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Commentary: “Fact-checking” the authors: Assessing understandability or awareness in cardiothoracic papers

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Gritti and colleagues,¹ in this issue of the *Journal*, use an elegant idea to update us about the prevalence and scope of “complex statistical methods” in cardiothoracic research papers. I use the term “update,” as the work presented builds on previous studies published in both *The New England Journal of Medicine* and *JAMA*.^{2,3} The authors reviewed 293 original cardiothoracic research papers published in the *Journal of Thoracic and Cardiovascular Surgery*, *Annals of Thoracic Surgery*, and the *European Journal of Cardiothoracic Surgery* over a 6-month period (January–April 2017) in OVID Medline. They then assigned 1068 statistical methods used in these papers to 28 defined categories described by Sato and colleagues³ (with some modification) as a measure of complexity. Following the characterization of the methods employed in the articles, the authors then characterized the readers using 2 steps: (1) creation of an “understandability index” that quantified the percentage of research articles a theoretic reviewer would “understand” if they learned progressively greater numbers of the defined statistical methods; (2) categorizing the ordinal level of biostatistical training (introductory, intermediate, advanced, and specialized) required to “understand, critique, and use each statistical method.” We won’t digress into the limitations of leveraging a basic ordinal scale to assess 3 very complicated conceptual processes. The educational levels were adjudicated by a university professor in biostatistics and were somewhat hazily

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CENTRAL MESSAGE

Basic fact checking reveals some overstatements in an assessment of reader “understanding” of published, contemporary cardiothoracic literature.

assigned “undergraduate versus graduate education.” Are you confused yet?

If you are still with us, what were the authors’ findings? Most papers used multiple methods (mean 3.6 ± 1.9) and the 3 most common statistical methods were surprisingly “mundane”—frequency tables (60%), *t* tests (49%), and survival analyses (44%). Qualifying the readership of these 3 journals was more interesting. Based on the “understandability index,” readers would need to “understand” 15 of the 28 categories of methods to access content in 78% of the reviewed literature. Moreover, with introductory biostatistical training, only 16% of the reviewed literature would be fully accessible, with advanced or specialized training (graduate level) needed for 50 of the reviewed articles.

Based on these results, the authors conclude that there has been an increase in the complexity of statistical methods in the literature over time without commensurate increases in “understanding” among health care professionals (including peer-reviewers). Gritti and colleagues recommend essentially 3 measures to mitigate this disparity: (1) that biostatisticians be engaged in conduct of cardiothoracic research from study inception; (2) that the editorial and peer-review process include statistical review; and (3) that creation of formal didactic statistical curricula be incorporated into cardiothoracic residency training.

These recommendations are certainly laudable and, in fact, most have been adopted by cardiothoracic journal editorial boards and cardiothoracic residency programs as best practices.⁴ Unfortunately, the data presented by Gritti

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and colleagues do not directly support these inferences; rather, the lengthy discussion promulgated by the authors is speculation based on referenced literature. Too harsh? Well, let's "fact-check" our comment: (1) the brief 6-month time period from which papers were reviewed cannot assess longitudinal changes in the complexity of methods and therefore the claim that complexity is increasing is FALSE; (2) "understanding" has not been formally assessed at the reader nor the reviewer level, and therefore the claim that this has not kept equivalent pace with the literature is FALSE.

A "do-over"... what might these authors have done to improve their contribution? The present paper could have provided primary knowledge assessment data from a moderate-sized cohort of "consumers" of cardiothoracic content as a secondary step in their analyses. This analysis would also provide a modicum of validation to the understandability index used. The addition of a cohort that could be segregated into types of "health care professional" (ie, surgeons, cardiologists, intensivists, nurses) would have been very informative. It is likely that acquired knowledge from the duration of residency training (exposure interval) and the prevalence of informal training within each specialty could impact individual reader comprehension. For example, many staff surgeons or physicians discuss research projects with their residents in the operating

room or offices, or during research meetings—"education" that is potentially more valuable than undergraduate coursework yet is unquantified in the present paper. Moreover, the assumption that exposure to educational content equates to understanding is a non-trivial leap. Perhaps a simple verbiage substitution of "awareness" in lieu of "understanding" may have better aligned the objective evidence the authors provide with their inferences.

In the end, we enjoyed the motivating idea of the paper by Gritti and colleagues more than the actual paper itself. An apt Kantian reminiscence by the German poet Philipp Mainländer in an ode to Immanuel Kant's description of the thing-in-itself: "He did it, because he feared nothing more than the allegation, that his philosophy is pure idealism, which makes the whole objective world into illusion and takes away all reality from it."⁵

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