Authors have nothing to disclose with regard to commercial support.

than traditional thoracotomy.⁴⁻⁶ It is therefore also a widely applied approach. Studies directly comparing VATS and MST, however, are still limited. In our study,¹ in which we used a propensity score-matched comparison, we showed VATS to be associated with lessened short-term complications and shorter hospital stay, whereas long-term survivals were equivalent between the groups.

In terms of confounding factors, Mehran and colleagues raise very good questions about variations in surgeons and the pain control. We agree that generally surgeons' preference may have an impact on which procedure is used and deserves respect. In this single-center study, surgeons performed both VATS and MST in large volumes, and the criteria for tube management and discharging patients were the same regardless of which approach was applied. Pain and quality of life are also important topics in the comparison of these procedures. We did not use these factors in the propensity-score matching algorithm, because pain was an outcome rather than a preoperative confounding factor and thus might mislead the results. A recent randomized, controlled trial demonstrated VATS to be associated with less pain than anterolateral open thoracotomy for the first year after surgery; however, limitations of that study included small sample size and the incompleteness of pain and quality-of-life data.⁷ In our cancer center, epidural analgesia with self-controlled analgesic bolus is routinely used for patients who undergo either MST or VATS. Intravenous flurbiprofen and a fentanyl patch are used if needed. There is limited study directly comparing pain after VATS and MST; and this comparison certainly merits further investigation in future studies.

In the era of minimally invasive thoracic surgery, no minimally invasive approach should be performed at the cost of compromised long-term survival for patients with cancer. Moreover, it is far more important for minimally invasive surgery to focus on reducing internal organ injury and systemic damage than to focus on reducing incisional injury alone. That is what we call "minimally invasive thoracic surgery 3.0" for a comprehensive approach to reduce surgical trauma.⁸ There are only limited number of randomized trials focusing on the comparison between MST and VATS; however, it is expected that more evidence will come out in the future to clarify this topic.

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References

1. Zhao Y, Li G, Zhang Y, Hu H, Zhang J, Sun Y, et al. Comparison of outcomes between muscle-sparing thoracotomy and video-assisted thoracic surgery in patients with cT1 N0 M0 lung cancer. *J Thorac Cardiovasc Surg*. 2017;154:1420-9.e1.
2. Yang HX, Woo KM, Sima CS, Bains MS, Adusumilli PS, Huang J, et al. Long-term survival based on the surgical approach to lobectomy for clinical stage I non-small cell lung cancer: comparison of robotic, video-assisted thoracic surgery, and thoracotomy lobectomy. *Ann Surg*. 2017;265:431-7.
3. Boffa DJ, Dhamija A, Kosinski AS, Kim AW, Detterbeck FC, Mitchell JD, et al. Fewer complications result from a video-assisted approach to anatomic resection of clinical stage I lung cancer. *J Thorac Cardiovasc Surg*. 2014;148:637-43.
4. Athanassiadi K, Kakaris S, Theakos N, Skottis I. Muscle-sparing versus posterolateral thoracotomy: a prospective study. *Eur J Cardiothorac Surg*. 2007;31:496-9; discussion 499-500.
5. Akçali Y, Demir H, Tezcan B. The effect of standard posterolateral versus muscle-sparing thoracotomy on multiple parameters. *Ann Thorac Surg*. 2003;76:1050-4.
6. Benedetti F, Vighetti S, Ricco C, Amanzio M, Bergamasco L, Casadio C, et al. Neurophysiologic assessment of nerve impairment in posterolateral and muscle-sparing thoracotomy. *J Thorac Cardiovasc Surg*. 1998;115:841-7.
7. Bendixen M, Jørgensen OD, Kronborg C, Andersen C, Licht PB. Postoperative pain and quality of life after lobectomy via video-assisted thoracoscopic surgery or anterolateral thoracotomy for early stage lung cancer: a randomised controlled trial. *Lancet Oncol*. 2016;17:836-44.
8. Cheng X, Onaitis MW, D'amico TA, Chen H. Minimally invasive thoracic surgery 3.0: lessons learned from the history of lung cancer surgery. *Ann Surg*. July 7, 2017 [Epub ahead of print].

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ARE WE COMPARING APPLES AND THORACOTOMIES? Reply to the Editor:

Mehran and colleagues raise an important point in their letter to the Editor that adequate pain control is a hallmark of thoracic surgery, and that operating through a thoracotomy is not mutually exclusive with providing adequate analgesia. In addition, they rightly point out that length of stay is a somewhat arbitrary metric, and that early recovery pathways are getting all patients out of the hospital faster, regardless of surgical approach and across a variety of surgical disciplines and patient cohorts.¹ In the article that they cite by Rice and associates,² it is true that the pain scores equalized between video-assisted thoracoscopic surgery (VATS) and thoracotomy in the liposomal bupivacaine

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group. There was no direct comparison of perioperative outcomes between thoracotomy and VATS, however, and the overall comparison between epidural and liposomal bupivacaine showed no difference in perioperative outcomes.

In the article under discussion of Zhao and colleagues,³ there was a 3-fold increase in perioperative complications in the muscle-sparing thoracotomy group compared with the VATs group. Much of the statistical difference was driven by chylothorax; however, the trend across all the respiratory complications measured favored a VATS approach and likely contributed to the overall difference in complication rate. Furthermore, this article does not exist in a vacuum but is part of a growing body of evidence, already well referenced and cited in the article by Zhao and colleagues,³ showing improved perioperative outcomes when rib spreading is avoided.

For many patients, a thoracotomy is still necessary, and therefore techniques to minimize the associated morbidity, such as muscle sparing approaches, and a focus providing aggressive, adequate analgesia, should continue to be explored and encouraged. Mehran and colleagues are right to highlight that in their letter and are to be commended for their strong advocacy in this arena and in their advancement of new techniques, such as the use of liposomal bupivacaine. The article by Zhao and colleagues,³ however, is an important contribution to the existing body of evidence that shows superior short-term outcomes for a minimally invasive approach. When appropriate, such an approach should be preferred to rib-spreading techniques.

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References

1. Liu VX, Rosas E, Hwang J, Cain E, Foss-Durant A, Clopp M, et al. Enhanced recovery after surgery program implementation in 2 surgical populations in an integrated health care delivery system. *JAMA Surg.* 2017;152:e171032.
2. Rice DC, Cata JP, Mena GE, Rodriguez-Restrepo A, Correa AM, Mehran RJ. Posterior intercostal nerve block with liposomal bupivacaine: an alternative to thoracic epidural analgesia. *Ann Thorac Surg.* 2015;99:1953-60.
3. Zhao Y, Li G, Zhang Y, Hu H, Zhang J, Sun Y, et al. Comparison of outcomes between muscle-sparing thoracotomy and video-assisted thoracic surgery in patients with cT1 N0 M0 lung cancer. *J Thorac Cardiovasc Surg.* 2017;4:1420-9.e1.

<https://doi.org/10.1016/j.jtcvs.2017.11.049>

PRECISE CAPTURE OF THORACIC MORBIDITY AND MORTALITY: ESSENTIAL TO THE PROCESS AND CULTURE OF QUALITY IMPROVEMENT

To the Editor:

We read with great interest the recent timely review by Brandt and colleagues,¹ focusing on quality metrics for lung cancer surgical care in the preoperative, intraoperative, and postoperative settings.

The difficulty in defining hard and fast quality metrics in thoracic surgery arises because quality improvement (QI) by definition is an active “process” in constant flux. For success of such a process, it must permeate the institutional structure of care delivery at every level. In this respect, thoracic surgeons must lead by example, developing a structured cultural shift from “blame” for postoperative adverse event outcomes to institutional self-reflection with the aim of continuous QI. This begins with a specialty-specific measurement tool at the foundation to maximize the precision with which conclusions can be drawn on the basis of collected data.

In this context, the authors may find the Canadian Thoracic Surgical approach to implement the Donabedian classification of structure, process, and outcomes to thoracic quality assessment of interest. The Thoracic Surgery Morbidity and Mortality (TMM) data reporting and recording structure developed by Seely and colleagues² is at the heart of the method. Initially derived from the Dindo-Clavien classification of postoperative adverse events based on their severity, the tool has been externally validated for use in the thoracic surgery population.³ TMM has been compared directly with the National Surgical Quality Improvement Program, and certain benefits include the capture of important thoracic-specific postoperative adverse events, such as prolonged air leak.⁴ In addition, selection bias inherent in reporting of health outcomes with routine medical records data sources is minimized secondary to the structured 100% data capture process, in contrast to the proportional sampling technique of case reporting with National Surgical Quality Improvement Program. In this way, TMM minimizes the risk of nondifferential misclassification of adverse event outcomes in patients with lung cancer.⁴

As reported by Dr Brunelli and colleagues,⁵ who also wrote the editorial commentary for this review article on the importance of incorporating patient experience and cost assessment into QI, there is a direct association