increase driving pressure if it deceases lung compliance (as in atelectasis), or increased tidal volume can decrease driving pressure if it increases lung compliance (as in recruitment). Therefore, reduction of tidal volume would decrease driving pressure until it reaches to the point where lung compliance starts to decrease. No study ever tested tidal volume in terms of driving pressure and it would be another interesting study subject. We think optimal tidal volume would be different in each individual if it is based on the lowest driving pressure.

We thank Dr. Amar for his careful review of our study.[1] As he said, lung resection and esophagectomy are two different surgeries. However, our hospital has many esophageal cancer surgeries (more than 300 cases per year). All included patients underwent the Ivor Lewis operation which usually takes only 4 to 5 h. All patients had no preoperative adjuvant chemoradio therapy. We only studied complications until postoperative day 3, thus a lot of delayed complications (graft failure, aspiration pneumonia, among others) were not included. For this reason, we did not see inclusion of esophageal cancer surgery as a problem. The number of esophageal surgeries was small (control group n = 12 *vs.* driving pressure group n = 16) and the incidence of pulmonary complications diagnosed by Melbourne Group Scale was control group n = 3 and driving pressure group n = 4. Dr. Amar's other concern was the use of statistics. As he said, it is correct to use the Fisher exact test when expected frequencies are less than 5. Our concern was that the Fisher exact test runs an exact procedure especially for small-sized samples and is more conservative than the chi-square test. Our institutional statistician advised that acute respiratory distress syndrome (ARDS) is a small part of our primary outcome (pulmonary complications); therefore, showing the incidence itself is enough (ARDS: control group n = 5, driving pressure group n = 0). $P = 0.05$ cut is a consensus, some argue $P = 0.10$, or $P = 0.001$ is meaningful. Our P value by two different statistics was 0.025 *versus* 0.060, and the difference mostly came from small incidence of ARDS. Dr. Amar questioned why pneumonia occurred more frequently in both operated and nonoperated lungs in the control group. We think direct surgical injury and one-lung ventilation are associated with a profound inflammatory cytokine release because of abundant immune cells on the lung endothelium and alveolus.[2] Excessive neutrophils recruited in response to the proinflammatory cytokines increase pulmonary vascular permeability in both dependent and nondependent lungs.[3] These reactions often precede systemic inflammatory response syndrome, ARDS, and pneumonia.[4–6]

Competing Interests

The authors report no conflicts of interest.

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Extracorporeal Membrane Oxygenation 1-yr Outcome: Comment

To the Editor:

Current trials published in medical literature, and especially the critical care literature, measure similar primary endpoints, namely, mortality. This measure is often an appropriate way of examining the effectiveness of some of our most novel and innovative treatments. Many trials also measure a number of other secondary endpoints, including time free from a ventilator or time spent in the hospital. But often these trials do not describe a patient's neurologic status or functional status after these interventions. Treatments for medical conditions once thought nonsurvivable have advanced rapidly in recent years. Patients can be kept alive in the face of complete failure of multiple organs, often for

extended periods of time. While mortality is an important endpoint, we applaud the recent publication by Grasselli *et al.*[1] for examining endpoints specifically related to a patient's quality of life.

An excellent example of quality of life–related outcomes research is in the cardiac arrest literature and the use of the modified Rankin scale to show neurologic outcomes after interventions.[2] Given that the incidence of the post–intensive care syndrome, or one of its three components, can be 25% or higher for patients *and* families or caregivers,[3] we think the time is right to expand outcomes to examine a patient's functional status and quality of life after discharge from the intensive care unit. In a recent meta-analysis, only 48 studies out of 11,927 (0.4%) included health-related quality of life after discharge from the intensive care unit as an outcome measure.[4]

In a recent large trial of extracorporeal membrane oxygenation (extracorporeal membrane oxygenation for acute respiratory distress syndrome),[5] 60-day mortality was not different between extracorporeal membrane oxygenation and conventional mechanical ventilation, but there was no information gathered on patients' quality of life after these interventions. Therefore, we were delighted to see Grasselli *et al.*'s[1] publication related to quality of life after extracorporeal membrane oxygenation and applaud them for including these measures in those who survived a very severe illness. The finding that those who underwent treatment with extracorporeal membrane oxygenation had less of an impact on health-related quality of life is especially important for such an invasive intervention. Could extracorporeal membrane oxygenation be a mechanism for helping people recover closer to their baseline functional status? Also, the fact that this intervention is often offered to a younger patient population (in this study, an average age of 54 yr)[1] makes us more hopeful that survivors of extracorporeal membrane oxygenation can have an acceptable quality of life for many years into the future.

We are hopeful that publications such as Grasselli *et al.*'s[1] are the beginning of a trend to new measures in the medical literature. Since "the ultimate goal of health care is to restore or preserve functioning and well-being related to health,"[6] measures such as these may shed new light on treatments that allow our patients to be happier and more satisfied with their medical care.

Competing Interests

The authors declare no competing interests.

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Extracorporeal Membrane Oxygenation 1-yr Outcome: Reply

In Reply:

We thank Drs. Phillips and Fink for their interest in our work[1] and we completely agree with all their observations. Through the years, we have assisted with continuous

significant advancements in the care of critically ill patients. Better management of mechanical ventilation and sepsis, advanced monitoring techniques, and more recently, extracorporeal life support techniques, all contributed to improve the rate of survival of critical illness. There is also a tendency to admit older patients with more comorbidities to intensive care units (ICU). At the same time, however, we are realizing that being discharged alive from ICU might not be "the last stage of the journey," but rather, the beginning of an even longer and potentially more painful ordeal. Indeed, ICU survivors experience not only the direct consequences of the critical illness, but also significant long-term outcomes including physical weakness, neurocognitive impairment, and psychiatric disorders that, in turn, significantly affect their quality of life.[2] Moreover, families and caregivers are also at increased risk for psychologic sequelae, particularly posttraumatic stress disorder. Hence, in critical patients, long-term mortality, morbidity, and quality of life may be considered more meaningful outcomes than short-term mortality.[3]

In our study,[1] acute respiratory distress syndrome survivors had almost full recovery of lung function, but severe impairment of quality of life, and stress, anxiety, depression, and posttraumatic stress disorder occurred with alarming frequency. Interestingly, patients treated with extracorporeal membrane oxygenation had a better health-related quality of life then those receiving conventional treatment. We acknowledge that the generalizability of our results is limited, since they come from a single-center study with significant methodologic limitations,[5] conducted in a highly specialized tertiary referral center. For these reasons, our data do not prove that extracorporeal membrane oxygenation is "a mechanism for helping people recover closer to their baseline functional status," but they provide a hypothesis for future research. We strongly believe that larger, multicenter, well-designed trials are necessary to understand the actual impact of extracorporeal membrane oxygenation support upon long-term outcomes. Moreover, from a clinical perspective, we believe that specialized multidisciplinary follow-up programs[5] may allow the early recognition and treatment of physical and/or psychologic sequelae and can play a crucial role to improve the quality of life of patients recovering from critical illnesses.

Competing Interests

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