Brief Preoperative Smoking Abstinence: Is There a Dilemma?

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The concern that stopping smoking shortly (<8 weeks) before surgery increases postoperative pulmonary complications poses a barrier to tobacco use interventions in surgical patients. We show how this concern arose from a misinterpretation of initial studies and has remained in the medical literature despite the accumulation of later evidence. The persistence of unsubstantiated concepts is not uncommon and can have a significant impact on medical practice. Although it may take several weeks to derive pulmonary benefit from quitting, fear of an increase in pulmonary complications should not be a barrier for clinicians to help their patients quit smoking at any time before surgery. (Anesth Analg 2011;113:1348–51)

Each year, millions of cigarette smokers undergo anesthesia and surgery. Cigarette smoking increases the risk of perioperative cardiac, pulmonary, and wound complications, and abstinence from smoking in this period can reduce complication rates. However, the duration of preoperative abstinence necessary for benefit is not clear. Indeed, some authorities suggest that smokers who quit for only a brief period before surgery (often defined as <8 weeks) may in fact be at increased risk for pulmonary complications. The purported mechanism responsible for this increased risk is a transient increase in cough and mucus production after abstinence. This consideration has prompted some authors to counsel against smokers attempting to quit in the immediate preoperative period. For example, a current anesthesia textbook states that “the fact that anesthesiologists rarely see their patients 4 weeks or more before surgery presents a dilemma: if one is unable to advise the patient to stop smoking 8 weeks or more before surgery, is it preferable for the patient to continue smoking?”

This consideration presents a potential barrier to clinicians helping their patients quit smoking in the preoperative period. Indeed, a recent commentary opines that the “uncertainty regarding the presence or absence of harm associated with smoking cessation shortly before surgery leaves clinicians uncertain as to what to advise patients, particular [sic] those for whom surgery is imminent,” and one current practice recommendation states that “cessation should occur at least 8 weeks before surgery to minimize the increase in pulmonary complications in recent quitters.”

But is there really a dilemma? In this article, we explore the origins of the dogma that quitting smoking shortly (<8 weeks) before surgery increases the risk of postoperative pulmonary complications, and the supporting evidence. In addition to providing guidance for clinicians regarding the preoperative management of smoking behavior, this is also an instructive example of how ideas supported by little or no evidence can become commonly accepted in the medical literature and impact practice.

The Evidence

The argument that brief preoperative abstinence from smoking increases pulmonary risk is based largely on 2 papers from the Mayo Clinic. In 1984, Warner et al. retrospectively reviewed the medical records of 500 patients undergoing coronary artery bypass grafting and analyzed the association between self-reported smoking history and postoperative pulmonary complications. These complications included purulent sputum with an associated oral temperature higher than 38.3°C, secretion retention requiring inhalation and chest physical therapy not a part of the routine care, bronchospasm requiring bronchodilator therapy, pleural effusions or pneumothorax requiring drainage, and segmental pulmonary collapse. They found that the proportion of smokers who developed at least 1 pulmonary complication and who stopped longer than 8 weeks before surgery was ~20%, significantly lower than the 48% of those who continued smoking and similar to the rate in nonsmokers. The complication rate in patients who stopped smoking for <8 weeks was 56%, a proportion not significantly different ($P = 0.18$, $\chi^2$ test) from those who continued smoking. The paper also included a bar graph showing that the rates in patients who stopped smoking <2 weeks (57%) and those who stopped between 2 to 4 weeks (61%) were numerically more than the rate in those who continued to smoke. However, the differences were also not statistically significant ($P = 0.22$ and 0.15, respectively, $\chi^2$ test). The authors concluded that longer periods of...
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abstinence (>8 weeks) were necessary for pulmonary benefit, without commenting on differences in rates within abstinence durations of <8 weeks (appropriately so, because no differences were statistically significant).

A subsequent study from the same group of authors in 1989 examined a cohort of 200 consecutive patients (of which 192 were analyzed) undergoing elective coronary artery bypass grafting. Data were gathered prospectively, using a definition of pulmonary complications similar to that used in their previous study, as well as urinary cotinine measurements to verify recent smoking history. This study also concluded that the rate of complications in patients who stopped smoking for >8 weeks before surgery (18 of 153 patients experienced at least 1 complication, 15%) was significantly lower than that in smokers who continued to smoke (6 of 18 patients, 33%), and similar to that of nonsmokers (12%). Of the 21 smokers who had stopped for <8 weeks before surgery, 12 (57%) developed at least 1 complication. They presented a logistic model predicting the rate of complications as a function of smoke-free days (their Figure 1), which appeared to show an increase in rate if the number of smoke-free days was between 1 and approximately 56 days (i.e., 8 weeks). These data are likely the major source of the concept that <8 weeks of abstinence increases pulmonary risk. However, this was not the conclusion of the authors, because these differences were not statistically significant. Regarding the comparison of complication rates for patients who quit for <8 weeks before surgery and those who continued smoking (33% and 57%, respectively), although there were seemingly impressive differences between the 2 values, statistical comparison achieved a probability of \( P = 0.2 \) (Fisher exact test). For the logistic regression model, it is apparent from their Figure 1 that the predicted rates within 8 smoke-free weeks remains within the 95% confidence intervals for continued smokers. Thus, this study did not find that quitting within 8 weeks of surgery increased complication rates, and the authors were careful not to make this conclusion. Rather, they again concluded that longer periods of abstinence are necessary for pulmonary benefit.

Nonetheless, in 1990 a major anesthesia textbook interpreted this study as showing that “smokers who stopped for <8 weeks actually had an increase (from 33 percent for current smokers to 57.1 percent for recent quitters) in the rate of one or more of the six complications surveyed” and that “this is one of the few studies [to] show both harmful and beneficial outcomes for pulmonary status from the same maneuver—smoking cessation.” The author then formulated the “dilemma” noted in the introduction. Although countervailing opinions continued to accumulate, the idea that brief preoperative smoking abstinence increases pulmonary risk has persisted for >20 years in textbooks (including recent texts), practice guidelines, and review articles, as noted in the examples provided in our introduction and others. A detailed review of all the evidence concerning the effects of relatively brief preoperative abstinence from smoking on pulmonary risk is beyond the scope of this article. However, there have been numerous studies subsequent to the aforementioned reports of Warner et al. 1, 5 that do not find that brief preoperative abstinence is associated with increased pulmonary risk. A recent meta-analysis concluded that available evidence does not support an association between brief abstinence and increased risk. It should be acknowledged that the quality of evidence is problematic, because these are primarily observational studies with the inherent potential for unmeasured confounders. For example, both surgery and the diagnosis of diseases such as cancer are teachable moments for smoking cessation, increasing the chances that smokers will quit. The magnitude of this effect depends on the severity of surgery and the seriousness of the diagnosis, such that sicker patients may be more likely to quit immediately before surgery and be more likely to develop complications. Thus, none of these studies can determine a causal relationship between quitting and complications. In addition, there is substantial heterogeneity among studies in important factors such as the type of surgery and the definition of pulmonary complications, such that meta-analysis may not be an ideal technique for combining and analyzing the collective data. Also, the numbers of patients in these studies, especially patients with <8 weeks of preoperative abstinence, is relatively small. Finally, the purported mechanism for increased risk, increased cough and sputum production, has also not been supported. In an ambulatory population, smoking cessation is not associated with an increase in cough and sputum production, and intraoperative sputum production is not increased in recent ex-smokers (<8 weeks abstinence before surgery) in comparison with current smokers. Thus, (1) no individual study has found that brief preoperative smoking abstinence significantly increases pulmonary risk, (2) meta-analysis of the available studies also does not find a significant increase in risk, and (3) there is no support for the purported underlying mechanism contributing to risk. Why then does the specter of the potential for increased risk continue to be raised?

**THE GESTATION AND PERSISTENCE OF CONCEPTS**

An increased interest in the concept of evidence-based medicine has prompted work to explain how concepts enter and are perpetuated in the medical literature and clinical practice. The 1990 textbook interpretation of the Mayo Clinic studies as showing an increase in complications with <8 weeks of smoking abstinence is an example of “interpretive bias,” a term used in the philosophy of science to describe errors generated in the evaluation process of original data. The potential for bias is inherent in the interpretation of all data. What is more difficult to understand is how this bias can be perpetuated in the medical literature by multiple subsequent authors, and in the face of mounting evidence to the contrary. Available evidence suggests that scientific judgments of evidence are influenced by prior beliefs. Evidence that agrees with the prior beliefs is more likely to be considered of better quality, whereas unconventional evidence may be subjected to prejudice. Experts may filter subsequent evidence to support their initial beliefs as studies inconsistent with this belief are discounted. It is also possible that authors simply quote earlier texts and reviews without...
themselves critically evaluating the primary evidence. There can be legitimate disagreement and controversies in the interpretation of evidence, but sometimes evidence is simply ignored.

Several authors have documented the persistence of unsubstantiated concepts in the medical literature. Antman et al. used the cumulative meta-analysis technique (in which meta-analyses are updated as further evidence is published) to compare the evolution of evidence based on randomized control trials and the recommendations of clinical experts in myocardial infarction treatment.23 Their results showed that there was a substantial lag between the publication of randomized control trials of therapies to reduce the risk of mortality in myocardial infarction and the recommendations in textbooks and review articles. Treatments with no benefits or potential harm continued to be recommended by several experts despite further evidence provided by randomized clinical trials. At the time that the Antman et al. article was published, resources such as the Internet were not widely available so that insufficient dissemination might have played a role in creating the delay between evidence and recommendations. However, more recent studies continue to find the persistence of ideas in the medical literature that are contradicted by subsequent evidence. For example, Tatsioni et al. analyzed how citations for highly cited studies proposing ideas that were later contradicted by additional evidence changed over time.24 As an example, they examined the claim that vitamin E supplementation improves cardiovascular risk, as suggested by observational studies in the early 1990s but not supported by more recent evidence. The authors found that although support for this concept in the literature became less favorable over time, as of 2005 the concept persisted, with half of the articles uncritically citing the early studies. They also presented similar stories for claims of benefit for β-carotene for cancer and estrogen for Alzheimer disease. The extensive work of John Ioannidis highlights that refutation of the results of highly cited clinical trials is relatively common, and that even for those that are not, effect sizes tend to diminish with subsequent studies.25 His analysis shows that research findings with a relatively low prior probability of being true in fact are often not, and that subsequent evidence may be further distorted by several potential types of bias.26 These considerations do not directly apply to our example of the “dilemma” of whether to quit smoking shortly before surgery, in that there was never evidence of statistically significant harm from brief smoking cessation. Nonetheless, the dilemma of brief preoperative smoking cessation again demonstrates that once introduced to medical literature, some ideas are very resistant to change despite the evolution of scientific evidence.

SUMMARY
The practice of evidence-based medicine is challenging at best, but is made more difficult when the medical literature does not accurately interpret and synthesize the actual evidence. The idea that stopping smoking shortly (<8 weeks) before surgery increases postoperative pulmonary complications initially grew from an overinterpretation of early clinical data, and the subsequent evidence, although imperfect, has also failed to find increased risk. The consequences of this unsubstantiated concept are particularly unfortunate, because clinicians may hesitate to advise their preoperative patients to quit smoking (during a period in which they are highly amenable to doing so) and to provide them with assistance. Although the evidence does suggest that it may take several weeks or months to derive pulmonary benefit from quitting, the unquestioned benefits of cessation to long-term health, and the fact that surgery is a powerful teachable moment for smoking cessation, makes any time a good time for presurgical smokers to quit. Textbooks, review articles, and editorials can be a valuable source of information, but close scrutiny and skepticism are required when using medical literature to guide clinical practice, especially in the face of apparent dilemmas.

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REFERENCES