

## Paradigm Consciousness: A New Approach to Understanding Anesthesia Knowledge and Education

*To the Editor:*—Kudos to Waisel *et al.* for his recent contribution to our journal, "Anesthesiology Trainees Face Ethical, Practical and Relational Challenges in Obtaining Informed Consent."<sup>1</sup> And also to our editors, for highlighting the usefulness of nonbiomedical research paradigms. Waisel *et al.* used narrative analysis, one genre of qualitative research methods, to deepen our understanding of the theory that underlies obtain informed consent in the practice of anesthesiology. Narrative analysis is only one of many accepted methodologies included in the realm of qualitative research. Others include biographical methods, critical theory development, hermeneutics, action research, and historiography. Qualitative methods, in any form, are both similar and different from our more familiar, quantitative, statistically based methods.

In both quantitative and qualitative methods there is an initially defined research question; optimal data sampling is based on known population characteristics; data collection and analysis follows rigorously defined protocols; and all sampling, data collection, analysis, and dissemination are in compliance with accepted research ethics.<sup>2</sup>

However, unlike hypothesis testing and statistical methods, qualitative research employs an inductive approach; the aim of qualitative research is to generate a theory grounded in both confirming and disconfirming evidence, such as observation, interviews, and documentation. These methods for theory generation are more useful in situations of complex social interactions where reductionist, statistical methods cannot adequately encapsulate all social confounds into one testable hypothetical premise, to the exclusion of all others. Qualitative

research methods have been a mainstay of social science and educational and psychological research for close to a century. And within the past two decades, they have been successfully merged with quantitative methods, especially in educational research, to both generate and confirm theory.<sup>2,3</sup> This innovative methodology is termed "mixed methods research."<sup>4</sup>

For those more interested in understanding and using complementary qualitative methods, several outstanding and readily accessible reference texts are available.<sup>2</sup> In addition, both PubMed and the Education Resources Information Center have medical subject headings that allow the reader to identify literature that employs qualitative methods. Hopefully the paradigm wars are indeed over, and the era of paradigm cooperation has begun in anesthesiology as well.

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### References

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The above letter was sent to the authors of the referenced report. The authors did not feel that a response was required. —James C. Eisenach, M.D., Editor-in-Chief.

## Body Mass Index: An Illogical Correlate of Obesity

*To the Editor:*—Lundström *et al.*<sup>1</sup> demonstrated that high body mass index (BMI), defined as weight per height squared ( $\text{kg}/\text{m}^2$ ), is a weak but significant predictor of difficult tracheal intubation. Exact determination of body composition to define the quantity and distribution of muscle and fat requires complex measurements unavailable in the perioperative setting. Teleologically, one hopes that an easily derived parameter like BMI can quantify obesity, which one intuitively expects to correlate with difficult tracheal intubation. Although the World Health Organization has adopted BMI to quantify obesity, BMI remains a misunderstood empiric 19th-century observation that is an illogical parameter for this task.<sup>2,3</sup>

BMI compares weight (and approximate volume) to surface area, which correlates to useful physical characteristics such as joint loading (force/area) or heat retention (mass of metabolically active tissue per surface area available for heat loss). It may not be apparent that, for objects of identical shape and density, BMI is directly and exactly proportional to height. Using the definition above, one can easily calculate that a 1-cm cube of water has a BMI of 10, a 2-cm cube of water has a BMI of 20, a 1-m cube of water has a BMI of 1,000, and so forth. However, differences in height may overwhelm differences in thickness: Short overweight patients may have a lower BMI than tall

thin patients. The ponderal index ( $\text{PI} = \text{kg}/\text{m}^3$ ) is a statistic proportional to the cube of the height instead of the square of the height. Because volume and mass are cubic functions of the linear dimension, the PI depends on shape but is insensitive to height: The PI of a sphere of water is always 523.6, the PI of a cube of water is always 1,000, and normal human PI is within a narrow range of 10 to 14.<sup>3</sup> The PI is more commonly used in pediatrics when height changes rapidly; during adolescence, the PI may decrease as children become taller and proportionally thinner, even though the BMI may paradoxically increase.<sup>3</sup> The human body shape index (HBSI) seeks to determine the optimal exponent, which appears to lie between 2.7 and 2.9 over a wide range of heights and ages ( $\text{HBSI} = \text{kg}/\text{m}^{2.85}$ ).<sup>3</sup>

For these reasons, Lundström *et al.* may find better correlations between either the PI or human body shape index and difficult tracheal intubation than between BMI and difficult tracheal intubation. The authors' data are a valuable resource, and we would like to encourage them to determine if a more significant relationship can be obtained using the PI or the human body shape index.

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