First Hope

COMPLETE NOTES

Click here to visit our website

PHARMACY PRACTICAL NOTES

Complete subject and semesters are available on FirstHope app only.

Scan or click here

Click here to get the app >

Available on Google Play

JOIN THE FIRSTHOPE COMMUNITY

Join our Telegram channel

Click here to join Telegram >

Scan or click here

@FirstHopeNotes

Instagram

@firsthope.official

Click here to follow >

YouTube channel

FirstHope-Pharmacy / Live streams

Click here to watch >

WhatsApp channel

Follow FirstHope on WhatsApp

Click here to join >

FirstHope website

firsthope.co.in

Click here to visit >

B.Pharm / D.Pharm / M.Pharm / Pharm.D

Complete subjects and semesters are available in the FirstHope app.

Sensitivity Analysis and Population Pharmacokinetics

Practical 18 - Software and data-analysis practical

Aim

To examine covariate effects, variability and sensitivity in a population pharmacokinetic dataset.

Principle

Population models separate typical parameter values, between-subject variability and residual variability. Covariates can explain part of the variation, but association within a model requires assessment of design, confounding and predictive performance.

Keep the supplied data, transformations, software version, analysis settings and complete output together. Record units explicitly and distinguish assumptions from observations.

Materials and Requirements

- Supplied subject-level dosing and concentration data
- Covariates, units, sampling times and analysis plan
- Spreadsheet or institution-approved analysis software
- Raw-data dictionary and analysis worksheet

Procedure

1. Define the analysis question and the variables, units, identifiers and missing-data conventions in the dataset.
2. Import a working copy and check values against the original file. Inspect ranges, duplicates, timing and unit consistency.
3. Verify subject identifiers, dosing events, actual sampling times and covariate definitions.
4. Specify the structural and variability models and identify covariates justified by the question.
5. Compare prespecified parameter scenarios and examine changes in clinically relevant model outputs.
6. Assess diagnostic plots, uncertainty and predictive checks appropriate to the software and dataset. Record covariate-selection decisions transparently.
7. Retain diagnostics, intermediate calculations and the selected analysis settings. Explain exclusions and sensitivity checks.
8. Write a conclusion that addresses the stated question and the limitations of the design rather than relying on one fitted statistic.

Observations and Record

Enter actual measurements or the supplied teaching data. Record the method, material identity, conditions and units.

Model / scenario	Covariate or parameter	Output change	Diagnostic / interpretation
Base model	Record	Record	Assess
Covariate model	Record	Record	Assess
Sensitivity scenario	Record	Record	Assess

Calculations

• Relative sensitivity can be expressed as percentage change in output / percentage change in the chosen input, over a stated perturbation.
• A covariate relationship must state its units, reference value and functional form.

Worked Example

Illustrative typical clearance changes from 5.0 to 4.0 L/h in a declared parameter scenario.
For the same dose and a linear model, AUC proportional to 1/CL increases by 5.0/4.0 - 1 = 25%.
This is a model sensitivity result, not an automatic dose-adjustment instruction.

Result and Interpretation

• Distinguish explained covariate effects from remaining variability and uncertainty. Describe the population represented by the data.

Precautions

• Keep actual event timing and units intact.
• Avoid selecting covariates solely for a convenient p value.
• Check overfitting and predictions for poorly represented groups.
• Preserve the original dataset and a reproducible record of the analysis.

Viva Questions and Answers

What is between-subject variability?

Variation in model parameters across individuals beyond the stated typical relationships.

Why record reference covariate values?

They define the interpretation of the typical parameter.

Why use predictive checks?

They assess whether the model reproduces important features of the data.

First Hope

COMPLETE NOTES

Click here to visit our website

PHARMACY PRACTICAL NOTES

Complete subject and semesters are available on FirstHope app only.

Scan or click here

Click here to get the app >

Available on Google Play

JOIN THE FIRSTHOPE COMMUNITY

Join our Telegram channel

Click here to join Telegram >

Scan or click here

@FirstHopeNotes

Instagram

@firsthope.official

Click here to follow >

YouTube channel

FirstHope-Pharmacy / Live streams

Click here to watch >

WhatsApp channel

Follow FirstHope on WhatsApp

Click here to join >

FirstHope website

firsthope.co.in

Click here to visit >

B.Pharm / D.Pharm / M.Pharm / Pharm.D

Complete subjects and semesters are available in the FirstHope app.