Vector Model of Complexity

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To the Editor:

Safford, et al., may have misappropriated the concept of vectors in their "vector theory of complexity."[1] The problem is highlighted by their statement: "While the summary vector in physics can be precisely calculated, we do not know the mathematical relationships between the vectors of patient complexity." Indeed, vectors are intrinsically mathematical[2] and are defined with regard to components along specified, orthogonal axes. Without such a mathematical framework, vectors per se have no meaning.

The proposed model describes complexity along five separate axes, incorporating important (and well-known) domains such as behavioral and cultural factors, but these entities do not have mathematical properties of vectors. For example, in Fig. 4 (a schematic of complexity vectors for two hypothetical patients), positive or negative values on the x-axis are not defined, and the horizontal intercept of zero complexity is not characterized—with corresponding angles between vectors therefore having no formal derivation or meaning. Additionally, it seems unlikely that cultural factors can remove complexity, which would be a logical inference from the vectors in this figure. Finally, although the Appendix of the article discusses summing of vectors, a single overall complexity score (ultimately measured on the y-axis) is unlikely to "inform the care of complex patients" as the stated application of the model.

The issue of patient complexity is challenging and certainly warrants the attention of clinicians and researchers. Using vectors in this conceptual model, however, may impart a false veneer of mathematical certitude.

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