Commentary

Attention to Detail in the Selection of Words in Epidemiologic Research Reports

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Initially submitted October 29, 2013; accepted for publication November 20, 2013.

A recent article in the Journal by Whelton et al. (Am J Epidemiol. 2013;178(7):1076–1084) prompted this commentary about the use of the word “elevated” in medical reports. We believe that the word used in that particular report should have been “higher.” The exposure variable was not actually elevated according to what we understand the word to mean in epidemiologic research. Consistent with the elimination of the inappropriate use of elevated and according to correct clinical chemistry usage, we suggest that the word “level” should also have been avoided in that context. We discuss the specific example of C-reactive protein in the article by Whelton et al. Appropriate word selection underpinning accurate reporting should avoid unnecessarily misleading readers about the meaning of epidemiologic findings.

A recent article in the American Journal of Epidemiology by Whelton et al. (1) prompted this brief commentary about the use of the word “elevated” in medical reports. The definition of the adjective elevated includes the following concepts: 1) raised up, especially above the ground or above the normal level (e.g., an elevated pulse); 2) exalted or noble; lofty (e.g., elevated thoughts); and 3) elated or joyful (2). In medicine and medical research, the term elevated is often used when the more accurate, and indeed more correct, word is “higher,” as in higher concentrations of cholesterol are associated with increased risk of coronary heart disease. Given that we understand that the association between cholesterol concentration and coronary heart disease risk is continuous, the word we should use to describe this relationship is higher rather than elevated (3), because any increase in concentration is associated with greater risk.

As a corollary to the elimination of the inappropriate use of elevated as a description of changed clinical measurements and consistent with proper use in clinical chemistry, we suggest that the word “level” should also be eliminated in this context. Level describes an amount, such as the level of water in a jug, level of interest in problem, level of intelligence in an individual, or even level of blood pressure. Level is not the correct term for concentration (which is mass per unit volume) or rate (as in beats per minute), both of which should be described as higher or lower but never elevated.

C-reactive protein is a particular case in point. Concentrations in the plasma or serum of healthy individuals and those with diseases range from approximately 50 µg/L to more than 500 mg/L (10,000-fold higher), but the median value in healthy US and European adults is 1–2 mg/L. In 90% of healthy subjects, the plasma C-reactive protein concentration is less than 3 mg/L, and this value has been frequently considered the cut-point between normal and elevated. However, there is no actual threshold at the concentration of 3 mg/L, and the use of the term elevated creates confusion as to nature of the relationship of acute inflammation and infection and/or tissue damage with high values of C-reactive protein that still fall within the normal range versus that with truly increased concentrations.

Kohli and Cannon (3) recently emphasized the importance of matching language to the type of research (e.g., higher values versus increased values or higher risk versus increased risk) so as not to mislead the reader of an observational study into thinking that the data derive from an interventional study. Similarly, authors need to use precise language to describe increased concentrations; for example, they must distinguish between values of C-reactive protein that fall within the upper limits of the reference range for healthy subjects and the much higher values in subjects who are mounting an acute phase response to a clinically significant pathological process. By striving for improved accuracy in reporting, we may avoid unnecessarily misleading the reader as to the meaning of the findings.
ACKNOWLEDGMENTS

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P.G. received research grant support from the National Heart, Lung, and Blood Institute and from the European Commission (FP7 Mechanism). M.P. received grant support from the United Kingdom Medical Research Council, the Wolfson Foundation, and the United Kingdom National Institute for Health Research Biomedical Research Centre and Unit Funding Scheme.

The views expressed in this article are those of the authors and not necessarily those of the United Kingdom National Health Service, the United Kingdom National Institute for Health Research, the United Kingdom Department of Health, or the US National Institutes of Health.

Conflict of interest: none declared.

REFERENCES

