

COURSE DESCRIPTION

Academic year: 2022/2023	
University: Comenius University Bratislava	
Faculty: Faculty of Pharmacy	
Course ID: FaF.KFChL/01-Mgr/20	Course title: Biostatistics for Pharmacists
Educational activities: Type of activities: lecture / seminar Number of hours: per week: 1 / 2 per level/semester: 14 / 28 Form of the course: on-site learning	
Number of credits: 3	
Recommended semester: 4.	
Educational level: I.II.	
Prerequisites:	
Course requirements: The final evaluation consists of continuous evaluation at seminars (0-10 points), evaluation of the final written project (0-24 points) and evaluation of the presentation (0-16 points) as a sum of points: A 45-50 points, B 40-44 points, C 36-39 points, D 33-35 points, E 30-32 points.	
Learning outcomes: After completing the course, the student will be familiar with methods of applied statistics in drug development and research, drug control and analysis, manufacturing processes and outputs, methods applied in epidemiology and drug policy, and finally in applied statistical procedures of economic management of pharmacies and drug distribution.	
Class syllabus: 1. Methodological basics of statistical survey: research question, research hypothesis, population, sample, selection methods, quantitative and qualitative research, types of studies, observation, experiment, meta-analysis, research file design, sample size, randomization procedures, factors, intervention, intervention effect , cross effect, effect size, background, suppressor, confounder, noise, main research result, supporting information, research protocol, phases of statistical survey (plan, data collection, quality assurance procedures, statistical analysis, interpretation) 2. Data preparation for statistical analysis: object and subject of the research, character, random variable, types and distribution of random variables, parameter, external and internal sources of variability, uncertainty and error, probability and its models, variable transformation, standardization of random variable, blinding methods , Latin square, data quality control and assurance (gross errors, incomplete, missing and remote data, transformation, encryption, coding), replicas, parallel measurements, sorting, filtering, stratification 3. Procedures for selection of processing methods: target population, research sample, sample design, prospective and retrospective studies, intervention, exposed and control sample, randomization, crossover plan, longitudinal study, blinding, instrumental and questionnaire research, reliability, validity, sensitivity and robustness of the questionnaire, Likert scale, scoring, signal, noise, distortion, standardized questionnaire, questionnaire validation methods, reliability measurement, data-information-knowledge transformation, character, character value, variable independence, descriptor, predictor, regressor	

4. Descriptive statistics: cardinal, ordinal and nominal variables, scale, interval and categorical variables, size measures, arithmetic, geometric and hypergeometric mean, statistical weight, mode, median, variability rates, variation range, mean deviation, variance and standard deviation, coefficient of variation, shape measures, distribution symmetry, distribution concentration, frequency analysis, information content and its reduction
5. Univariate sample analysis: sampling types, point and interval estimation, parametric tests, null hypothesis, significance level, effect size, first and second type errors, false positivity and negativity, statistical significance, clinical and biological significance, mean value hypothesis tests and variance, agreement of the agreement of two means and variance, decomposition of variability into components, analysis of variance, balanced experiment, fixed, random and mixed effects and models, one-factor analysis of variance
6. Measures of association: countable random variable, transformation of measurable variables into countable, exposure and effect as quality, frequency analysis of qualitative traits, chance and risk, absolute and relative risk, risk ratio and chance ratio, frequency interval estimation, interval estimation OR and RR, contingency table, independence, tables 2x2, Fisher-Freeman exact test, Pearson goodness-of-fit test, survival curves, Kaplan-Meier survival curve
7. Relative numbers and indices - aggregation, temporal and spatial development, time series, cyclical phenomena, seasonality, trend, chaos, noise, influence of cyclical and random phenomena on processes, predictability
8. Multivariate analysis: correlation and covariance, trends, correlation dependence, simple linear regression, linear modeling, transformation to linear problem, statistical dependence tightness measures, sign tests, rank tests, Kruskal-Wallis test, Friedman test for dependent samples, regression diagnostics (linearity, homoskedasticity, autocorrelation, residue analysis), multifactor analysis of variance, general linear model, nonlinear regression models with two or more parameters
9. Process evaluation: types of measurement errors, simple and complex uncertainty, propagation and composition of uncertainties, Ishikawa diagram, accuracy, precision, robustness, limit of detection (LOD), limit of quantification (LOQ), outliers, validation, control standard, certified reference material, accredited tests, ROC curve, sensitivity and selectivity, AUC, inter-rater agreement, statistics in pharmacopoeial methods, validation of evaluation processes
10. Statistical software: data import and export, format compatibility, mass data processing, scripts, data mining, statistical software for users from the CU.

Recommended literature:

- Fazekaš, T.: Moderná aplikovaná štatistika pre farmaceutov. 1st.edt. Bratislava : UK, 2000. 195 p.
- Hanousek, J., Charazma, P.: Moderní metody zpracování dat : matematická statistika pro každého. Praha : Grada, 1992. 216 p.
- Meloun, M., Militký, J.: Statistické zpracování experimentálních dat. Praha : Plus, 1994. 839 p.

Languages necessary to complete the course:

Slovak

Notes:

Past grade distribution

Total number of evaluated students: 117

A	ABS	B	C	D	E	FX
89,74	0,0	8,55	0,0	0,0	0,0	1,71

Lecturers: RNDr. Tomáš Fazekaš, PhD., RNDr. Alexander Búcsi, PhD.

Last change: 23.03.2022

Approved by: RNDr. Tomáš Fazekáš, PhD.