MATHEMATICAL BASICS OF EVIDENCE-BASED MEDICINE

Stolyar O. M., Storozhenko I. P.
The National University of Pharmacy, Kharkiv, Ukraine
oxanastolyar@i.ua

Introduction. Medical researches spend all over the world. Some of them form the basis for new recommendations. But how effective and safe the new recommendations? This problem solves evidence-based medicine.

Aim of this article is a review of mathematical methods underlying evidence-based medicine.

Results and discussion. Evidence-based medicine eliminates the evaluation results of the studies of human bias. It is accomplished by transfer bias at random with subsequent mathematical processing. Modern design evidence-based medicine consists of the following principles.

1. The homogeneity of the groups is random selection and strict control criteria.

2. Triple control is, when the patient, physician and statistician do not know use of the drug or the method.

3. A sufficiently big size of the sample to achieve the required accuracy.

4. The direction of research is to prevent endpoints and improved quality of life.

Modern statistical treatment varied. They are used as parametric and non-parametric methods. For medical researches of properties, which abnormally distributed used nonparametric methods such as, for example, Mann–Whitney's U test, Kruskal-Wallis's test, McNemar's test, Friedman's test, Cochran's test and others.

For the interpretation of the results of research are widely used assessment of the relative risk (RR) and the odds ratio (OR). RR and OR are used to compare the probability of the outcome depending on the availability factor. At risk is the ratio of the studied, with particular feature *D*, a sample volume $D + H$ and at odds is the ratio of the test with a sign *D*, to the number study that do not have this feature *H*.

Consequently, we have $RR = \frac{D_e(D_c + H_c)}{D_c(D_e + H_e)}$ and $OR = \frac{D_e H_c}{D_c H_e}$, where index *e* corresponds to the experimental group and *c* to the control group.

The confidence interval of the natural logarithm of the RR and OR are

$$\ln(RR) \pm U_{1-\alpha/2}\sqrt{\frac{H_e}{D_e(D_e+H_e)}+\frac{H_c}{D_c(D_c+H_c)}} \text{ and}$$

$$\ln(OR) \pm U_{1-\alpha/2}\sqrt{\frac{1}{H_e}+\frac{1}{D_e}+\frac{1}{H_c}+\frac{1}{D_c}},$$

where *U* is quantile Gaussian distribution.

Confidence intervals RR(OR) and compliance with the design of medical research determine a rating system for evaluating clinical research into I, II, III, IV classes and A, B, C, D levels. The class indicates the degree of predominance of the usefulness of the risk, and the level of confidence result.

A special place in modern studies takes systematic reviews and meta-analysis. A systematic review is a special kind of scientific research, where the objects of study are the results of other studies. Meta-analysis is a method of secondary statistical processing of the results of different studies on the same problem. High-quality meta-analysis involves the study of all the studies dealing with the corresponding problem, assess heterogeneity and identifying information content of the main results of the sensitivity analysis by. Sensitivity analysis technique is to modify selected parameters within certain limits if the other parameters remain unchanged.

With the results of medical research can be found on the resource Pub Med of ncbi.nlm.nih.gov or site trialresultscenter.org.

Conclusions. Thus, the evidence-based medicine results overturn our understanding of existing methods and guidelines medicine. Therefore, evidence-based medicine concept, based on the achievements of mathematical statistics, demand for modern scientific world, pharmaceutical companies and public.