Commentary: Optimal approach for pulmonary lobectomy: Open versus thoracoscopic versus robotic—Surgeon's choice?

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Central Message

Although robotic lobectomy may improve outcomes without excessive costs, each surgeon's choice of surgical approach should be guided by the individual surgeon factors of experience and comfort level.

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Lung cancer surgery used to be simple. In the days of the Lung Cancer Study Group, there was only a single surgical approach, open thoracotomy; thus, it was relatively straightforward to focus solely on oncologic and occasionally economic outcomes. Today, the landscape has changed dramatically, with lung cancer surgery running the gamut from open thoracotomy to robotic procedures with a myriad of variations in between, such as muscle-sparing thoracotomy, multiport versus single-port thoracoscopy, and even subcostal and subxiphoid thoracoscopy. This proliferation has expanded surgeons' attention to include the various procedure details themselves, as well as optimal surgical, economic, and oncologic outcomes. All approaches have advocates, and publications have highlighted the pros and cons of minimally invasive versus open surgery, as well as, more recently, thoracoscopic versus robotic procedures.

A recent addition to this expanding body of literature is the detailed retrospective analysis in this issue of the *Journal* by Kneuert and colleagues¹ comparing costs and short-term surgical outcomes between robotic, thoracoscopic, and open lobectomies. The report includes 296 robotic, 161 thoracoscopic, and 240 open lobectomies during an approximately 5-year period. A currently almost ubiquitous propensity score–matched analysis is used, but a careful attempt to balance potential treatment selection bias among the 3 groups is added through inverse probability of treatment weighting with a multinomial logistic regression analysis that was based on 18 covariates and the resulting stabilized weighting from 10 imputed data sets.

The results are predictable, but they are also surprising and conflicting with published literature. Patients undergoing open thoracotomy predictably had more complications (pneumonia and atelectasis) and longer hospital stays but shorter surgery times compared to patients undergoing

thoracoscopic or robotic procedures. Interestingly, patients undergoing thoracoscopic procedures had the longest surgical times. The net effect on costs was that open lobectomy had lower intraoperative costs but higher postoperative costs, whereas robotic and thoracoscopic lobectomy had higher intraoperative costs (from greater equipment and time resources, respectively) and lower postoperative costs. The somewhat surprisingly net economic effect (although few accounting details were provided) is that the final costs of the 3 approaches were nearly identical. This conflicts with Kneuert and colleagues'¹ own previous literature review, which showed a \$2901-\$4708 premium for robotic relative to thoracoscopic lobectomy.²

Caution is imperative in interpreting these results and in using the data for the overly enthusiastically promotion of robotic surgery. The use of inverse probability of treatment weighting to eliminate as much bias in patient selection as possible is a positive step, but not a perfect one. The complex decision-making process that surgeons use in choosing surgical approaches likely involves many confounders beyond those identified, including surgeon factors, support staff expertise, tumor location (central vs peripheral), and even others. Ideally, inverse probability of treatment weighting must include all confounding variables (condition termed ignorability), but if not, or if relationships are

nonlinear, residual biases may remain or actually increase.^{3,4}

Clearly, safe procedure-specific surgeon speed and good clinical judgment in avoiding complications are the 2 primary driving forces in cost containment, and these are surgeon and procedure specific. Although minimally invasive lobectomy in the right hands may improve some outcomes, there is no doubt that individual surgeons' decisions should be driven by each surgeon's specific "experience and comfort level."¹

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