publication to determine whether the methods used are appropriate and accurate and that the conclusions are valid.

Reference

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Commentary: Statistics: Embracing the ignorance

Paul Kurlansky, MD

Several years ago, when I was first awarded the honor of performing statistical reviews for the *Journal*, aside from the terror of ignorance (which still persists), I recall the reaction of several of my colleagues—“*JTCVS* has become impossible; we’re submitting elsewhere.” However, with time, with a rising impact factor and an increasing number of submissions, surgeons soon learned that the rigor of the process resulted in articles trusted for their methodological integrity. Gritti and colleagues¹ present a fascinating and provocative dive into the statistical methodology manifest in the 3 leading journals of cardiothoracic surgery.¹ Using a previously validated classification scheme² and a complexity scale based on the level of academic statistical training at which such methods appear, they arrive at some surprising and challenging conclusions: Some 82% of articles require greater than an introductory understanding of statistical methodology. Without assessing complexity, the sheer number of methods applied per article was comparable among the 3 journals. Absent are analyses of trends over time, grading of appropriateness, or exploration of whether there is any difference in the statistical sophistication depending upon whether cardiothoracic surgical articles are published in the leading surgical journals or in their higher impact medical counterparts.

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Normal distribution or insurmountable barrier—a matter of perspective.

CENTRAL MESSAGE

Robust interaction with and engagement of statistical colleagues provide a promising approach to managing the ever-increasing demand for greater statistical sophistication in surgical publication.

Moreover, nowhere do we find specification of the rapidly emerging techniques of machine learning, although many of these might be subsumed into the existing categories of missing data and predictive modeling.

However, most troubling is what do we do with this information? Certainly the journals need to integrate robust statistical assessment into the routine review process—an approach embraced by this and other journals. But what about the wealth of potential authors, say nothing of inquisitive readers, who do not currently possess the requisite skills? Indeed, an aspiring academic surgeon might well consider some formal training in statistical methodology time well spent—although where exactly during crowded training years or perhaps even more saturated practice years that “time” is going to be found is not always simple to answer. And for those of us for whom our training is a distant memory?

When I entered my internship, the internet had not yet been invented. When I finished my formal training, the human genome was decades away from definition.

Artificial intelligence was the stuff of intriguing novels and movies. One of the most exhilarating aspects of the human experience is the ability to learn. Rather than viewing the statisticians as some sort of foreign species, my advice is to embrace the uncertainty—work closely with statisticians whom you know and trust. If you cannot explain your clinical/scientific questions to them in terms that they can understand, it is likely that you do not understand the questions yourself. If they cannot explain the methods they would recommend to best answer those questions in terms that you

can understand, there is the likelihood that they may not understand those methods either. The rich interplay of investigator and statistician is a formula for high-level impactful research, as well as for mutual self-education.

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Check for updates

Commentary: Statistical methodology in cardiothoracic surgery: The devil is in the details

J. Hunter Mehaffey, MD, MSc, and
Robert B. Hawkins, MD, MSc

Gritti and colleagues¹ are to be congratulated on an interesting and timely study evaluating the use of statistical methodology in the 3 preeminent cardiothoracic surgery journals. The authors evaluated all original manuscripts published in the *Journal of Thoracic and Cardiovascular Surgery*, *Annals of Thoracic Surgery*, and the *European Journal of Cardio-Thoracic Surgery* over the first 3 months of 2017. They report that 293 articles used a total of 1068 statistical methods, with an average of 3.6 methods per paper. Importantly, they highlight that only 4% used basic descriptive methods, whereas an introductory level of statistical knowledge was sufficient for only 16% of studies. These data support the growing body of literature

J. Hunter Mehaffey, MD, MSc, and Robert B. Hawkins, MD, MSc

CENTRAL MESSAGE

The use of advanced statistical methodology in the cardiothoracic literature continues to grow, and formal education is needed to enable clinicians to critically review and appropriately interpret results.

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demonstrating an increasing complexity of the statistical methodology used in health outcomes research.²

The authors nicely highlight many of the statistical methods used; however, I was surprised to see the topic of propensity score categorized as “intermediate training required.” This method was used in 12% of the articles evaluated, and its use has certainly increased in recent years. Many clinicians consider propensity score matching studies to be similar to randomized trials and enjoy the ease of interpretability. Great care must be taken when interpreting these studies, however. Although a perfectly performed match is