Pulmonary Risk Assessment and Optimization

Kurt J. Pfeifer, MD[a,*], Gerald W. Smetana, MD[b]

KEYWORDS

• Perioperative care • Preoperative risk stratification
• Postoperative pulmonary complications • Pneumonia • Respiratory failure

HOSPITAL MEDICINE CLINICS CHECKLIST

1. Postoperative pulmonary complications are consistently associated with several patient-specific and procedure-specific risk factors, including presence of multiple comorbidities, advanced age, obstructive sleep apnea, chronic obstructive pulmonary disease, cigarette smoking, prolonged surgery, and abdominal or thoracic procedures.
2. Diagnostic testing rarely adds to clinical assessment when performing a preoperative pulmonary risk assessment.
3. Lung-protective ventilation, regional and neuraxial anesthesia, and use of shorter-acting neuromuscular blockade are intraoperative methods of pulmonary risk reduction.
4. Smoking cessation, lung expansion maneuvers, preoperative respiratory conditioning, and epidural or patient controlled analgesia–based opioid administration are preoperative and postoperative methods of reducing pulmonary complications.
5. Obstructive sleep apnea is an increasingly prevalent risk factor for postoperative complications, which may be reduced through screening and the use of guideline-based interventions.

Disclosure: The authors have nothing to disclose.
[a] General Internal Medicine, Department of Medicine, Medical College of Wisconsin, 9200 West Wisconsin Avenue, Milwaukee, WI 53226, USA; [b] Division of General Medicine and Primary Care, Beth Israel Deaconess Medical Center, Harvard Medical School, Yamins 102C, 330 Brookline Avenue, Boston, MA 02215, USA
* Corresponding author.
E-mail address: kpfeifer@mcw.edu

Hosp Med Clin 5 (2016) 176–188
http://dx.doi.org/10.1016/j.ehmc.2015.11.005
2211-5943/16/$ – see front matter

EPIDEMIOLOGY

What are the clinically significant postoperative pulmonary complications (PPCs)?

Multiple surgical, anesthetic, and patient risk factors predispose patients to several important PPCs (**Box 1**). The primary underlying causes for PPCs are aspiration related to perioperative sedation and neuromuscular blockade, and a reduction in postoperative lung volumes caused by the effects of anesthesia and incisional pain. In turn, these respiratory problems increase the risk of clinically significant PPCs (ie, those requiring intervention).

How common are PPCs, and what is their impact on patient care?

Although cardiac risk is often given greater attention in the preoperative evaluation, PPCs are more common than cardiac complications and result in substantial morbidity and mortality.[1] Recent studies suggest that PPCs occur in 2% to 12% of nonthoracic surgeries and up to 38% of thoracic procedures.[2,3] Patients who develop PPCs have in-hospital mortalities of 17% to 38% as well as a 6-fold increase in the probability of discharge to a skilled nursing facility.[4,5] Hospital costs in patients with PPCs are also greatly increased; 0.7% of all Medicare patients undergoing surgical procedures are rehospitalized within 30 days for postoperative pneumonia.[6]

PATIENT EVALUATION AND DIAGNOSIS

What are the procedure-related risk factors for the development of PPCs?

In contrast with postoperative cardiac complications, procedure-related risk factors are more important than patient-related risk factors for the development of PPCs. Thus, even healthy patients carry a substantial risk of PPCs if multiple procedure-related risk factors are present. The most important of the procedure-related risk factors is the surgical site. In general, PPCs are more common the closer the incision is to the diaphragm. For example, upper abdominal surgery confers higher PPC rates than lower abdominal surgery. **Table 1** provides estimates of the unadjusted rates of PPC for different surgical sites from the American College of Physicians (ACP) guideline on preoperative pulmonary assessment.[7] Even after adjustment for other patient-related and procedure-related risk factors that are common among patients undergoing particular types of surgery, surgical site remains the most important clinical predictor of PPC rates (see **Table 1**). Other important procedure-related factors include

Box 1
Clinically significant PPCs

- Pneumonia
- Respiratory failure
- Obstructive lung disease exacerbation
- Pleural effusion
- Pneumothorax
- Atelectasis (severe)