Code that Cures: Validating GxP-Compliant R Shiny Apps for Clinical Decisions

R/Pharma Virtual Conference

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Validation is more than just checking boxes

Patient Safety

- Critical decisions rely on these applications
- Impact to patient care
- Steep consequences to errors

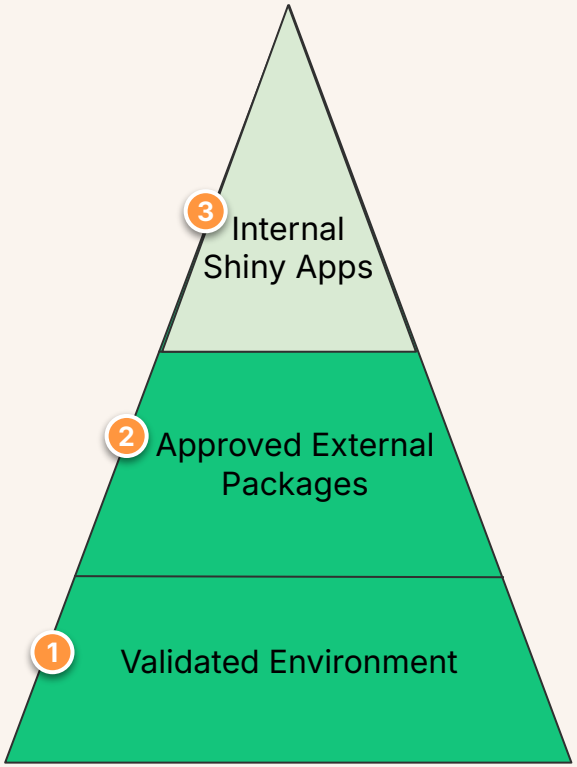
Regulatory Compliance

- 21 CFR Part 11 & ICH E9
- Documented evidence
- Results are reproducible and reliable

Unlocked Innovation

- Efficiency gains
- Risk reduction
- Ensured quality

Building a foundation for Shiny Apps validation



3 Software Development Lifecycle (SDLC) for Validating Apps

- Requirements based development
- Ensures documented quality
- Consider integrating GAMP principles in the SDLC

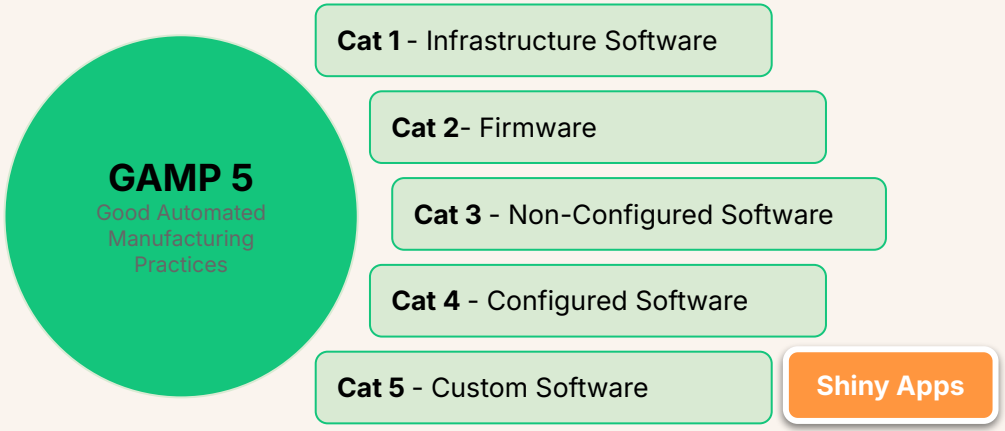
2 Risk Based SOP to Approve use of External Packages

- Measuring and testing quality of a package
- Consider higher quality thresholds for higher impact use cases
- Build vs buy

1 Validating R Installations

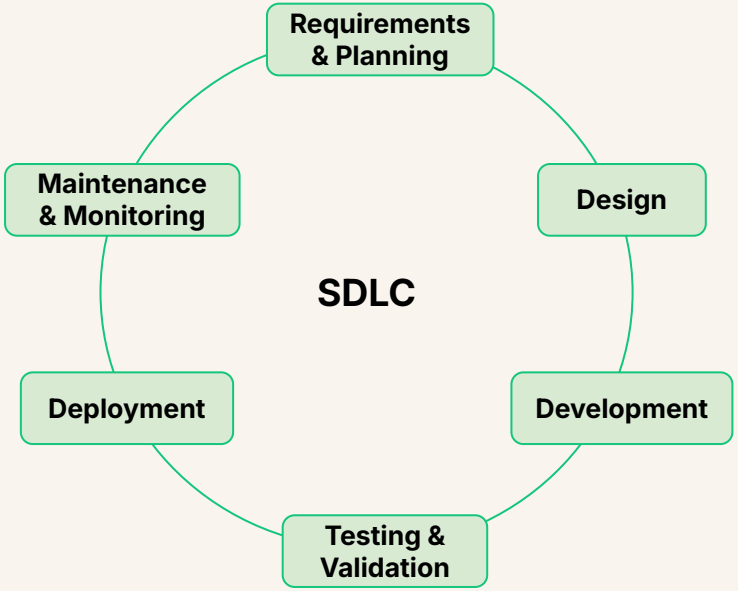
- SOPs to manage risk & define QC for the installation
- Reproducibility & traceability
- Operational tooling

Considering Shiny Apps as GAMP category 5 software



- Developed by the International Society for Pharmaceutical Engineering (ISPE)
- Risk-based framework for ensuring quality, integrity, and compliance
- Impact + complexity
  - Product quality (IP)
  - Patient safety
  - Clinical data integrity
- Categories are increasing in technical complexity

Integrating SDLC and GAMP frameworks to validate Shiny Apps



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GAMP Documentation

Recommended Readings

Regulatory Compliance:

- R: Regulatory Compliance and Validation Issues A Guidance Document for the Use of R in Regulated Clinical Trial Environments: https://www.r-project.org/doc/R-FDA.pdf
- R Validation Hub: https://www.pharmar.org/regulations/
- {renv} https://rstudio.github.io/renv/articles/renv.html

Approving Use of External Packages:

- A Risk-Based Approach for Assessing R Package Accuracy Within a Validated Infrastructure: https://www.pharmar.org/white-paper/
- Phuse Open Source Technology in Clinical Data Analysis: https://phuse-org.github.io/OSTCDA/
- R Package Validation Framework https://phuse.s3.eu-central-1.amazonaws.com/Deliverables/Data+Visualisation+%26+Open+Source+Technology/WP059.pdf
- R Package Qualification: Automation and Documentation in a Regulated Environment https://www.lexjansen.com/pharmasug/2023/SI/PharmaSUG-2023-SI-212.pdf
- External R Package Qualification Process in Regulated Environment https://www.lexjansen.com/pharmasug/2022/SI/PharmaSUG-2022-SI-057.pdf
- {riskmetric}: https://pharmar.github.io/riskmetric/
- Atorus OpenVal: https://www.atorusresearch.com/openval/

SDLC:

- Software Development Life Cycle A Description of R's Development, Testing, Release, and Maintenance Process https://www.r-project.org/doc/R-SDLC.pdf
- R Package Oriented Software Development Life Cycle in Regulated Clinical Trial Environments https://www.lexjansen.com/phuse-us/2020/tt/TT12.pdf
- GAMP 5 Guide, 2nd Edition: https://guidance-docs.ispe.org/doi/book/10.1002/9781946964571?utm_source=google&utm_medium=paidsearch&utm_campaign=gamp5guide_wiley&gad_source=1&gclid=Cj0KCQjwpvK4BhDUARIsADHt9sSnP_AQmCJZFGKcK5yO3O2RO35jNuAK73bOccF8riPQqoCBGY_MGVcaAjNkEALw_wcB
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