

Course unit name: CLINICAL PHARMACOKINETICS OF ANTINEOPLASTIC DRUGS

1.- General information

Code	303008	Plan		ECTS	3
Type	Elective	Course	2024/2025	Periodicity	1 st Semester
Department	Pharmaceutical Sciences				
Virtual Platform	Platform:	Studium:			
	URL de Acces:	https://studium.usal.es/			

Faculty

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2.- The course in the context of the Master's Program

Training Module
Thirth block (out of six) of master program organization.
General aim of the subject
The objective of this subject is to review and apply the basic concepts of clinical pharmacokinetics (PK) together with " <i>in silico</i> " tools for optimization of the pharmacological treatment of cancer diseases. Clinical PK contributes to the precision medicine in personalising drug treatments according to patient characteristics. In addition, therapeutic drug monitoring (TDM) is addressed as a tool for dosage individualization to improve clinical outcomes in terms of efficacy and/or safety.
Professional specialization
This topic is oriented to researchers and clinicians involved in clinical investigation, drug development and improvement of antineoplastic drugs. These include pharmacists, , biologists, biotechnologists and other professionals integrated in multidisciplinary groups

working on optimization of pharmacological treatment of cancer diseases.

3.- Previous recommendations

A degree on life sciences topics.

4.- Aims of the subject

To provide theoretical and practical knowledge about antineoplastic drugs oriented to the study of its pharmacokinetics (PK) and the main factors responsible for PK variability.
To acquire the ability to apply "*in silico*" and TDM tools to incorporate PK variability for precision dosage in the clinical practice.

Specific aims:

- To know the mechanism of action of the main antineoplastic drugs used in the clinical practice
- To understand the population pharmacokinetic (PopPK) modeling and simulation methodology and the factors with a relevant impact on patient exposure to drug (demographics, physiopathological, genetics, etc.)
- To study the concepts and tools regarding TDM of antineoplastic drugs in the clinical routine
- To learn about physiological based pharmacokinetic (PBPK) modeling and simulations approach and its application to *in silico* clinical trials
- To achieve a holistic knowledge on the operation in a hospital pharmacy service for development, validation and follow-up of oncological therapies

5.- Contents

TOPICS (LECTURES):

1. Mechanism of action of the main anticancer drugs used in the clinical practice
2. Clinical pharmacokinetics: basic concepts and application to antineoplastic drugs
3. Population pharmacokinetics (PopPK)
4. Physiological Based Pharmacokinetics (PBPK)
5. Model-informed precision dosing and follow-up criteria in oncology treatments

SEMINARS and HANDS-ON:

1. Data handling and Bayesian estimation
2. Implementation of population pharmacokinetic models
3. Parameters estimation of antineoplastic drugs: case reports
4. Application of PBPK models to oncology patients
5. *In silico* clinical trials
6. Development and validation of the oncology therapy in a hospital pharmacy service

6.- Skills to be acquired

Basic skills

Understanding the usefulness of clinical PK to evaluate factors with a significant impact on the response to pharmacological treatments
 Application of dosage individualization PK tools in the oncological patient
 Ability to use the PopPK models to improve the efficacy and safety of treatments with antineoplastic drugs
 Application of PBPK models for “first-in-human” dose estimation and dosage individualization in oncologic patients
 Pharmacy validation and follow-up of oncological therapies in a University Hospital

Specific skills

- Interpretation and aplicacion of TDM results to optimize and individualize pharmacological treatments with antineoplastic drugs
- Using pharmacokinetic information to select the dosage regimen with the optimal benefit/risk ratio for antineoplastic drugs
- Ability to perform clinical trials in virtual populations
- Understanding the application of PK models for dosage optimization
- Understanding the multidisciplinary of the clinical team involved in the validation and follow-up of onco-hematologic therapies

7.- Teaching methodology

- Introductory activity
- Lectures
- Seminars
- Hands-on
- Case reports discussions
- Focused activities: presentation, analysis and proposals related to scientific papers

8.- Estimated learning time

		Hours tutored by the teacher		Individual work (hours)	TOTAL HOURS
		Attendance required (hours)	Distance learning (hours)		
Lectures		11	8	10	29
Practices	- In classroom				
	- In laboratory				
	- In computer classroom	6			6
	- Countryside				
	- Visualization classroom				
Seminars		4		2	6
Work presentations and debates		7		8	15
Tutorials		2		2	4
Online activities					
Work preparation			5	7	12
Other activities		3			3
TOTAL		33	13	29	75

8.- Estimated learning time

Books

Individualizing Dosage Regimens of Antineoplastic Agents. In Individualized Drug Therapy for Patients: Basic foundations, Relevant software and clinical applications. Ed. Jelliffe R and Neely M. Elsevier. 281-306, 2017.

A First Course in Pharmacokinetics and Biopharmaceutics by David Bourne:
<http://www.boomer.org/c/p4/>

Scientific Journals

- Therapeutic Drug Monitoring
- Clinical Pharmacokinetics
- British Journal of Clinical Pharmacology

Recommended lecture

- Veal GJ, et al. (2019) Pharmacodynamic Therapeutic Drug Monitoring for Cancer: Challenges, Advances, and Future Opportunities. Ther Drug Monit;41:142–159.
- Guidi M, eta al (2020). Parametric Approaches in Population Pharmacokinetics. J Clin Pharmacol. Oct 26. doi: 10.1002/jcph.1633. Epub ahead of print. PMID: 33103774. <https://doi.org/10.1002/jcph.1633>
- Darwich, A. S. et al. (2021). Model-Informed Precision Dosing: Background, Requirements, Validation, Implementation, and Forward Trajectory of Individualizing Drug Therapy. Annual Review of Pharmacology and Toxicology, 61(1), 225–245. <https://doi.org/10.1146/annurev-pharmtox-033020-113257>
- Mueller-Schoell A. et al. (2021) Therapeutic drug monitoring of oral targeted antineoplastic drugs. European Journal of Clinical Pharmacology 77:441–464. <https://doi.org/10.1007/s00228-020-03014-8>

10.- Assessment

Assessments on the performance of the student

Continuous follow-up of the knowledge, skills and abilities acquired by the students.
Student participation will be highly appreciated and positively taking into account.
Attendance and active participation in lectures and seminars (hands-on).
Comments and proposals to the case-studies
Scientific accuracy of the commentaries and answers to the questions
Presentation and debate of a scientific paper

Recommendations

Active participation in the proposed activities
Debate about the multidisciplinary of the oncological treatments.