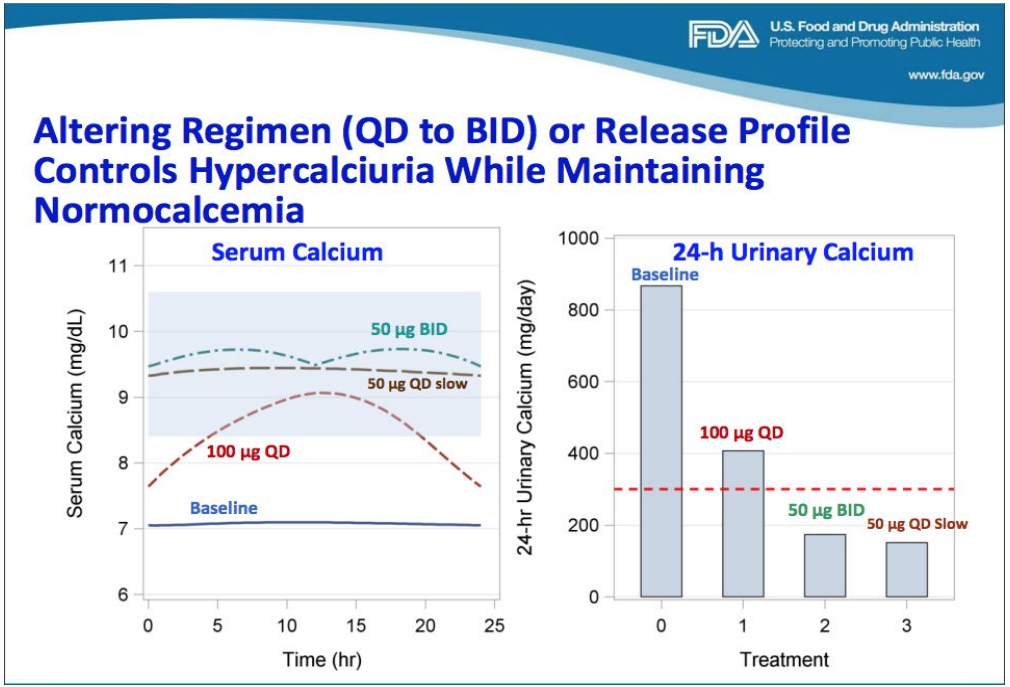
Training & OSPL Software

- Train scientists, not technicians of tools
- Independent thinkers & resourceful problem solvers
- Competency with coding/scripting language
- OSPL Software ensures accessibility
- Community support fosters shared learning
- Global interoperability
- Facilitates open science

Utility of OSPL (*R, mrgsolve*) for Open Science

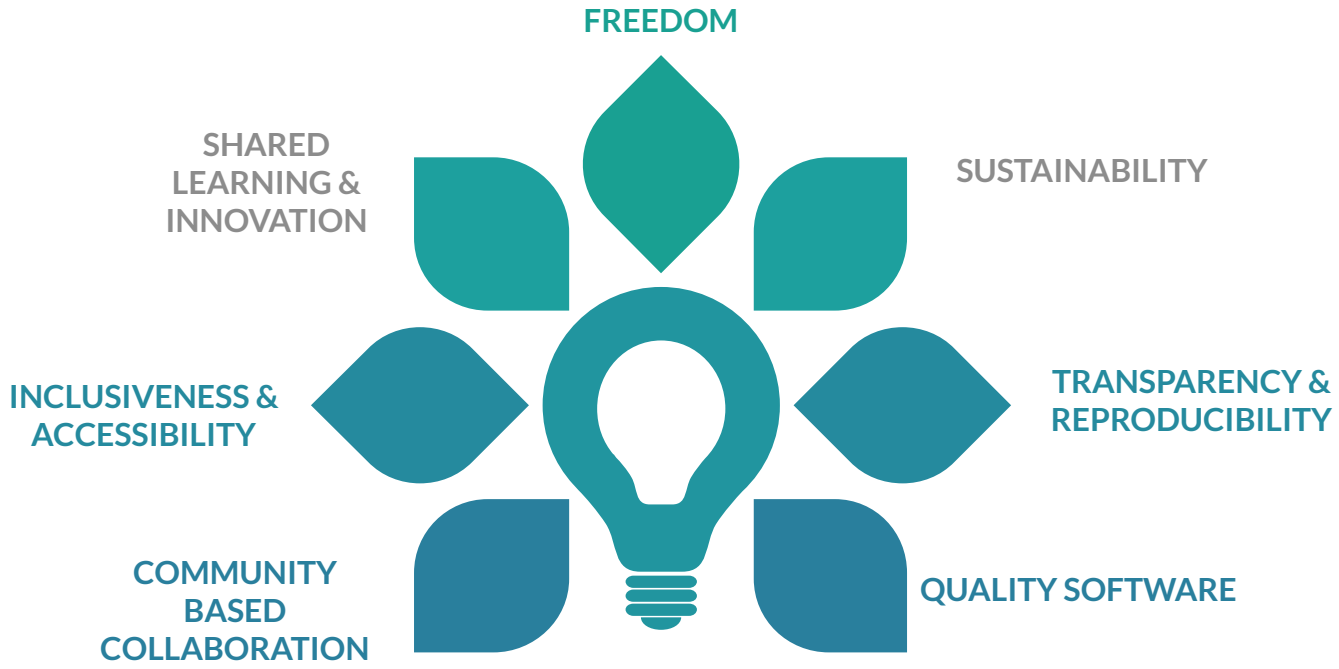


https://github.com/metrumresearchgroup/OpenBoneMin



https://wayback.archive-it.org/7993/20170405215559/https://www.fda.gov/downloads/AdvisoryCommittees/CommitteesMeetingMaterials/Drugs/EndocrinologicandMetabolicDrugsAdvisoryCommittee/UCM416168.pdf

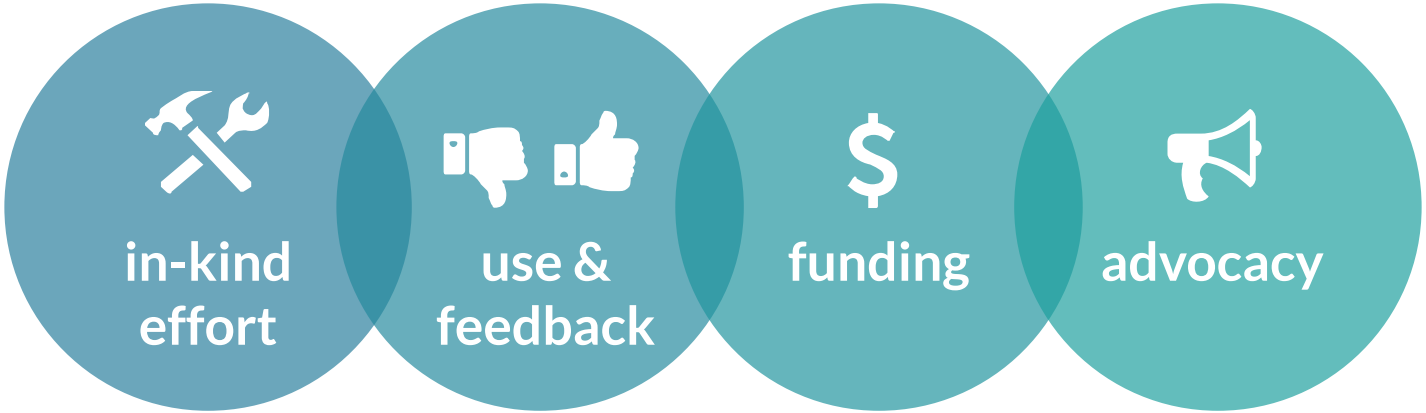
Why OSPL Software in Pharmacometrics?



Should the future of our science be constrained by the imagination and internal agendas of a few commercial software companies?

A Call to Action

Support open-source, public license software projects…



Thank You

Presentation available at https://metrumrg.com/publications/