Feasibility of Tobacco Interventions in Anesthesiology Practices

A Pilot Study
David O. Warner, M.D.,† The American Society of Anesthesiologists Smoking Cessation Initiative Task Force†

Background: Abstinence from smoking can improve postoperative outcomes, and surgery is also an excellent opportunity for smokers to permanently quit. One strategy for perioperative tobacco interventions is that anesthesiologists Ask, Advise, and Refer (AAR)—Ask their patients about tobacco use, Advise them to abstain, and Refer them to resources such as telephone quitlines. This pilot project determined the feasibility and acceptability of the AAR strategy in anesthesiology practices.

Methods: An educational program, including presentations, written materials, and Web-based resources, was developed and disseminated to 14 U.S. anesthesiology practices, representing both academic and private practices, who agreed to implement the AAR strategy as a part of their routine clinical practice. Three months after implementation, a survey was administered to those members of these practices who were instructed in the AAR strategy.

Results: There were 97 respondents (75% response rate). Since the pilot project began, 91%, 79%, and 58% of respondents reported that they frequently or almost always asked, advised, and referred their patients who smoke, respectively. The majority of respondents (56%) agreed that they were responsible for helping patients get the help they need to quit smoking. Most (74%) also agreed that they planned to incorporate the AAR strategy into their routine practice.

Conclusion: These results suggest that the AAR strategy is potentially feasible and well-accepted in anesthesiology clinical practice. Further work will be needed to define whether these practices and attitudes can be sustained and whether they are ultimately effective in modifying perioperative smoking behavior in surgical patients.

EACH year, up to ten million cigarette smokers in the United States require surgery and anesthesia.1,2 Two major benefits could result from efforts to help them quit.3 First, smoking increases the frequency of postoperative complications, including pulmonary complications such as pneumonia, cardiovascular complications such as myocardial ischemia, and wound-related complications such as surgical site infections.4 Even temporary abstinence from smoking may reduce the risk of some complications and improve surgical outcomes. Second, a surgical episode may represent a teachable moment for smokers to permanently quit, with the potential for long-term benefit to the patient and to the public health.5 For example, undergoing a major surgical procedure itself increases spontaneous quit rates, and tobacco interventions can further increase quit rates.6–8 There is thus an excellent rationale for clinicians to intervene in the surgical setting to address their patients’ tobacco use. However, several barriers to tobacco interventions by anesthesiologists and surgeons exist, including a lack of time and a lack of expertise in tobacco control.9

A prior survey of members of the American Society of Anesthesiologists (ASA) and the American College of Surgeons showed that few of those surveyed incorporate such interventions in their clinical practices.10 Despite the promulgation of Clinical Practice Guidelines by the United States Public Health Services designed to help clinicians provide tobacco interventions as an integral part of their routine care,11 these recommendations have not been widely adopted in any clinical practice setting.12 This has led some to suggest that rather than trying to provide a complete tobacco intervention themselves, clinicians should ask their patients about tobacco use, advise them to quit, and refer them to resources such as a telephone “quitline” that can provide assistance and follow-up to smokers attempting to quit.13 The ASA has sponsored a Smoking Cessation Initiative Task Force to promote efforts to help surgical patients quit smoking. The Task Force has recommended that anesthesiologists employ this Ask-Advise-Refer (AAR) strategy and has devised several tools to help them accomplish this. However, it is not known whether this strategy would be feasible in busy anesthesiology practices.

The purpose of this pilot project was to determine the feasibility and acceptability of the AAR strategy when implemented as a part of routine clinical care in United States anesthesiology practices.
Materials and Methods

This project was determined to be exempt by the Mayo Clinic institutional review board.

The ASA Smoking Cessation Initiative Task Force was appointed in 2006 to promote efforts to help surgical patients quit smoking. It has developed a variety of educational materials and other tools on the AAR strategy to help those who provide services to surgical patients help them quit smoking. These include (but are not limited to) brochures designed for both patients and providers, a wallet-sized “quitcard” presenting the national toll-free quitline number (1-800-QUITNOW), an educational slide presentation, and the address of a Web site maintained by the ASA that provides a variety of additional educational resources.‡

In the summer of 2007, anesthesiology practices were recruited to participate in this pilot project. Recruitment methods included presentations at two state anesthesiology societies and personal contacts by Task Force members. Fourteen practices expressed interest and were mailed a letter that included the educational materials developed by the Task Force; all of these practices agreed to participate. Each practice designated an anesthesiologist implementation leader who was the point of contact with the Task Force.

A variety of methods were used to disseminate the AAR strategy to these practices. All were based on an approximately 45-min presentation that presented the rationale for anesthesiologist involvement in smoking cessation efforts and how to apply the strategy (see presentation, Supplemental Digital Content 1, http://links.lww.com/A1187). Four practices included members of the Task Force, who made the presentation to their members. Five additional practices were visited by members of the Task Force, who made the presentation to these groups. The remainder of the practices received the Task Force materials for distribution by the implementation leader, who was encouraged to make the presentation to their colleagues. All practices were also mailed a supply of written materials (See provider brochure, Supplemental Digital Content 2, http://links.lww.com/A1188; patient brochure, Supplemental Digital Content 3, http://links.lww.com/A1189; quit card, Supplemental Digital Content 4, http://links.lww.com/A1190) and given access to an educational Web site targeted to anesthesia providers.§

Each practice was free to decide how best to implement the strategy in their own practice setting, beginning in September of 2007. In December of 2007, when each practice had been implementing the strategy for at least 3 months, two survey instruments were sent to each implementation leader. The first was distributed by the implementation leaders to those members of the practices who the leaders had asked to implement the strategy. It included items that assessed the amount of time spent learning about the strategy, self-efficacy regarding application of the strategy, impressions of patient reactions, estimated rates at which the strategy was applied, and general knowledge and attitudes regarding the provision of tobacco interventions to surgical patients. The second survey was completed by only the implementation leaders. It included items querying practice demographics, the number of practice members to whom the first survey was distributed, and future plans for continuing the strategy in the practice.

The first survey could be administered via a paper form or a Web-based format; the method used was at the discretion of the implementation leader. The second survey (implementation leaders) was paper only. All paper forms were collected from individual practice members and returned by the implementation leaders.

Statistical Methods

Summary statistics of responses were prepared and represented the primary focus of this report. Questions regarding practices had four options ranging from “Never” to “Almost always (over 75% of the time).” For items assessing the respondent’s attitudes/beliefs and interest in learning about interventions, there were five levels of agreement ranging from “Strongly agree” to “Strongly disagree.” Descriptive statistics were calculated using SAS statistical software (version 8.2; SAS Institute, Inc., Cary, NC).

As the result of a programming error in the Web-based survey tool, not all questions were asked of all respondents who completed the Web-based survey (see Appendix 2 for details); the numbers of responses for each question are indicated in the tables.

Results

Fourteen anesthesiology practices participated in the pilot project and were surveyed; 9 (64%) of them were private practices, and 5 were within academic medical centers. These practices perform a median of 14,000 cases annually (range, 2,000–50,000), and include a median of 17 (3–48) anesthesiologists and 16 (0–50) Certified Registered Nurse Anesthetists. Nine practices (65%) staffed a preoperative evaluation clinic. Implementation leaders reported distributing surveys to a total of 132 individuals. Of these, 97 (74%) completed the survey. Three respondents indicated that they had not heard about the pilot project and provided no further responses. Thus, the following results are based on 94 completed surveys.

Respondent demographics are presented in table 1; 70 (76%) were physicians, and 3 (3%) were current smokers. The majority of respondents reported hearing about the pilot project at a staff meeting (49%) and/or conversations with a colleague (61%). Sixty-nine percent of respondents

spent less than 30 min learning about the pilot project, and only a minority (28%) heard a formal presentation.

Regarding practices and patient responses during the pilot project period, the majority of respondents reported either frequently or almost always performing each element of the AAR strategy (table 2). Approximately half reported that their patients frequently or almost always seemed interested in what the respondents had to say about their smoking, and approximately one-third responded that their patients frequently or almost always seemed interested in the quitlines. More than 90% of respondents found the materials provided by the ASA (brochures for patients and providers, quitcards, and Web site) either very or somewhat useful. Sixty-seven percent of respondents were very or somewhat interested in learning more about how to help their patients quit smoking.

Regarding the effects of the pilot project on measures of practitioner attitudes towards tobacco interventions, 65% agreed that after the pilot project they knew enough about quitlines to be able to explain them to their patients, and 48% agreed they were more comfortable in addressing smoking. A majority agreed that it was part of their responsibility to advise patients to quit smoking (80%) and to assist them in getting help (64%). Most (80%) respondents agreed that quitlines could be useful to help patients quit smoking. Only 23% agreed that they did not have enough time to apply the AAR strategy in their practices.

Regarding intentions for their future practice, 74% planned to incorporate the AAR approach into their individual clinical routine (table 3). Of the 51 (53%) of respondents who regularly see patients in a preoperative clinic, 44 (86%) agreed that the preoperative clinic was the best place to discuss smoking. According to the implementation leaders’ survey, eight of the nine practices who staff a preoperative clinic plan to definitely address smoking in their clinics in the future. Twelve (86%) of the practices definitely or probably will incorporate the AAR approach into their practices, and 4 (29%) plan to seek reimbursement from Medicare or other sources for providing smoking cessation counseling.

A strong majority (78%) agreed that the ASA should promote the AAR strategy among their membership.

**Discussion**

The main finding of this pilot study is that the AAR approach to tobacco interventions in surgical patients was feasible and well-accepted in a variety of different anesthesiology practices.

Clinicians in diverse specialties have an important role to play in helping their patients quit smoking. A primary recommendation of the United States Public Health Service Clinical Practice Guideline for Treating Tobacco Use and Dependence¹¹ is that whenever patients contact

### Table 1. Respondent Demographics (n = 97)

<table>
<thead>
<tr>
<th>Age, yrs</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;35</td>
<td>21 (22%)</td>
</tr>
<tr>
<td>35–44</td>
<td>27 (28%)</td>
</tr>
<tr>
<td>45–54</td>
<td>37 (38%)</td>
</tr>
<tr>
<td>55–64</td>
<td>12 (12%)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>56 (58%)</td>
</tr>
<tr>
<td>Role</td>
<td></td>
</tr>
<tr>
<td>Staff anesthesiologist</td>
<td>53 (58%)</td>
</tr>
<tr>
<td>Anesthesia resident</td>
<td>17 (18%)</td>
</tr>
<tr>
<td>Perioperative nurse</td>
<td>13 (13%)</td>
</tr>
<tr>
<td>Physician’s assistant</td>
<td>4 (4%)</td>
</tr>
<tr>
<td>Other (including CRNA)</td>
<td>10 (10%)</td>
</tr>
<tr>
<td>Smoking status</td>
<td></td>
</tr>
<tr>
<td>Current</td>
<td>3 (3%)</td>
</tr>
<tr>
<td>Former</td>
<td>18 (19%)</td>
</tr>
<tr>
<td>Never</td>
<td>76 (78%)</td>
</tr>
</tbody>
</table>

CRNA = Certified Registered Nurse Anesthetist.

### Table 2. Practices and Patient Responses

<table>
<thead>
<tr>
<th>Question</th>
<th>n*</th>
<th>Never or Rarely</th>
<th>Sometimes (&lt;25%)</th>
<th>Frequently (25–75%)</th>
<th>Almost Always (&gt;75%)</th>
<th>Did Not Discuss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Since this project started in October, I told my patients who smoke about...</td>
<td>92</td>
<td>18</td>
<td>23</td>
<td>33</td>
<td>26</td>
<td>0</td>
</tr>
<tr>
<td>When I discussed their smoking, my patients who smoked seemed interested...</td>
<td>93</td>
<td>12</td>
<td>38</td>
<td>35</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>When I told my patients who smoked the quitlines, they seemed interested...</td>
<td>93</td>
<td>14</td>
<td>45</td>
<td>28</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>How often do you ask your patients if they smoke cigarettes?</td>
<td>75†</td>
<td>1</td>
<td>4</td>
<td>4</td>
<td>8</td>
<td>87</td>
</tr>
<tr>
<td>How often do you advise your patients who smoke to quit?</td>
<td>75†</td>
<td>4</td>
<td>11</td>
<td>56</td>
<td>29</td>
<td>—</td>
</tr>
<tr>
<td>How often do you tell your patients who smoke about quitlines or other stop smoking resources?</td>
<td>75†</td>
<td>8</td>
<td>24</td>
<td>56</td>
<td>27</td>
<td>41</td>
</tr>
</tbody>
</table>

Values are percent of responses.  
* The number that answered the question (excluding blank responses); † numbers do not equal total number of respondents due to an error in the Web version of the survey.
the healthcare system, a systematic effort be made to identify tobacco users, strongly urge them to quit, and provide aid to do so. Because tobacco dependence is a chronic disease affecting approximately 21% of the United States population, the Guideline emphasizes that "... tobacco interventions must become an integral part of healthcare delivery." The Guideline recommends an evidence-based 5-As approach - Ask to systematically identify all tobacco users at every visit, Advise them to quit, Assess willingness to quit, Assist those who are willing with quitting, and Arrange for follow-up. The Guidelines present convincing evidence that elements of the 5 As are efficacious in a variety of settings. However, like many other preventative services, it has proved difficult to disseminate and implement these recommendations like many other preventative services, it has proved difficult to disseminate and implement these recommendations.12 Several barriers have been identified to adoption of the 5As approach by clinicians, including lack of time, training, and low self-efficacy.14–16

To overcome these challenges, a different role for clinicians has been suggested.15 Rather than attempting to deliver all elements of the 5As, clinicians would identify tobacco users, advise them to quit, then refer them to other resources that could provide assessment, assistance, and follow-up. This technique, referred to as the AAR approach, obviates the need for extensive training of clinicians in intervention techniques, and the burden of follow-up. The hope is that this technique could be more readily adopted by clinicians. In most settings, the most accessible referral resource is a telephone quitline.17,18 Quitlines can provide extensive counseling services by tobacco treatment specialists. They are currently available free of charge to all Americans through a single national toll-free number that will automatically route the caller to the appropriate service (1-800-QUITNOW); quitlines are now available in several other countries.17 Although efficacious when used, significantly increasing the proportion of smokers who maintain long-term abstinence.17,18 Current utilization of quitlines by smokers is low, with an average utilization rate by eligible smokers of about 1% across states in 2004 and 2005.19

Barriers to tobacco interventions are particularly apparent in surgical practices, and few anesthesiologists or surgeons currently incorporate tobacco interventions into their practices. In a prior survey of members of the ASA and the American College of Surgeons, only 30% of anesthesiologists and 58% of surgeons reported even advising their patients to quit smoking, and less than 10% reported providing any assistance with quitting.10 Nonetheless, there was considerable interest in learning more about interventions, and almost all respondents (90%) would refer smokers to an effective intervention service if it was available in their practice setting.

In 2006 the ASA formed a Task Force to increase the involvement of ASA members in smoking cessation efforts. On the basis of available evidence, The Task Force included among its recommendations that the AAR strategy be promoted among the ASA membership and developed a variety of materials and other educational strategies to do so. However, even a potentially effica-

Table 3. Attitudes

<table>
<thead>
<tr>
<th>Question</th>
<th>n*</th>
<th>Strongly Agree (%)</th>
<th>Somewhat Agree (%)</th>
<th>Neither Agree nor Disagree (%)</th>
<th>Somewhat Disagree (%)</th>
<th>Strongly Disagree (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I think that the ASA should encourage their members to help their patients quit smoking through the Ask-Advise-Refer approach.</td>
<td>94</td>
<td>50</td>
<td>28</td>
<td>14</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Because of this project, I now know enough about the quitlines to be able to explain them to my patients.</td>
<td>94</td>
<td>18</td>
<td>47</td>
<td>24</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>The quitlines could be a useful tool to help surgical patients quit smoking.</td>
<td>94</td>
<td>30</td>
<td>50</td>
<td>17</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Since this project started in September, I now feel more comfortable about addressing my patient’s smoking.</td>
<td>93</td>
<td>14</td>
<td>34</td>
<td>27</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>Since this project started in September, I now am more likely to address my patient’s smoking.</td>
<td>93</td>
<td>15</td>
<td>42</td>
<td>22</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>I do not have enough time to apply this approach (Ask-Advise-Refer) to my patients who smoke.</td>
<td>93</td>
<td>3</td>
<td>20</td>
<td>19</td>
<td>28</td>
<td>29</td>
</tr>
<tr>
<td>It is part of my responsibility to advise my patients to quit smoking.</td>
<td>75†</td>
<td>47</td>
<td>33</td>
<td>13</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>It is part of my responsibility to make sure that patients get the help that they need to quit smoking.</td>
<td>75†</td>
<td>25</td>
<td>39</td>
<td>23</td>
<td>11</td>
<td>3</td>
</tr>
<tr>
<td>I plan to incorporate this approach (Ask-Advise-Refer) to smokers into my practice where appropriate.</td>
<td>92</td>
<td>33</td>
<td>41</td>
<td>14</td>
<td>7</td>
<td>5</td>
</tr>
</tbody>
</table>

Values are percent of responses.

* Number that answered the question (excluding blank responses); † numbers do not equal total number of respondents due to an error in the Web version of the survey.

ASA – American Society of Anesthesiologists.
cious intervention such as the AAR strategy will not be effective in clinical practice unless it is actually adopted and implemented by clinicians. This concept has been codified in the RE-AIM framework. In this framework, interventions are evaluated on the basis of their potential Reach (how many could potentially receive the intervention), Efficacy (does the intervention work among those who receive it), Adoption (what proportion of clinical practices adopt the intervention), Implementation (the extent to which the intervention is actually implemented in clinical practices as intended), and Maintenance (the extent to which the program is sustained over time). In the context of this framework, the current study aimed to assess the potential for adoption of the strategy by anesthesiology practices before any large-scale dissemination efforts.

For this pilot project, we did not employ a highly structured dissemination strategy. Although the same materials were made available to educate members of all practices, implementation leaders were free to use these materials as they felt appropriate in their practice settings. Indeed, most respondents spent relatively little time learning about the strategy, and most did not hear the formal presentation created by the Task Force to educate practices. It is possible that adoption would have been enhanced if a more formal dissemination procedure had been implemented. However, we felt it preferable to follow a simple dissemination strategy to estimate feasibility in a real world environment, as both our prior survey and subsequent qualitative research indicated that most anesthesiologists would not be willing to spend much time in learning about tobacco interventions. It is also unlikely that a more structured dissemination process could be consistently applied to the thousands of anesthesiology practices in the United States.

Despite the relatively brief training period reported by most of the respondents, overall attitudes and behaviors towards the AAR strategy were generally favorable. In particular, many respondents reported an increase in measures of self-efficacy (the belief that one is capable of performing in a certain manner) in regards to tobacco interventions, which may reflect the simplicity and appeal of the AAR strategy. We did not perform any surveys before implementation, so it is difficult to directly measure changes in attitudes/behavior attributable to the pilot project itself. However, data from a prior national survey of anesthesiologists may be useful to estimate this effect. This prior survey queried the frequency with which anesthesiologists provided each element of the Ask, Advise, and Refer (AAR) strategy. When compared with the current results (fig. 1), the rate of asking about tobacco use was similar in the two surveys, and the rate of advising to quit smoking was somewhat higher in those surveyed after the pilot project. However, there was a substantial difference in the reported provision of referral or other assistance with quitting. Although not definitive, this suggests that the pilot project may have altered behavior. Also, in the prior survey, only 20% of respondents agreed that it was their responsibility to assist patients in getting help with quitting smoking, compared with 64% in the current survey, again suggesting that the pilot project influenced attitudes favorable towards interventions.

Attempts to measure how the strategy might affect patient behavior are well beyond the scope of this feasibility study. However, it was encouraging to note that respondents perceived that their patients were often interested in discussions regarding their smoking behavior in general and the quitlines in particular.

Whether inventions, once adopted, can be successfully maintained over time is a major issue. Although we did not perform follow-up surveys, most of the individual respondents and practices indicated that they planned to incorporate the AAR approach into their clinical practice, and all but one of the nine practices who staff perioperative clinics plan to incorporate tobacco interventions here, widely regarded by respondents as an excellent setting for this purpose. Medicare and some private insurers now provide separate reimbursement for providing smoking cessation counseling, which may provide some incentive for adoption and maintenance of interventions.

Limitations
The characteristics of anesthesiology practices vary widely, and we attempted to include a variety of practice settings in terms of size, geographic location, academic versus private practice, and use of the anesthesia care team. However, this was a convenience sample, and no attempt was made to create a sampling proportional to characteristics of national anesthesia practices due to limitations of resources available to conduct this pilot project. It is possible that practices who volunteered to participate would be more interested in tobacco control than the average practice, so that these results would be biased towards responses favorable to tobacco control. Similarly, the response rate among those who received...
surveys was good, but respondents may be biased towards those members of practices with favorable attitudes. Also, not all members of every practice were surveyed – only those whom the implementation leaders asked to participate, which again may introduce bias.

**Summary**

The results of this pilot project suggest that the AAR strategy is feasible and potentially well-accepted in wide range of clinical anesthesiology practices. Further work will be needed to define whether these practices and attitudes can be sustained and whether they are ultimately effective in modifying perioperative smoking behavior in the surgical patient. On the basis of these results, the ASA Smoking Cessation Initiative Task Force is continuing and expanding its efforts to promote tobacco control in anesthesiology practices.

The ASA Smoking Cessation Initiative Task Force thanks the implementation leaders and other members of each participating practice: Don Arnold, M.D., Department of Anesthesiology, St. John’s Mercy Medical Center, St. Louis, Missouri; Dan Briggs, M.D., Unifour Anesthesia Associates, PA, Hickory, North Carolina; James Viapiano, M.D., Department of Anesthesiology, University of Vermont, Burlington, Vermont; Joel Arney, M.D., Ridge Anesthesiology, Minneapolis, Minnesota; Andrew Houlton, M.D., Department of Anesthesiology, North Memorial Medical Center, Minneapolis, Minnesota; Alan Reitz, M.D., Anesthesiology Associates, St. Cloud, Minnesota; Laun Wright, M.D., Associated Anesthesiologists, St. Paul, Minnesota; Niel Amin, M.D., Department of Anesthesiology and Perioperative Medicine, Medical College of Georgia, Augusta, Georgia; Ali Jahan, M.D., Department of Anesthesiology, Cleveland Clinic, Cleveland, Ohio; Marguerite Group, M.D., Maymount Hospital Ambulatory Surgery Center, Garfield Heights, Ohio; Ken Cummings, M.D., Anesthesia Department, Hillcrest Hospital, Mayfield Heights, Ohio; Rod Yamat, M.D., Strongsville Surgery Center, Strongsville, Ohio; Hinda Abramoff, M.D., Department of Anesthesiology, Huron Hospital, East Cleveland, Ohio; Doug Mayers, M.D., Department of Anesthesiology, Beachwood Surgery Center, Beachwood, Ohio.

The Task Force thanks the ASA staff who support its work, including Donna Habich, Communications, Jill Formeister, Director of Meetings and Exhibits, Dawn Glossa, Director of Communications, and Catherine Wagner, Communications (all located in Park Ridge, Illinois), and to the Smoking Cessation Leadership Center (San Francisco, California) for its ongoing support. Finally, the Task Force also thanks the Mayo Clinic (Rochester, Minnesota) for its ongoing support, and to the Smoking Cessation Leadership Center (San Francisco, California) for its ongoing support.

**Appendix 1**

**Members of the Smoking Cessation Initiative Task Force**

Daniel Briggs, M.D., Raleigh, North Carolina; Lowell Dale, M.D., Mayo Clinic, Rochester, Minnesota; Patti Davidson, M.D., Columbus, Ohio; Michael Entrup, M.D., Tufts Medical Center, Boston, Massachusetts; Al Head, M.D., Medical College of Georgia, Augusta, Georgia; Scott Hernberg, D.O., Linwood, New Jersey; Zev Kain, M.D., University of California Irvine, Irvine, California; Bob Kiesges, Ph.D., St. Jude Children’s Research Hospital and University of Tennessee Health Science Center, Memphis, Tennessee; Stan Stead, M.D., Encino, California; David O. Warner, M.D., Mayo Clinic, Rochester, Minnesota.

**Appendix 2**

**Error in Web-based Survey Tool**

Due to a programming error in the Web-based version of survey tool, not all questions were asked of all respondents. Specifically, there were 22 individuals who completed the survey via the Web format who were not asked how often they asked their patients if they smoked cigarettes, how often they advised their patients who smoke to quit, how often they tell their patients who smoke about quitlines or other stop smoking resources, if they thought advising patients to quit smoking was their responsibility, and whether they thought it was their responsibility to make sure that patients get the help that they need to quit smoking. To assess the potential impact of these missing data on the overall results, two alternative approaches for handling missing data were deployed. The first was a weighted frequency approach whereby case weights were used to compensate for the fact that the skip pattern used for the Web survey resulted in an overall sample that overrepresented individuals who see patients in a preoperative clinic and underrepresented individuals who do not see patients in a preoperative clinic (the index item from which the intended skip sequence was errantly deployed in the Web version). The second approach calculated the frequency distribution based on five imputed datasets constructed using the propensity score method in SAS v.9.1 software (SAS PROC MI; SAS Institute Inc., Cary, NC). Neither approach demonstrably altered the overall pattern of results for the affected items. Therefore, for ease of presentation and interpretation, we present the results of the 75 cases unaffected by the skip instruction error for the affected items.