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For decades, surgery has been the mainstay of treatment in early stage lung cancer, as well as complex infectious conditions of the lung. Concomitantly, forced expiratory volume (FEV<sub>1</sub>) alone has been the discriminating parameter of surgical eligibility. Still, the limitations of FEV<sub>1</sub> have emerged in published literature, and so carbon monoxide diffusing capacity (DLCO) has been suggested as a complementary parameter, to be introduced along with the concept of defining numeric values corresponding to the predicted postoperative figures of FEV<sub>1</sub> and DLCO. However, recent evidence argues against the predicting ability of postoperative FEV<sub>1</sub> and DLCO, especially in the immediate postoperative period and in patients with severe airflow limitation.

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Beside pulmonary function tests, other measures of cardiopulmonary fitness have been shown to be useful for preoperative risk stratification. Reduced values of carbon monoxide lung diffusion capacity and its predicted postoperative value have been reported to be associated with postoperative complications and mortality. The most widely used low-technology exercise tests, which include 6 minutes of walking and stair climbing, have been reported to be valid predictors of complications. Patients with an impaired performance at these tests need to undergo a formal cardiopulmonary test with measurement of maximum oxygen consumption at cycle-ergometry or treadmill. Functional algorithms have been proposed that incorporate all these tests, with the aim to assist in defining the surgical risk.

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The assessment of regional lung function to predict postoperative function is integral to preoperative evaluation of pulmonary resection candidates who have impaired lung function. The four validated ways are: anatomic calculation, split radionuclide perfusion scanning with single photon emission CT (SPECT), quantitative CT scanning, and dynamic perfusion MRI. Estimations of predicted postoperative lung function based on anatomical calculations are the simplest, tend to overestimate postresectional

functional loss, and should be performed in most operative candidates. Patients requiring further evaluation require one of the other techniques: SPECT, quantitative CT, or MRI. All effectively predict postoperative forced expiratory volume in 1 second (FEV<sub>1</sub>). Cost, local expertise and availability, and the need to predict postoperative maximum oxygen consumption ( $\dot{V}O_2$  max) dictate the clinician's choice.

## **Future Trends in Preoperative Evaluation**

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Gonzalo Varela and Nuria M. Novoa

Preoperative evaluation before major thoracic procedures is aimed at classifying patients according to their probability of adverse postoperative outcomes and the estimated effectiveness of the surgical procedure. Although knowledge about perioperative physiologic changes has increased, clinicians are still far from finding a way to put this knowledge down and make it applicable for an individual patient. Multicentric cooperation and evaluation of large prospectively recorded databases are essential to develop evidence-based clinical guidelines on preoperative evaluation.

## **Preoperative and Postoperative Pulmonary Rehabilitation in Lung Cancer Patients**

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Linda Nici

The most effective treatment for non-small cell lung cancer is surgery; however, many patients diagnosed with lung cancer have significant underlying chronic lung disease as well as other symptoms related to their cancer that may increase morbidity and mortality risks. Preoperative assessment is essential. An important question is whether the institution of a perioperative pulmonary rehabilitation program for this patient population results in better outcomes, with respect to functional status and decreased morbidity and mortality rates.

## **Preoperative Cardiac Evaluation of Lung Resection Candidates**

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Steven L. Cohn

Cardiac complications are second only to pulmonary complications as a cause of perioperative morbidity and mortality after lung resection surgery. Preoperative evaluation should focus on clinical risk factors in the history, physical examination, functional status, and electrocardiogram to identify patients at high risk who require further investigation or intervention. Because these patients need to have surgery performed within a month or two of their diagnosis to minimize the chance of the disease spreading, it is important to avoid unnecessary or prolonged delays to evaluate or treat other medical comorbidities.

## **Predicting the Need for Intensive Care Following Lung Resection**

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Simon Jordan and Timothy W. Evans

The use of screening techniques, such as computed and positron emission tomography, in patients thought to be at high risk of developing primary lung tumors is increasing. Anticipating, and preferably predicting, which patients undergoing thoracic surgery will require intensive care postoperatively therefore assumes considerable clinical significance, and has implications for resource provision and utilization.

## **Risks of Neoadjuvant Chemotherapy and Radiation Therapy**

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Georgios Stamatis

The aim of the present contribution is to overview the literature and to evaluate the risks for medical and surgical complications of lung cancer surgery after induction

chemotherapy or chemoradiotherapy in patients with locally advanced non-small-cell lung cancer. Obvious limitations of this report will be the complexity and heterogeneity of stage III disease in association with the difficult data collection of a large number of retrospective and small number of prospective randomized studies. The different definition of the time of postoperative mortality, as well the range of reported morbidity and mortality rates may reflect varying criteria for patient selection; differences in type and doses of induction treatment; and differences in the experiences of oncologists, radio-oncologists, and surgeons involved.

## **Long-Term Quality of Life After Lung Resection**

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John Cannon and Thida Win

Several studies have shown that physical domains of quality of life deteriorate early after lung cancer surgery but improve to baseline by six months after surgery. Impaired cardiopulmonary function following pulmonary resection is an important predictor of immediate postoperative morbidity. Chronic pain is the most common complication after lung cancer surgery. Lung cancer survivors do not experience the same length of life and quality of life as their age-matched peers or other cancer survivors. There is clearly a need to identify and intervene with subgroups of patients who are at an elevated risk of premature death and diminished quality of life.

## **Parenchymal-Sparing Resections: Why, When, and How**

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Matthew J. Schuchert, Brian L. Pettiford, James D. Luketich,  
and Rodney J. Landreneau

Historically, the rates of local recurrence of non-small cell lung cancer have been higher with sublobar resection than with lobectomy. Recent data from Japan and the United States show that sublobar resection of small tumors (especially those  $\leq 2$  cm) can be performed with no significant difference in local recurrence or long-term survival. Recurrence rates can be reduced further by achieving an adequate margin of resection. The use of intraoperative brachytherapy mesh implants during sublobar resection may help minimize the risk of local recurrence. For larger tumors, or when adequate surgical margins are not obtainable, lobectomy should be performed.

## **The Use of Scoring Systems in Selecting Patients for Lung Resection: Work-up Bias Comes Full-Circle**

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Martin Utley and Tom Treasure

Statistical models of perioperative risk and long-term postoperative survival facilitate the fair assessment of surgical outcomes and provide insight into the association between certain clinical features and outcome. They provide quantitative estimates of risk or long-term survival. These models, however, have a number of limitations in informing decisions concerning the selection of patients for lung resection. This article examines those limitations.

## **The Influence of Preoperative Risk Stratification on Fast-Tracking Patients After Pulmonary Resection**

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Ayesha S. Bryant and Robert J. Cerfolio

Fast-tracking protocols or postoperative care computerized algorithms have been shown to reduce hospital length of stay and reduce costs. Although fast-tracking protocols cannot be applied to all, the vast majority of patients who undergo elective pulmonary resection, even those at high risk, can undergo safe, efficient, and cost-saving care via preset postoperative algorithms. When the typical daily events are convened each

morning and the planned date of discharge is frequently communicated with the patient and family before surgery and each day in the hospital, most patients can be safely fast-tracked with high satisfaction and outstanding results.

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