VNIVERSITAT DE VALÈNCIA

Course Guide
43038 Population pharmacokinetic and pharmacodynamic analysis and simulation of clinical trials

COURSE DATA

Data Subject	
Code	43038
Name	Population pharmacokinetic and pharmacodynamic analysis and simulation of clinical trials
Cycle	Master's degree
ECTS Credits	4.0
Academic year	2023 - 2024

Study (s)

Degree	Center	Acad. year	Period
2138 - M.D. in Research in and Rational Use of Medicines	Faculty of Pharmacy and Food Sciences	1	First term
3103 - Biomedicine and Pharmacy	Doctoral School	0	First term

Subject-matter

Degree	Subject-matter	Character
2138 - M.D. in Research in and Rational Use of Medicines	14 - Population pharmacokinetic and pharmacodynamic analysis and simulation of clinical trials	Optional
3103 - Biomedicine and Pharmacy	1 - Complementos Formación	Optional

Coordination

Name	Department
MANGAS SANJUAN, VICTOR	358 - Pharmacy, Pharmaceutical Technology and Parasitology
MERINO SANJUAN, MATILDE	358 - Pharmacy, Pharmaceutical Technology and Parasitology

SUMMARY

Modeling and pharmacokinetic-pharmacodynamic simulation (FC-FD) is a fundamental tool for the current development of medicines. Analyzing and understanding the physiopathological mechanisms, the temporal evolution of the drug and the resulting pharmacological responses, as well as the associated sources of variability, allows the selection and design of clinical trials with a greater benefit / risk balance.

The objectives of the subject are:
• To know the current role of quantitative clinical pharmacology and the utility of PK-PD models in the process of developing new drugs in the pharmaceutical industry.
• Know the methods for the analysis of the temporal evolution of the concentration of the drug and the effect of this
• Understand the basic fundamentals of population analysis
• Learning methodologies of analysis and simulation of patient populations and pharmacokinetic-pharmacodynamic responses of efficacy and toxicity

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

Previous knowledge of Pharmacokinetics and Biopharmacy, Pharmacology and Physiology is required.

OUTCOMES

LEARNING OUTCOMES

Be able to understand and select pharmacokinetic and pharmacodynamic models that are most appropriate to the observed experimental behavior.

Be able to understand and apply the foundations of population analysis in order to characterize not only the typical behavior of the variable analyzed, but also to adequately characterize the different sources of variability.

Be able to design clinical trials that allow different objectives to be evaluated during the development of the medication.

DESCRIPTION OF CONTENTS

1. Introduction to quantitative clinical pharmacology and modeling and pharmacokinetic-pharmacodynamic simulation

Program;
Definitions;
Application in Industry and role mention in positional individualization within the hospital pharmacy

2. Pharmacokinetics and Pharmacodynamics

Mathematical models of pharmacokinetics and pharmacodynamics. Assumptions and limitations

3. Population analysis

Fixed and random elements. Computer tools

4. Analysis of covariates

Interpretation of the regression variables and their statistical / clinical implication

5. Evaluation of the population model

Elements of evaluation and graphic validation, statistics and clinical

6. Role of modeling and FC-FD simulation in dose selection

Selection of the appropriate dose in different phases of drug development Importance of modeling and FC-FD simulation in dose selection

7. Drug development in special populations: pediatrics, obese patients, kidney failure patients, patients with hepatic insufficiency

Extrapolation and efficacy / safety evaluation in special population groups

8. Pharmacokinetics: application from perspective industry

Different types of analysis and use in the phases of drug development

9. Regulation of drug development: perspective EMA

Regulatory guidelines and medication authorization process

WORKLOAD

ACTIVITY	Hours	% To be attended
Computer classroom practice	30,00	100
Theory classes	10,00	100
TOTAL	40,00	

TEACHING METHODOLOGY

Master classes. Destined to obtain basic knowledge. The dogmatic method combined with the heuristic method will be used to present the fundamental concepts and the most relevant contents of the subject, through the audiovisual media necessary for the development of the same.
Case resolution seminars. Different real situations will be exposed for their resolution and discussion in face-to-face sessions between the expert professional and the students, which will imply an active participation of the student. Expert professionals will be invited on the corresponding topics.
To complete the classroom hours, the materials provided for face-to-face teaching will be adapted, so that the student can access them at any time. Use of the virtual classroom forum to answer questions.
For the practical sessions of the theoretical content, the use of videoconferences and / or the completion of the exercises proposed would be combined using the "Task" option in the virtual classroom.

EVALUATION

Evaluation of theoretical teaching. It will be done through continuous evaluation and represents 40% of the overall score.
The attendance of at least 85% of the theoretical classes is mandatory to obtain and obtain the minimum in the continuous evaluation.
In case the student's attendance at the theoretical classes is less than 85%, and their absence is justified, the student will be evaluated by means of a written exam on the subject taught in the theoretical classes and in the practical cases .
Resolution and discussion of the practical cases. It represents 60% of the overall score.

Evidence of copying or plagiarism in any of the assessable tasks will result in failure to pass the subject and in appropriate disciplinary action being taken. Please note that, in accordance with article 13. d) of the Statute of the University Student (RD 1791/2010, of 30 December), it is the duty of students to refrain from using or participating in dishonest means in assessment tests, assignments or university official documents.

In the event of fraudulent practices, the "**Action Protocol for fraudulent practices at the University of Valencia**" will be applied (ACGUV 123/2020): https://www.uv.es/sgeneral/Protocols/C83sp.pdf

REFERENCES

Basic

- P Bonate. Pharmacokinetic-Pharmacodynamic modeling and simulation. Springer. 2006
-EFPIA MID3 Workgroup. et al. Good practices in model-informed drug discovery and development: Practice, application, and documentation. CPT Pharmacometrics Syst. Pharmacol. 5, 93122 (2016).
-Derendorf H, Meibohm. Modeling of pharmacokinetic/pharmacodynamic (PK/PD) relationships: concepts and perspectives. Pharm Res 1999; 16: 176-185.
-Marshall SF. Good Practices in Model-Informed Drug Discovery and Development: Practice, Application, and Documentation. CPT. 2016.
-Milligan P. Model-Based Drug Development: A Rational Approach to Efficiently Accelerate Drug Development. Nature. 2013.
-Moore H. How to mathematically optimize drug regimens using optimal control. JPKPD. 45:127-137. 2018.
-Peletier LA, Gabrielsson J. Impact of mathematical pharmacology on practice and theory: four case studies. JPKPD. 45:3-21. 2018.
-Nguyen, T.H., Mouksassi, M.S. & Holford, N. et al. Model Evaluation Group of the International Society of Pharmacometrics ISoP Best Practice Committee. Model evaluation of continuous data pharmacometric models: Metrics and graphics. CPT Pharmacometrics Syst. Pharmacol. 2016.