

## Pure Science or Purely Biased

*To the Editor:*

The carefully crafted study “Auscultation *versus* Point-of-care Ultrasound to Determine Endotracheal *versus* Bronchial Intubation”<sup>1</sup> was performed with great care to blind the observers. The ultrasound technique is described in detail, but the auscultation technique is unmentioned. Because the authors report that the “screens of the anesthesia machine and general monitor were partially covered to conceal the peak and mean airway pressure readings, capnography waveform, and the pulse oximetry (SpO<sub>2</sub>) values,” we may deduce that auscultation was performed during mechanical ventilation, presumably using current recommendations of tidal volumes of 5 to 7 ml/kg and positive end-expiratory pressure. The proper technique for auscultating for endotracheal tube placement requires placement of the stethoscope in the axilla and rapidly inflating the lungs with a larger than normal tidal volume to maximize breath sounds. Failure to utilize such a technique places auscultation at a distinct disadvantage in the comparison. An appropriate comparison for an ultrasound examination might be performing it with the gain minimized or the display turned to minimal intensity. Is it scientifically rigorous to compare two devices when the technique applied to one seriously hinders its application?

In the accompanying editorial, Isono *et al.*<sup>2</sup> have supported their argument that the stethoscope is obsolete with a table claiming that there is “no” “cost per use” for point-of-care ultrasonography. A quick check of the internet for the LOGIQ E device utilized in this study suggests retail prices of \$25 to \$30,000 with replacement probes costing a few thousand dollars each. Amortizing this cost over some reasonable number of anesthetic uses is clearly going to result in a real cost per use, perhaps half the \$50 they quote for fiberoptic. Just as the editorial suggests that sensitivity and specificity can be improved by a variety of enhancements in technique, so can auscultation be augmented by other physical diagnostic maneuvers, including the assessment of the cuff position by ballottement of the suprasternal notch to improve its performance.

In our enthusiasm to embrace new technology, it is easy to accept unfair comparisons as demonstration of superiority. In response to the editorial’s titular question, the well-trained clinician needs to use all of his senses, including common sense, to provide optimal care for his patients.

### Competing Interests

The author declares no competing interests.

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2. Isono S, Sandberg WS, Jiang Y: Do you believe what you see or what you hear?: Ultrasound *versus* stethoscope for perioperative clinicians. *ANESTHESIOLOGY* 2016; 124:989–91

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## High *versus* Low Technology in Assessment of Endotracheal Tube Position

*To the Editor:*

I read with great interest the publication by Ramsingh *et al.*,<sup>1</sup> which elegantly shows that point-of-care ultrasound examination is considerably more accurate than chest auscultation in discriminating between endotracheal and endobronchial intubation. However, several factors limit the practicality of this technique in routine clinical practice. It requires unrestricted access to neck and thorax and considerable operator experience. All ultrasound examinations were performed by anesthesiologists with at least 4-yr postresidency experience who had previously completed at least 50 whole-body point-of-care ultrasound examinations and at least an additional 25 pulmonary tree and lung expansion ultrasound examinations. Even under the optimal study conditions, it took close to 4 min to complete the ultrasound examination in individual cases. The authors appropriately acknowledge these limitations. However, acknowledgment will not eliminate them.

Somewhat surprisingly, the authors did not make any reference to the 21/23-cm method as a means of assessing endotracheal tube (ETT) position. When using this method, the ETT is positioned at the 21-cm mark in women and at the 23-cm mark in men, measured at the upper incisor teeth or the corner of the mouth. Although this technique is effective in predicting ETT position,<sup>2–4</sup> the authors state that using standardized ETT insertion depth is prone to error.<sup>1</sup> However, the referenced publication<sup>2</sup> does not necessarily support this view. The study population consisted of endotracheally intubated patients admitted to the intensive care unit.<sup>2</sup> In the control group (n = 263), position of the ETT was left unchanged. In the study group (n = 304), ETTs were (re) positioned at the 23-cm mark in men and at the 21-cm mark in women, measured at the upper incisor teeth or the upper anterior gums in edentulous patients. The distance between the tip of the ETT and the carina was radiographically determined. In the study group, there were no endobronchial

intubations, and in only two patients, the tip of the ETT was between 2 and 3 cm proximal to the carina (0.65%). In the control group, there were seven endobronchial intubations (2.7%); in eight patients, the tip of the ETT was less than 2 cm proximal to the carina (3.0%); and in 20 patients, the tip of the ETT was between 2 and 3 cm proximal to the carina (7.6%).

In a prospective randomized trial, chest auscultation, observation and palpation of chest movements, and check of the ETT tube insertion depth on the centimeter scale basis were used for detecting or excluding endobronchial intubation.<sup>4</sup> The position of the ETT was fiberoptically controlled. A maximum of 30 s was allowed to judge the tube position. Of all three tests, checking depth of insertion by the centimeter scale on the ETT was the most accurate. This method showed a sensitivity of 88% (95% CI, 0.75 to 1) and a specificity of 98% (95% CI, 0.39 to 1) for detecting or excluding endobronchial intubation. These values are as good as those obtained by the ultrasound method.<sup>1</sup> Importantly, the test results were independent of the anesthesiologist's experience. Noteworthy, had the 21/23-cm rule been followed, not a single patient would have been endobronchially intubated. However, it would have resulted in a shorter than the recommended safety distance of 2.5 cm between the distal end of the ETT and the carina in 24 of 118 women (20%) and 7 of 42 men (18%). If a 20/22-cm rule had been used, the recommended safety distance would have been achieved in 108 of 118 (92%) women and in all 42 men. The shortest correct intubation depth was 19 cm in 10 women with an average height of 157 cm and a body mass index of 28.4 kg/m<sup>2</sup>. These findings suggest that in general, using the 20/22-cm rule (with the possible exception of using 19 cm in small women with a higher body mass index) might be safer than using the "traditional" 21/23-cm rule.

The overall evidence suggests that the 21/23-cm method (possibly to be replaced by the 20/22-cm method) allows rapid and reliable assessment of the likelihood of endobronchial intubation without the need for advanced clinical experience and for additional technical equipment and specialized training. The practicing clinician should be aware of a "low-tech" alternative method of assessing the likelihood of endobronchial intubation of equal sensitivity and specificity as the ultrasound method but without its limitations. When next investigating the effectiveness of a technique in assessing the ETT position, it might be more appropriate to choose the 21/23-cm method as the "accepted" standard for comparison rather than chest auscultation.

### Competing Interests

The author declares no competing interests.

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### "We Hear What You Are Saying, but..."

*To the Editor:*

We read with interest as Ramsingh *et al.*<sup>1</sup> described their study comparing the efficacy of point-of-care ultrasound *versus* auscultation by using a stethoscope in determining proper endotracheal/bronchial positioning. We have used ultrasound to answer questions about endotracheal tube placement, possible pneumothorax, and difficult airway anatomy—all of which have been well-described by Kristensen.<sup>2</sup> Clearly, ultrasound offers advantages in very specific situations. We applaud the authors for describing a new technique in confirming the laterality of bronchial intubation. The authors rightly recognize the limitations of their study, especially the fact that auscultation and ultrasound were compared in isolation. In the actual clinical setting of other monitors including capnography, peak airway pressures, observation of chest excursion, and endotracheal tube humidification, it is hard to imagine that the addition of ultrasonography offers any significant advancement in patient safety for the following reasons: first, the authors state that the technique is "quick," which is then defined as "less than 4 min." In terms of airway management, 4 min strikes us as a long time. Depending on habitus and other pulmonary pathologies, the safe apneic time of a given patient may preclude ultrasound examination. Second, ultrasound is expensive, and availability is a legitimate concern. Even though we are employed in a large academic center that has many portable ultrasounds, the demand frequently exceeds the supply of devices. Third, compared to a stethoscope, ultrasounds are currently more cumbersome, breakable, and energy-source dependent. Fourth, ultrasounds do not fill every role our stethoscopes play; for example, they cannot diagnose bronchospasm or flash pulmonary edema.

In summary, while we respect the application of this technology, we do not yet see how it can be a point-of-care