Effect of Preoperative Smoking Cessation Interventions on Postoperative Complications

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The term *evidence-based medicine* was first coined by Sackett and colleagues[1] as "the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients." The key to practicing evidence-based medicine is applying the best current knowledge to decisions in individual patients. Medical knowledge is continually and rapidly expanding and it is impossible for an individual clinician to read all the medical literature. For clinicians to practice evidence-based medicine, they must have the skills to read and interpret the medical literature so that they can determine the validity, reliability, credibility and utility of individual articles. These skills are known as critical appraisal skills. Generally, critical appraisal requires that the clinician have some knowledge of biostatistics, clinical epidemiology, decision analysis, and economics as well as clinical knowledge.

The Canadian Association of General Surgeons and the American College of Surgeons jointly sponsor a program titled "Evidence-Based Reviews in Surgery" (EBRS), supported by an educational grant from Ethicon Inc and Ethicon Endo Surgery Inc. The primary objective of this initiative is to help practicing surgeons improve their critical appraisal skills. During the academic year, 8 clinical articles are chosen for review and discussion. They are selected not only for their clinical relevance to general surgeons, but also because they cover a spectrum of issues important to surgeons; for example, causation or risk factors for disease, natural history or prognosis of disease, how to quantify disease (measurement issues), diagnostic tests and the diagnosis of disease, and the effectiveness of treatment. Both methodologic and clinical reviews of the article are performed by experts in the relevant areas and posted on the EBRS website. A listserve discussion is held where participants can discuss the monthly article. Fellows and candidates of the College can access Evidence-Based Reviews in Surgery through the American College of Surgeons website (www.facs.org). All journal articles and reviews are available electronically through the Web site. Currently we have a library of 50 articles and reviews which can be accessed at any time. Each October, a new set of articles will be available each month until May. Surgeons who participate in the current (modules) packages can receive CME credits by completing a series of multiple choice questions. Additional information about EBRS is on the ACS Web site or by email to the administrator, Marg McKenzie at mmckenzie@mtsinai.on.ca.

In addition to making the reviews available through the ACS and CAGS websites, 4 of the reviews are published in condensed versions in the *Canadian Journal of Surgery* and the other 4 will be published in the *Journal of the American College of Surgeons* each year.

REFERENCE

1. Evidence-Based Medicine Working Group. Evidence-based medicine. JAMA 1992;268:2420–2425.

SELECTED ARTICLE

Effect of Preoperative Smoking Cessation Interventions on Posteroperative Complications and Smoking Cessation

Thomsen T, Tønnesen H, Møller AM. Br J Surg 2009;96:451–461

Question: Does preoperative smoking cessation decrease the risk of postoperative complications? Secondly, does preoperative smoking cessation decrease the likelihood of short- and long-term cessation of smoking?

Data Sources: Relevant databases (PubMed, Cochrane Library, Embase and CINAHL) were searched from randomized controlled trials (RCTs) of preoperative smoking cessation interventions.

Study Selection: Randomized controlled trials assessing smoking cessation interventions before elective surgery either in the hospital or primary care setting.

Outcome Measures: Postoperative complications were defined as wound healing, respiratory, cardiovascular and urological complications and other complications re-

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quiring treatment. Preoperative and postoperative smoking cessations were defined as either point prevalence or continuous abstinence.

Results: Eleven randomized controlled trials were included containing 1,194 patients. Smoking interventions were categorized as high, medium or low intensity. Follow-up for postoperative complications was 30 days. For smoking cessation it was from the day of surgery to 12 months thereafter. Overall, the interventions significantly reduced the occurrence of complications (pooled risk ratio 0.56 (95% CI 0.41–0.78); $p<0.001$. Intensive intervention increased smoking cessation rates both before operation and up to 12 months thereafter. The effects of medium to less intensive interventions were not statistically significant.

Conclusions: Surgical patients may benefit from intensive preoperative smoking cessation interventions. These include counseling initiated 4 weeks before operation and nicotine replacement therapy (NRT).

Commentary: Cigarette smoking in the United States results in an estimated 443,000 premature deaths and $193 billion in direct health care expenditure. In 2007, 19.8% of American adults were smokers and of these, one third underwent surgery unrelated to smoking. Smoking cessation is thought by many clinicians to be important in the perioperative care of patients. However evidence directly connecting it to improved outcomes is scarce. The goal of research in this area is two fold: first to determine if the intervention is effective in long term smoking cessation, and second to determine if smoking cessation is associated with improved surgical outcomes. This meta- analysis attempts to pool the data from published randomized controlled trials assessing the effectiveness of preoperative smoking cessation in decreasing the risk of postoperative complications and the success of smoking cessation itself. The search strategy is clear and the exclusion of studies is transparent. Eleven trials of varying quality and power were included, with three reporting smaller study samples than originally planned. The intervention used for smoking cessation, and the outcomes used to measure its success, as well as the definition of perioperative complications vary among all 11 studies, with only 6 studies reporting on postoperative complications. The percentage of eligible but nonrandomized patients is also highly variable – from 10 to 91% of patients. Finally, the reported drop out rate ranged from 1 – 49% in these studies. After review of the data, the authors found that specific conclusions were difficult to draw because of both statistical and clinical heterogeneity between the trials. However, even with this caveat, a statistically significant decrease (relative risk 0.56, [95% confidence interval 0.41–0.78]) in post operative complications was seen in patients randomized to smoking cessation.

This meta-analysis has utility in clinical practice because it provides a thorough descriptive analysis of the available literature, and outlines the types of smoking cessation programmes available. With respect to the effectiveness of these programmes, it appears that studies with more intensive interventions were more likely to result in nonsmokers in the 12 months after surgery, although statistical heterogeneity did not permit pooling of the data. These same patients involved in intensive smoking cessation protocols were also less likely to have wound complications – proof of concept that decreasing exposure to smoke in the perioperative period may improve outcome. However, due to the widely varying interventions in the trials included in this analysis, it is difficult to extract a single successful intervention to apply clinically.

This meta-analyses provides a good platform to discuss heterogeneity in the literature. Both statistical and clinical heterogeneity may exist, both of which must be considered when performing a meta-analysis. Statistical heterogeneity exists when it is unlikely that the variability in the results of the individual trials is due to chance and can be reflected in an I^2 statistic.

Clinical heterogeneity refers to variability in the treatment of patients between studies, and is more important to the application of the results to clinical practice. For example the broad term 'smoking cessation programme' can be used to describe many different interventions, and in this review, it is clear that a variety of different intensity programmes were studied. However, the challenge in this meta-analysis is even more complex: clinical heterogeneity is not only present in the types of smoking cessation programs assessed in the different randomized controlled trial, but also in the types of outcomes and definitions of outcomes reported in each trial.

Table 2 of the article briefly describes the definition that each study established for postoperative complications as well as the varying intensity of perioperative smoking interventions provided in each trial. Despite noted discrepancies between these trials, the authors chose to pool outcomes for post operative complications. Because no two randomized controlled trials are likely to be completely identical, there must be some tolerance for clinical heterogeneity within the protocols, and it is up to the methodologists steering the analysis to decide if the clinical discrepancies are minimal enough to produce a pooled result that is generalizable.

Despite the limitations of the data in this review, smoking cessation in the perioperative period appears to be ben-

eficial in improving surgical outcomes. Elective surgery indeed represents a "teachable moment" for smoking cessation (i.e. an event that motivates individuals to spontaneously adopt risk-reducing health behaviors[1]) so there is a need to develop and implement effective interventions into routine surgical practice to encourage smoking cessation. Intensive smoking cessation interventions such as individual counseling and nicotine replacement therapy administered for a period of 4–8 weeks before surgery seem to have the greatest impact on the risk of complications and increase short and long term cessation of smoking. The addition of nicotine replacement therapy to counseling increases the likelihood of smoking cessation by 50–70% without any adverse effects on wound healing. A minimum intervention of 3 weeks is recommended in order to ameliorate the deleterious effect of smoking on post-operative recovery. It is not clear whether postoperative abstinence is needed but abstinence might be helpful until healing is complete.

A preoperative smoking cessation program should be viewed as another technique to improve perioperative outcome in all patients undergoing surgical interventions. Costs incurred by establishing such programs may be recovered by the decrease in smoking related perioperative morbidity. Multidisciplinary smoking cessation programs led by both surgeons and anesthesiologists are optimal. As well, involvement of primary care physicians may be beneficial. Patients having both elective as well as urgent surgery should be included. As well, there is benefit from either permanent or temporary perioperative cessation and the latter may be more attractive to long-term smokers who are reluctant quitters and it may boost their confidence for complete cessation. Although longer periods of preoperative abstinence may be beneficial, they may also present barriers to implementation in busy surgical practices where there is little experience and few resources. Thus, at hospitals where there is not a formal smoking cessation program, those who provide surgical services should still take every opportunity to intervene with their patients who smoke, given that the potential benefits to both short- and long-term outcomes are so great. The American Society of Anesthesiologists has developed a variety of tools to help practitioners.

Finally, although this meta-analysis has provided a review of the current literature, further research is required so we can understand the duration of preoperative abstinence and the intensity of interventions that are necessary to achieve optimal benefit.

The Evidence-Based Reviews in Surgery Group Comprises:

REFERENCES

1. Shi Y, Warner DO. Surgery as a teachable moment for smoking cessation. Anesthesiology 2010;112:102–107.