

Understanding of Statistical Terms Routinely Used in Presentations: A Survey among Residents who participate at a Summer School

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Received: 7 December 2014/Accepted: 18 December 2014/Published online: 26 December 2014

Abstract

Aim: The aim of our study was to investigate the understanding of statistical terms commonly used in lectures presented at summer schools for residents and young specialists. *Material and Method:* A survey was distributed to all the participants at the “Diabetic neuropathy from theory to practice” Summer School, 2014. The program was addressed to residents or young specialists in diabetes, neurology, surgery, and orthopedic from Romania. The survey consists of 6 multiple-choice questions and the first four questions evaluate the understanding of statistical terms. *Results:* There were 51 (42.5%) participants who completed the questionnaires. From 204 total questions 81 (39.7%) had correct answers. At the question 1, where relative risk was evaluated, only 3 (5.9%) respondents answered correctly while at the question 2 (number need to treat) about 78.4% (40) of answers were correct. At the question 3 (sensitivity), 22 (43.1%) respondents answer correct while at the question 4 (Receiver Operating Characteristic curves) only 16 (31.4%) respondents provided a correct answer. The overall mean score of correct answers was 1.56 ± 0.91 . *Conclusion:* Our study showed that young specialists who participated to the survey were not familiarized with simple statistical terms commonly used in presentations.

Keywords: Data Interpretation; Statistical Knowledge; Continuing Medical Education.

Introduction

The understandings of statistical terms from the medical literature are of great importance to the objective of continuous education of medical doctors. Life long learning involves reading articles about original studies and hearing presentations at conferences or participation to education courses. Majority of the studies present the results using statistical terms. Statistical terms commonly used include risk ratio (RR), odd ratio (OR), mean, standard deviation, standard error, sensitivity, specificity, number needed to treat (NNT), p value etc. Some authors consider that medical doctors need not only to understand the meaning of statistical terms, but “it requires being able to explain, decide, judge, evaluate, and make decisions about the information” in other words there is a need for statistical literacy competencies [1]. Some authors highlight the difficulties of teaching statistical terms [2-3]. Previous studies reported a dissatisfactory understanding of

statistical terms [4-6]. There is no study, as to our knowledge, about the understanding of statistical terms in Romanian practitioners in medical field.

Summer schools are usually organized for young specialist: residents, young medical doctors or students. A summer school is part of Continuing Medical Education (CME). CME are addressed to all kind of practitioners from medical field. The objective of a summer school is to train the doctors to obtain abilities or to train in practical techniques and to learn from a person who is an expert in his domain. CME schools are organized by professional societies, medical education organizations, hospitals, universities and medical schools [7].

The aim of our study was to investigate the level of comprehension of statistical terms commonly used in presentations at summer schools with an audience of residents and young specialists.

Material and Method

A survey was distributed to all the participants in the second day of the Summer School called "Diabetic neuropathy from theory to practice" Sinaia, 17-20 July 2014. The goal of the Summer School was "to increase the awareness of diabetic neuropathy and diabetic foot among the young doctors" [8]. The program was addressed to residents or young specialists in diabetes, neurology, surgery and orthopedics from Romania.

Most of the courses at the summer school were in English. The recommendation for subscribers to the summer school was at least a medium level of English language. There were no selection conditions for admittance.

The survey was conceived in English language and consists of multiple-choice 6 questions. The first four questions evaluate the understanding of statistical terms (Table 1). Each of the first four questions had a single correct answer. All the terms (RR, NNT, sensitivity, area under the receiver operating characteristic (ROC) curve, p-value, 95% confidence level) were choose from the lectures presented in the first day at the summer school mentioned above.

Participants were informed about the aims of the study. One question was about their specialty (diabetology, surgical, neurology or others). No other personal information was collected. The questionnaires were anonymous. Informed consent of the participants was implied by the completion of the questionnaire.

A score was computed: each correct answer was considered 1 pct. The minimum value of the score can be 0, meaning that there was no correct answer. The maximum value of the score can be 4, meaning that all answers were correct.

Statistics

Categorical variables were described using mean \pm standard deviation and median (25th - 75th percentile). The following statistical tests were used: Man-Whitney test to compare the ranks for two independent samples and Kruskal-Wallis test to compare the ranks for four independent samples. All tests were applied at a significance level of $\alpha = 0.05$.

Statistical calculations were performed using SPSS 15.0 and Microsoft Excel applications.

Results

From 120 distributed questionnaires 51 (42.5%) participants completed the questionnaires. The distribution of the respondents according to their specialty was: 28 (54.9%) diabetology, 4 (7.8%) surgical, 10 (19.6%) neurology and 9 (17.6%) others. The responses to the questions 1-4 where presented in Figure 1. From 204 total questions 81 (39.7%) had correct answers. At the question 1 only 3 (5.9%) respondents had correct answer. At the question 2 about 78.4% (40) of answers were correct. At the question 3, 22 (43.1%) respondents had correct answer. At the question 4 only 16 (31.4%) respondents answer correct.

Table 1. The questionnaire

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For questions 1 to 4 please select the statement you consider the correct conclusion for the presented problem. Please provide your answer to questions 5 and 6:	
1.	A cohort study analyzed the association between smoking and peripheral vascular disease; the risk ratio (relative risk, RR) was 1.25 (95% confidence intervals (CI): 0.57 – 2.24). According to this study: a. Smoking and peripheral vascular disease are dependent. b. Smoking and peripheral vascular disease are independent. c. RR is not sufficient to say that there is an association between smoking and peripheral vascular disease. d. I am not sure.
2.	A randomized controlled trials (RCT's) compared a new drug versus an old drug for the pain relieve; the number need to treat (NNT) = 2.6 for the new drug versus the NNT = 6.4 for the old drug (p<0.05). According to this study: a. The new drug is more effective than the old one. b. The new drug is less effective than the old one. c. The new and the old drugs are equally effective. d. I am not sure.
3.	A study compared a new diagnostic test versus a golden standard test for the neuropathic foot; sensitivity of the new test was 92%. According to this study: a. The new test is effective to detect subjects having the disease. b. The new test is effective to detect subjects not having the disease. c. 92% of the subjects who test positive have the disease. d. I am not sure.
4.	A study compared a new diagnostic test versus an old one for the Charcot foot disease; for the new test area under the receiver operating characteristic (ROC) curve (AUC) was 365, for the old test was 467 (p<0.05). According to this study: a. The new test is more accurate than the old one. b. The new test is less accurate than the old one. c. The new test and the old one had similar accuracy. d. I am not sure.
5.	Your specialty is: a. Diabetology (nutrition, metabolic disease, endocrinology); b. Surgical (other than neurology); c. Neurology; d. None of the above.
6.	Are you considering that the speaker should explain the meaning of the statistics terms used during the presentations? a. Yes b. No
Correct answers at each question (if is the case) is with bold.	

The overall mean score was 1.56 ± 0.91 , with median (25th-75th percentile) 1 (1-2).

The score between the respondents groups were not significantly different ($p=0.85$, Figure 2). Diabetologists had the score of correct answers 1.57 ± 0.96 , median (25th-75th percentile) 1 (1-2). Surgeons had the higher score 1.75 ± 1.26 , 2 (0.5-2.75), neurologist had the mean score of correct answers 1.70 ± 0.68 , 2 (1-2), and others specialists had 1.44 ± 1.01 , 1 (1-2.5).

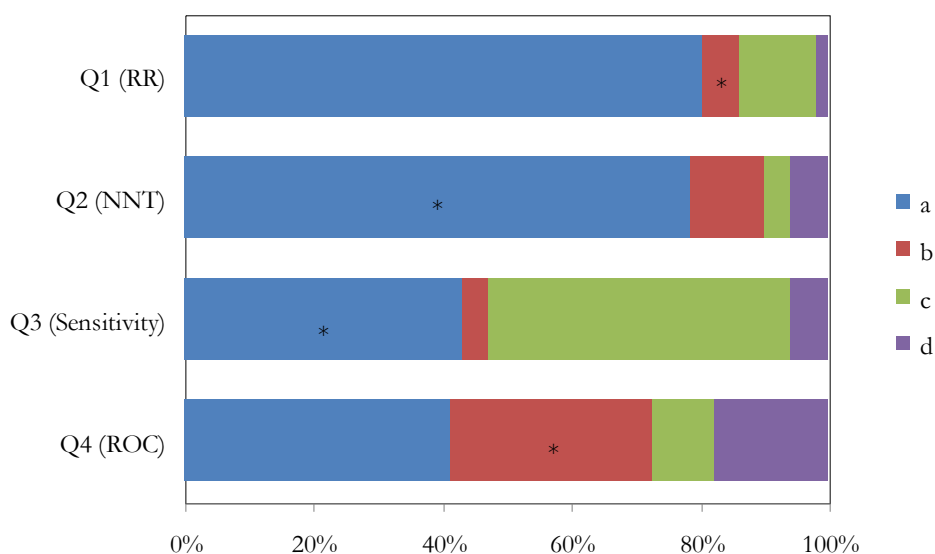


Figure 1. The distribution of responses to each question of the questionnaires (* the correct answer; Q – question; RR – relative risk; NNT – number needed to treat; ROC – receiver operating characteristic) where a, b, c, d are the possible answer to the questions (see Table 1)

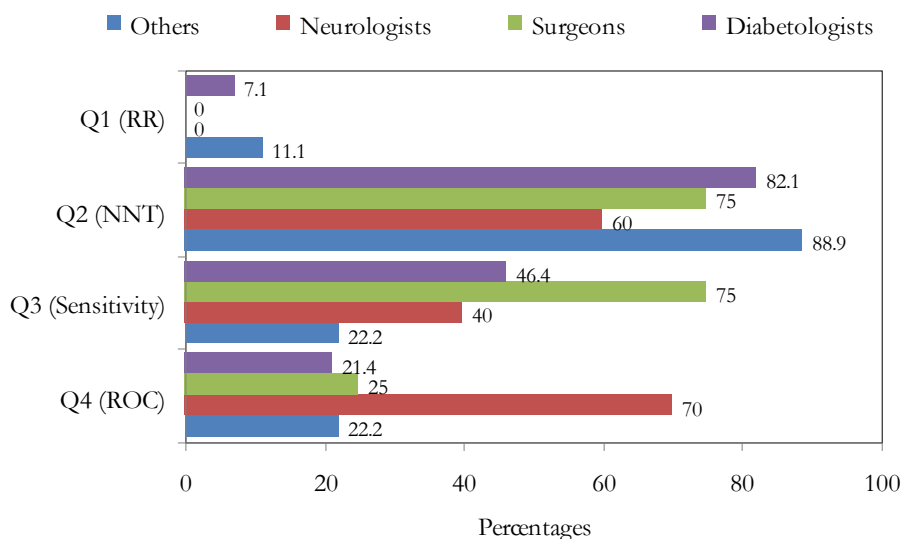


Figure 2. The distribution of percentages of correct answers to each question by groups of respondents (Q – question; RR – relative risk; NNT – number needed to treat; ROC – receiver operating characteristic)

At the question number 6: “Are you considering that the speaker should explain the meaning of the statistics terms used during the presentations?” 43 (84.3%) respondents answer “Yes” and 7 (13.7%) respondents answer “No”, 1 (2 %) respondent did not answer. The mean score between the respondents who answers “Yes” (1.44 ± 0.85 , median (25th-75th percentile) 1 (1-2)) to the question no 6 and the respondents who answer “No” (2.29 ± 0.95 , 3 (1-3)) to the same question was significant different ($p=0.03$, Figure 3).

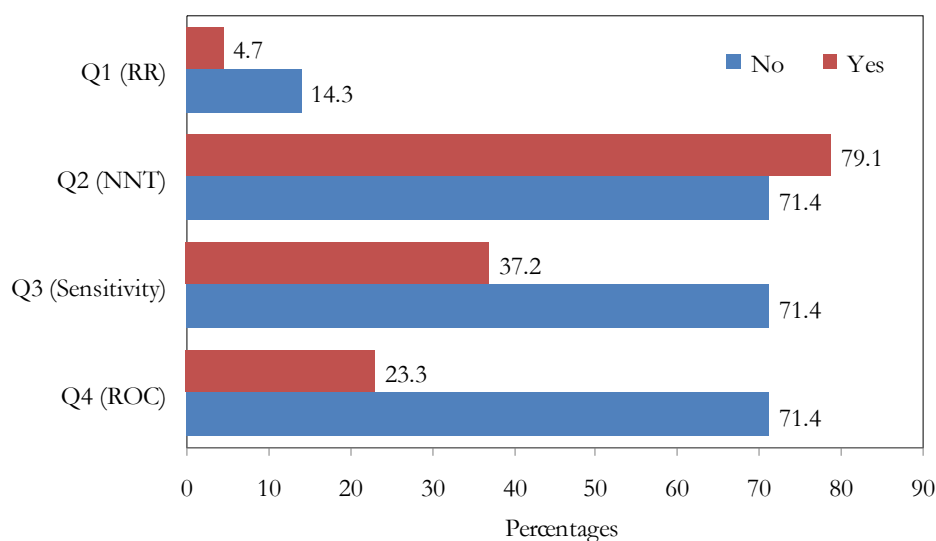


Figure 3. The distribution of percentages of correct answers to each question by respondents who answer “Yes”/”No” to the question “Are you considering that the speaker should explain the meaning of the statistics terms used during the presentations?” (Q – question; RR – relative risk; NNT – number needed to treat; ROC – receiver operating characteristic)

Discussion

Our aim to evaluate the young medical doctors about the understanding of statistical terms commonly used in a presentation was fulfill. The main findings of our study is that the young specialists and residents from Romania had a lack of understanding of statistical terms specific to the medical research and often used in presentations. Even worse, it seems that even the questions were about terms and interpretations commonly used in the biomedical literature, more than half (60.3%) were answered incorrectly. None of the respondents answered correctly to all the questions, while 9.8% answered all questions incorrectly. In Mavros et al., at a similar study on researchers, the overall correct answers was 51.7%, much greater than in our study [6]. In Falagas et al., a study about the correct computation of RR and OR among researchers, they found a 62.7% of correct answers [9].

The first question was about RR and his interpretation based on 95% confidence level interval. A search of RR in PubMed Central gave as 1,683,347 results demonstrate that RR is the most common term for the medical field evaluated on this study (NNT – 23,537 articles; Sensitivity – 497,831 articles; ROC curve – 50,668 articles). The first question about RR had the worst result (5.9% correct answers). This is probably due to the fact that our subjects do not know the interpretation of the RR with 95% confidence interval. In Mavros et al. was found that 70% of correct answers to the question that evaluates RR [6].

Surprisingly, the second question had a very high rate of correct answers. Probably due to the evaluated term NNT. We can say that the audience to the summer school is more familiar with the term of NNT than with the 95% confidence interval level of RR. We suppose that they are more interested in the evaluation of a therapeutic approach than in the evaluation of prognostic factors.

The third question about sensitivity had a medium rate of correct answers. In another study the authors finds more than half incorrect answers when they test the ability to compute the probability post diagnostic test knowing the prevalence of the disease, sensitivity and specificity of the test, among the medical doctors with experience [5].

The fourth question had a predictable rate of correct answers, lesser than the third question. The AUC was a term in the same area as sensitivity, but is less common than sensitivity.

We found that there were no significant differences in knowing the statistical terms meaning between diabetologists, surgeons, neurologists and others. Other authors found that clinicians had higher correct answer rates than surgeons [6]. We suppose that they are at the beginning of their career and they had no or less experience in research.

Respondents who answer “No” to the question “Are you considering that the speaker should explain the meaning of the statistics terms used during the presentations?” had greater score than the respondents who answer “Yes”. This can mean that they were aware of their lack of understanding of statistical terms and they consider that they need to be informed about the meaning of them.

Our findings can be generalized to the majority of young specialists and residents from our country. There were no criteria of selection at the admittance in the summer school. There was no difference between the specialties. We can consider the participants a random national sample of young specialists.

If we presume that some people completed the questionnaire without sufficient attention, but this is out of the question, because the questionnaire was not compulsory (only 42.5% completed questionnaires) and we can presume that if they complete the questionnaire they were paying attention to it.

At the summer school were participated young medical doctors from all over the country, but we cannot exclude that some regions are not well represented at the summer school.

They are encouraged to learn more basic biostatistics. The speakers must take into account the high probability that the audience does not understand the statistical terms and thus would be desirable to present the concepts in more detail. The organizers of summer schools may provide brief information about the statistical terms use to estimate study’s findings.

Conclusion

Young specialists who participated to this survey were not familiarized with interpretation of simple descriptive estimates used in presentations at the summer school where they participate.

List of abbreviations

CME	Continuing Medical Education
NNH	Number needed to harm
NNT	Number needed to treat
OR	Odds ratio
Q	Question
RR	Risk ratio

Ethical Issues

We confirm that this study raises no ethical issues.

Conflict of Interest

The authors declare no conflict of interest.

Acknowledgements

We want to thank to the “Society for Diabetic Neuropathy”, which organized the Summer

School and approved this study.

Cosmina-Ioana Bondor is a fellow of POSDRU grant no. 159/1.5/S/138776, grant with title: "Model colaborativ institutional pentru translatarea cercetarii stiintifice biomedicale in practica clinica – TRANSCENT".

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