Appointment of Statistical Editor and Quality of Statistics in a Small Medical Journal

Ivan Krešimir Lukić, Matko Marušić
Croatian Medical Journal, Zagreb, Croatia

Aim. To test the if the appointment of a statistical editor improves the quality of manuscripts published in a small general medical journal.

Methods. Retrospective review of all manuscripts containing statistical data published in the Croatian Medical Journal between 1992 and 2000 (n = 241). Statistical analysis and its presentation were assessed by a single observer.

Results. Before the appointment of statistical editor in 1996, 97 manuscripts with statistical data were published. Statistics was not satisfactory in 52 (54%) of them, including 26 definite errors in analysis and 43 in presentation. After the appointment of statistical editor, 144 manuscripts containing statistical data were published. Statistics was not satisfactory in 91 (63%) of them, with 51 definite errors in analysis and 69 in presentation. Out of 144 manuscripts, the editor-in-chief sent out 30 (21%) for statistical review. Statistics was not satisfactory in 25 of them, including 11 definite errors in analysis and 17 in presentation. Statistical editor’s comments improved three manuscripts. If the authors had acknowledged all statistical editor’s suggestions, 9 more manuscripts would have been improved. Statistical editor had a total of 195 comments on 30 published manuscripts. Most numerous were the comments concerning the presentation of the statistical analysis (51%), followed by the general comments (26%), comments on analysis (11%), study design (8%), and interpretation (4%).

Conclusion. Appointment of a statistical editor is not a guarantee of the improvement of statistics in small journals. Other measures are necessary, including strict editorial policy on statistical review, monitoring of revised manuscript versions, and enrollment of formally trained biostatisticians.

Key words: Croatia; journals; manuscripts, medical; peer review; periodicals; publishing; quality control; statistics

The importance of statistical analysis and use of statistics in medical research has rapidly increased over the past few decades (1-3). The proportion of the original manuscripts containing some sort of statistical analysis varies between 60% and 90% (2-8). In addition, the use of more complex statistical methods is becoming more frequent (2-4,6,9-11).

Since the statistical knowledge of most physicians may be best described as “limited” (12), it is not surprising that a considerable proportion of published manuscripts contain serious statistical errors (1,2,5,13-16). One way to reduce the number of flaws in the published studies is the statistical review of submitted manuscripts (10,13,17,18). Along that line of reasoning, we introduced the position of the statistical editor in the Croatian Medical Journal in 1996. The aim of this study was to assess the influence of appointing a statistical editor on the quality of statistical analysis and presentation of statistics in the Journal.

Material and Methods
Volumes 33-41 (years 1992-2000) of the Journal were included in the study. All manuscripts (N = 594) were screened for the statistical analysis. Manuscripts with no statistical analysis (n = 353) were not included in the study.

Statistical analysis, the presentation of statistical analysis in published manuscripts, and the reviews of the statistical editor were assessed by a single observer (a physician who attended a course on biostatistics during graduate education) in 241 published manuscripts which contained numerical data. The errors in the analysis and presentation were categorized as either “definite errors” or “poor reporting”, based on the classification proposed by Altman (19). The third Altman’s category, “matter of judgment”, was beyond the scope of the study.

To assess the work of the statistical editor, original reviews of the statistical editor were collected from editorial files. The reviews were compared with the published versions of manuscripts (Fig. 1). During the study, the rater did not know which manuscripts had actually been sent out to the statistical editor for review.

Results
Before the appointment of statistical editor in 1996, a total of 257 manuscripts had been published in the Journal. Out of those, 97 (38%) had contained some type of statistical analysis. The statistics was not satisfactory in 52 (54%). We found 26 definite errors in analysis and 43 in reporting, and 17 poor reporting
errors regarding data analysis and 16 regarding the presentation of the analysis.

Out of 337 manuscripts published after the appointment of statistical editor, 144 (43%) contained statistical analysis. The statistics was not satisfactory in approximately two thirds of them (91 or 63%). We found 51 definite errors in analysis and 69 in presentation, and 20 poor reporting errors in analysis and 16 in presentation. The comparison of the average number of errors per published manuscript before and after 1996 did not reveal any notable difference (Fig. 2). Also, the proportion of the manuscripts with unsatisfactory statistics did not significantly change (54% vs 63%, chi-square=1.828, df=1, p=0.183).

Out of 144 manuscripts published after 1996, which contained statistical analysis, editor-in-chief sent only 30 (21%) for statistical review. Since there was no editorial policy on methodological reviews, the editor-in-chief chose the manuscripts according to his assessment of the complexity of statistical methods. We found that statistics in most manuscripts remained unsatisfactory even after the statistical editor had reviewed them (25/30), including 11 definite errors in analysis and 17 in presentation, and eight poor reporting errors in analysis and four in presentation. The statistical editor had improved three manuscripts and, if the authors had acknowledged all his suggestions, 9 more manuscripts would have been improved (Fig. 1).

The statistical editor made a total of 195 comments on 30 manuscripts he received to review. Most numerous were the comments concerning the presentation of the statistical analysis (51%), followed by the general comments (26%), comments on analysis (11%), study design (8%), and interpretation (4%). No manuscript was rejected specifically because of the statistical review.

**Discussion**

Our study showed that the quality of statistics in the Journal did not improve after the introduction of statistical editor. Surprisingly, the average number of definite errors in analysis and presentation slightly increased (Fig. 2).

There are several possible explanations of our results. The central issue is that there was no editorial consensus on the role of statistical peer review in the *Croatian Medical Journal*. Editor-in-chief sent out a small number of manuscripts for revision (21%), based on his judgment whether the evaluation of statistical methods was needed. He frequently asked the statistical editor to “improve the article” (ie, generally), and not to comment on the statistics only (editors, personal communication). Consequently, without explicit “mission statement” and following the recommendation of the editor-in-chief, the statistical editor focused on the “looks” of the Journal – 51% of comments concerned the presentation and 26% of comments were general (e.g., table and chart design, style of the manuscript). Another problem was that a considerable number of authors of the statistically reviewed articles (9 out of 30) did not revise their manuscripts according to the review. Since there was no policy on the monitoring of the revised manuscripts, this problem passed unnoticed. Finally, the statistical editor had no formal training in statistics.

The study has several important limitations. First, it focused on the analysis and presentation. One might speculate that the assessment of the design and interpretation of the statistics would have given even...
worse results. Second, the errors in design might be clinically more relevant than the errors in presentation. The criteria used for categorization were rather "subjective" (19). In addition, definite errors are not necessarily the important ones (19). Moreover, the assessment of the quality of statistics was not completely blinded, because the rater knew which manuscripts were published after the appointment of the statistical editor. However, it is reasonable to assume that the bias in this respect would generate more favorable assessment of the statistical quality of the manuscripts, which was not the case.

Two other recent studies on the effect of statistical review on the quality of manuscripts published in medical journals (Medicina Clinica and Annals of Emergency Medicine) also failed to prove the benefit of such review (20,21). The studies which reported the beneficial outcome of statistical refereeing (22,23) were focused on large, prestigious medical journals (e.g., Journal of American Medical Association and British Medical Journal), which are highly selective for studies with superior study design (24). On the other hand, studies by Arnau et al (20), Schriger et al (21), and our own came from relatively low-impact, "small" journals.

Small and big medical journals differ in many ways. Various confounding factors, including editorial practice and review process, may close a positive feedback loop ("vicious circle") of inadequacy in small journals (25-27). It seems reasonable to conclude that inadequate practice of statistical refereeing may also be one of such factors.

Even big, high-impact journals are not immune to the poor editorial practice of methodological peer review (28). However, there is evidence that the situation in the big journals is changing for the better. For example, the proportion of journals with a policy that all papers which are to be published have to undergo statistical review increased two-fold during the last two decades (18,28). The small journals will have to revise and change their editorial policies if they want to keep up with the mainstream journals.

However, our study shows that the appointment of a statistical editor in a small journal is not a guarantee for the improvement of statistics in manuscripts. It seems that most problems arise from the inadequate editorial practice. Therefore, additional measures are necessary, including strict editorial policy on sending out all manuscripts with numerical data for statistical review, strict monitoring of revisions made in manuscripts, and internal quality control measures. Another key issue is the quality of statistical reviews. To obtain relevant statistical reviews it is essential to have reviewers with background not only in statistics, but in biomedicine as well, and vice versa.

After analyzing the preliminary data from this study, the Croatian Medical Journal has appointed three new statistical editors and introduced a special statistical review form. In addition, each manuscript containing some type of statistical analysis is now sent out for statistical refereeing and the revised versions are sent back to the statistical editors. The overall effect of those changes remains to be evaluated.

References

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Correspondence to:
Ivan Krešimir Lukić
Croatian Medical Journal
Zagreb University School of Medicine
Šalata 3b
10000 Zagreb, Croatia
iklukic@mef.hr