Computers can compute better than humans

Wael C. Hanna, MDCM, MBA, FRCSC

From the Division of Thoracic Surgery, McMaster University, Hamilton, Ontario, Canada.

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Address for reprints: Wael C. Hanna, MDCM, MBA, FRCSC, St Joseph's Healthcare Hamilton, 50 Charlton Ave E, Juravinski Tower, Suite T2105 F, Hamilton, Ontario L8N4A6, Canada (E-mail: hannaw@mcmaster.ca).

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Wael C. Hanna, MDCM, MBA, FRCSC

Central Message

Volumetric analysis is a first step toward practice-changing research in minimally invasive lung surgery.

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Lung preservation is a timely and important topic in modern thoracic surgery. The advent of computed tomography screening for lung cancer and our increasing knowledge of the long-term behavior of ground-glass opacities have altered our understanding and management of early stage lung cancer. We are also becoming more aggressive in surgical resection for lung metastases in highly selected patients. As a result, our approaches to lung cancer surgery now rely more heavily on sublobar resections, keeping in mind that the same patients will need to undergo multiple operations (for multiple metachronous tumors) throughout their lifetimes. The natural consequence of this newfound emphasis on lung preservation is that thoracic surgeons will need more accurate models to predict lung function postoperatively.

In this issue of the *Journal*, Fernández-Rodríguez and colleagues¹ demonstrate a novel method of predicting postoperative lung function with volumetric computed tomography. They demonstrate that their method, which relies on 3-dimensional computed tomographic modeling, correlates better with true postoperative pulmonary function than the traditional methods of counting the anatomic segments and perfusion scintigraphy. Although the equations they used to compute postoperative pulmonary function are too complex to be applied successfully in daily practice, it is only a matter of time until new computed tomographic software makes volumetric analysis a standard part of any imaging report.

Unfortunately, this work is limited by serious selection bias. Fernández-Rodríguez and colleagues¹ tested their novel approach on patients who had already been deemed to be surgical candidates by the traditional methods of scintigraphy or segment counting. As such, they were merely able to show that volumetric analysis is better able to describe a known outcome. Patients who were not deemed candidates for operation by standard methods were not included in this analysis. One does wonder, however, whether these patients would be the ideal population to benefit from this technology. What if a patient whose disease was “inoperable” by current standards had it labeled

“operable” when volumetric analysis was used to compute the postoperative function? What about a patient who has previously undergone lobectomy for a cancer and another segmental resection for a ground-glass opacity presents with a new lesion that requires resection; could this patient benefit from volumetric analysis to determine operability? The answer remains unknown, because patients who underwent previous thoracic surgery were excluded from this analysis.

Fernández-Rodríguez and colleagues¹ have demonstrated what we all suspected was true: computers can compute postoperative lung volumes better than humans. This is a crucial step in our continued effort to offer surgery to patients who currently have their lesion labeled “inoperable.” It has already been demonstrated that patients with forced expiratory volume in 1 second and diffusing capacity of lung for carbon monoxide less than 50% predicted can safely undergo thoracoscopic surgery.² Determining whether we can push the envelope further will require some precise volumetric analyses and prediction models—and this article by Fernández-Rodríguez and colleagues¹ provides the preliminary data for practice-changing research.

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