Liverpool John Moores University

Title:	QUANTITATIVE METHODS FOR PHARMACEUTICAL SCIENCE AND PRACTICE
Status:	Definitive
Code:	**5500PPPHAR** (111540)
Version Start Date:	01-08-2011

Owning School/Faculty:	Pharmacy & Biomolecular Sciences
Teaching School/Faculty:	MAHSA College

Team	emplid	Leader
Philip Rowe		Y

Academic Level:	FHEQ5	**Credit Value:**	12.00	**Total Delivered Hours:**	58.00
Total Learning Hours:	120	**Private Study:**	62		

Delivery Options

Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	38.000
Practical	6.000
Workshop	11.000

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS1	Exam 1. Calculations and MCQs covering all learning outcomes except 10	80.0	2.00
Report	AS3	Coursework	15.0	
Exam	AS2	Exam 2. MCQs covering learning outcome 10	5.0	1.00

Aims

To achieve or enhance theoretical understanding and to develop practical competence in the use of quantitative methods relevant to pharmaceutical science and practice. The areas covered are:

1) Pharmacokinetics - The mathematical parameters that describe the movement of drugs into and around the body and their elimination. The rational design of dosage regimen based upon these concepts.
2) The evaluation of clinical trial evidence - The detection of differences in clinical outcomes in terms of both statistical and practical significance.
3) Pharmaceutical calculations - A revision and re-inforcement of concepts initially introduced in year 1.

Learning Outcomes

After completing the module the student should be able to:

1	Describe the physical meaning and pharmaceutical significance of pharmacokinetic parameters
10	Perform basic pharmaceutical dosage calculations
2	Recognise circumstances where drug disposition is likely to be significantly altered
3	Perform dosage calculations based upon population data and therapeutic drug monitoring data
4	Recognise that some drugs display non-linear kinetics and the therapeutic significance of this
5	Critically appraise the methods of randomisation used in an experiment or clinical trial
6	Test hypotheses, utilising parametric statistical methods that compare two or more mean values and interpret the results both in terms of statistical significance and in terms of practical superiority, equivalence or non-inferiority
7	Decide when a non-parametric method may be preferable to its parametric equivalent
8	Recognise the difference between classification and measurement data and apply suitable tests to classification data
9	Identify those aspects of any trial/experiment that will influence necessary sample size

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

EXAM	1	2	3	4	5	6	7	8	9
RPT	1	2	3	6	7	8			
EXAM	10								

Outline Syllabus

i) Pharmacokinetic parameters - volume of distribution, absorption and elimination rate constants, bioavailability, salt factors, half life, area under the curve, extraction ratio and clearance
ii) Pathological and physiological factors causing significant changes in kinetics
iii) Specific regimen - single iv bolus injection into one or two compartment systems, constant iv infusion, multiple dosing

iv) Design and monitoring of therapeutic regimen for digoxin, lithium, theophylline and aminoglycosides
v) Simple, block and dynamic randomisation
vi) Two independent samples t-test, paired samples t-test, one and two way analyses of variance, interaction, Dunett's & Tukey's tests for multiple comparisons, data transformations
vii) Equivalence limits, practical/clinical superiority, equivalence and non-inferiority
viii) Mann-Whitney, Wilcoxon paired samples & Kruskal-Wallis tests and Spearman rank correlation
ix) Chi-square tests for goodness-of-fit and contingency tables
x) Power and calculation of necessary sample size
xi) Pharmaceutical calculations including concentrations, dilutions, dosages based upon body weight, number of dosage units required, isotonicity, and trituration

Learning Activities

Lectures, tutorials, workshops and computer based workshops

References

Course Material	Book
Author	Rowland, M Tozer, TN
Publishing Year	1995
Title	Clinical pharmacokinetics
Subtitle	Concepts and applications
Edition	3rd ed
Publisher	Williams and Wilkins
ISBN	0-6830-7404-0

Course Material	Book
Author	Winter ME
Publishing Year	2004
Title	Basic clinical pharmacokinetics
Subtitle	
Edition	4th ed
Publisher	Lippincott Williams & Wilkins
ISBN	0-7817-4147-5

Course Material	Book
Author	Campbell MJ & Machin D
Publishing Year	1999
Title	Medical statistics
Subtitle	A commonsense approach
Edition	3rd ed

Publisher	Wiley
ISBN	0-471-98721-2

Course Material	Book
Author	Bolton, S
Publishing Year	1997
Title	Pharmaceutical statistics
Subtitle	Practical and clinical applications
Edition	3rd
Publisher	Marcel Dekker
ISBN	0-8247-9812-0

Course Material	Book
Author	Zar, JH
Publishing Year	1999
Title	Biostatistical analysis
Subtitle	
Edition	4th ed
Publisher	Prentice Hall
ISBN	0-13-082390-2

Course Material	Book
Author	Rowe, PH
Publishing Year	2007
Title	Essential statistics for the pharmaceutical sciences
Subtitle	
Edition	1st
Publisher	John Wiley & Sons
ISBN	9780-4700-34682

Notes

Examination 2 (Covering learning outcome 10) must be passed with a mark of at least 60% in order to pass the module.

The module gives students sufficient expertise in quantitative methods to allow them to apply pharmacokinetic principles in a clinical setting, appreciate the use of statistics in published research and to carry out analyses of their own data. It also allows them to progress towards full competence in pharmaceutical calculations.