

Editorial

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Applied biostatistics in laboratory medicine

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As Associate Editors of J Lab Med, we were pleased to organize a special issue on “Applied Biostatistics in Laboratory Medicine” at the request of Editor-in-Chief Peter Schuff-Werner. This field is both old and new for the journal. On the one hand, biostatistical evaluation has been an established part of almost every publication in clinical chemistry and laboratory medicine. On the other hand, there are innovative research and development activities at the interface between medicine and statistics that go well beyond the scope of the usual statistical challenges.

Contents of the issue

If one wanted to classify the respective challenges according to their degree of innovation, one would probably have to form three groups: On the traditional side (A) would be tasks of daily laboratory routine such as quality control and method comparison, or simple hypothesis tests such as t-test or ANOVA (analysis of variance). Hand in hand with this statistical knowledge, young laboratory scientists in particular are increasingly gaining the digital competence to understand and to write relevant computer programs if necessary. In this context, it is worth mentioning that the “Young Laboratory” section of the DGKL (Deutsche Gesellschaft für Klinische Chemie und Laboratoriumsmedizin) has recently established a “Digital Competence” working group, which has made significant contributions to this issue.

At the transition between routine and research (B), we find standard statistical methods such as analysis and decomposition of distributions in direct and indirect reference interval determination [1] or zlog standardization of laboratory values for electronic health records [2].

At the most innovative end of the task scale (C) is undoubtedly the application of Big Data and Statistical

Learning techniques [3, 4], for which laboratory medicine seems predestined simply because of its immense flood of data. In Germany alone, our conservative estimate suggests that about four million laboratory values are generated every day, which are stored in increasingly large electronic databases and made available for statistical analysis as part of local and national research and e-health initiatives.

We have attempted to highlight some of the current research areas in this special issue to give J Lab Med readers a broad impression of tasks that are at hand in the three areas mentioned above and to demonstrate some practical solutions currently being developed by representatives of our field. Our admittedly subjective selection includes six contributions [5–10] (Table 1).

The first two articles [5, 6] are about skills in statistics and computer science that can be used in daily laboratory work. The two following articles [7, 8] demonstrate the state of the art in dealing with reference intervals based on the widely used statistical programming language R. The last two articles [9, 10] address the modern challenges of machine learning in large data sets.

Editorial objectives and experience

From our own experience, we as editors of this special issue have found that it is difficult to get publications at the interface between laboratory medicine and statistics through the state-of-the-art review process. Traditional medical journals often reject such submissions out of hand because they do not fit the focus of the editors. On the other hand, the problem with mathematically oriented journals is that the questions focus too much on practical problems in laboratory medicine and do not offer much that is new from a statistical point of view.

Adoption often fails at the peer review stage because too few experts can cope with both, the medical and the statistical, sides. Typically, the editor-in-chief then selects two reviewers, one from medicine, who often finds the topic remote and complicated, and one from mathematics, who may feel unable to judge the medical importance of the question. Therefore, a key challenge in editing this special issue was to appoint reviewers with dual expertise and possibly even dual degrees.

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Table 1: Overview of articles in this special issue. The three categories represent statistical tasks in daily routine (A) and applied research (B), as well as current challenges in machine learning, Big Data applications, and artificial intelligence (C).

Category	Topic	Remarks	Reference
A	Digital competence in laboratory medicine	International survey among young scientists	10.1515/labmed-2023-0021
A	User-friendly tools for routine statistical applications	RStudio Shiny app programming guide	10.1515/labmed-2023-0020
B	Indirect methods for verification and validation of reference intervals	International multi-center study, method comparison	10.1515/labmed-2023-0042
B	Visualization of continuous reference intervals with GAMLSS	Tool to make sophisticated algorithms widely accessible	10.1515/labmed-2023-0033
C	Artificial intelligence in routine medical operations	Concepts for a commercial AI application	10.1515/labmed-2023-0011
C	Statistical learning and Big Data applications in laboratory medicine	Critical opinion paper on current developments	10.1515/labmed-2023-0037

In addition, the publication style in natural sciences and humanities can be fundamentally different. While the former is based on the classical four chapters Introduction, Materials/Methods, Results and Discussion, the latter often follows a less strict scheme like Introduction, Related Work, Background/Definitions, Theoretical Part(s), Application Examples, Conclusions. In this issue, the authors have followed the classical formatting guidelines of *J Lab Med*, but in the future, we might also allow formats oriented to mathematical journals in an agreement with the publisher.

Thus, this issue is also intended as an entry into a new era of *J Lab Med* and possibly the DGKL. With our focus on “Applied Biostatistics in Laboratory Medicine,” we would be pleased to encourage excellent scientists in medicine and statistics, as well as related fields such as bioinformatics and data science, to submit the results of their research to *J Lab Med*. We will endeavor, on the part of the editors and reviewers, to overcome the traditional hurdles of interdisciplinarity, both scientifically and formally, and will also be happy to offer advice and assistance in selecting attractive topics, formulating relevant questions, and interpreting complex results. *J Lab Med* and DGKL are heading towards an exciting future with this initiative and are looking forward to committed people to accompany them on this journey.

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