



## Guidelines

Guidelines on smoking management during the perioperative period<sup>☆</sup>

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## ABSTRACT

Smoking is a public health problem of particular importance during the perioperative period, since it exposes patients scheduled for surgery to risk increases of 20% in hospital mortality and 40% in major postoperative complications. In addition, current smoking increases almost all specific surgical complications. The perioperative period offers a genuine opportunity for smoking cessation. The rate of preoperative smoking cessation can be increased significantly by offering behavior management and the prescription of a nicotine substitute before any scheduled surgical intervention. Preoperative smoking cessation should be routinely recommended independently of the timing of the intervention, even though the benefits increase in proportion with the length of cessation. All professionals of the care pathway (general practitioners, surgeons, anesthetists-intensivists, caregivers) must inform smokers of the positive effects of smoking cessation and offer them dedicated management and personalized follow-up. In children, cessation of parental smoking or removal of the child from environmental tobacco smoke as long before surgery as possible is indispensable.

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## 1. Summary

Smoking is a public health problem of particular importance during the perioperative period, since it exposes patients scheduled for surgery to risk increases of 20% in hospital mortality and 40% in major postoperative complications. In addition, current smoking increases almost all specific surgical complications.

The perioperative period offers a genuine opportunity for smoking cessation. The rate of preoperative smoking cessation can be increased significantly by offering behavior management and the prescription of a nicotine substitute before any scheduled surgical intervention. Preoperative smoking cessation should be routinely recommended independently of the timing of the intervention, even though the benefits increase in proportion with the length of cessation. All professionals of the care pathway (general practitioners, surgeons, anesthetists-intensivists, caregivers) must inform smokers of the positive effects of smoking cessation and offer them dedicated management and personalized follow-up.

## 2. Summary for the patient

Current smoking before a surgical intervention increases both in-hospital mortality and all potential complications. The physicians involved must therefore determine the patient's smoking status, advise regarding the inherent risks of smoking, give advice and/or offer management, and prescribe nicotine substitutes and personalized follow-up to stop smoking as far upstream of the surgical intervention as possible. Children should be removed from environmental tobacco smoke as soon as possible.

## 3. Preamble

### 3.1. Guidelines and their purpose

#### 3.1.1. Background

Of the 11 million patients who undergo anesthesia in France every year, nearly 30%, i.e., 3 million are smokers. Tobacco smoke strongly inhibits tissue and bone repair, which is of prime importance in the surgical context in ensuring timely wound healing. The carbon monoxide produced and inhaled with cigarette smoke results in a mismatch between oxygen uptake and the availability of oxygen to cells.

An analysis of 18 meta-analyses, large cohort studies and systematic reviews [1–18] (cf. [supplementary material: perioperative complications related to smoking](#)) indicated that current smoking increases by about 20% in-hospital mortality and by 40% major postoperative complications (deep infection, pneumonia, unscheduled intubation, pulmonary embolism, ventilation > 48 h, stroke, coma > 24 h, cardiac arrest, myocardial infarction, transfusion > 5 units, sepsis, septic shock). Current smoking increases all specific surgical complications, except for ENT surgery for which associated smoking-related diseases were not taken into account in the available studies.

The overall quality of evidence is high for the analysis of all types of surgery taken together, and ranges from very low to high as a function of the type of surgery. The desirable effects of smoking cessation therefore clearly outweigh the undesirable effects.

The preoperative period is a moment when the smoker's motivation to quit is high and therefore constitutes a highly favorable opportunity for providing smoking cessation support. It is a teachable moment [19].

### 3.1.2. Rationale

The guidelines of the 2005 Conference of Experts held under the aegis of the *Office français de prévention du tabagisme* (OFT; French Office for Tobacco Control) in association with the Sfar (French Society of Anesthesia and Intensive Care) and the *Association française de chirurgie* (French College of Surgeons) ([http://sfar.org/wp-content/uploads/2015/10/2a\\_AFAR\\_Tabagisme-perioperatoire.pdf](http://sfar.org/wp-content/uploads/2015/10/2a_AFAR_Tabagisme-perioperatoire.pdf)) recommend a proactive attitude among health care professionals regarding smoking cessation in patients. However, these guidelines are not well known or followed in clinical practice. One of the major barriers to application of these guidelines by practitioners relates to the methodology employed and to the large number of questions covered. This is why Sfar, through its Board of Directors, decided together with the SFT (*Société francophone de tabacologie*), the CNCT (*Comité national contre le tabagisme*), the SOFCOT (*Société française de chirurgie orthopédique et traumatologique*), the *CNP de chirurgie plastique* and the *CNP de chirurgie thoracique et cardiovasculaire* to update the 2005 guidelines by asking the clinical benchmarking committee (*Comité des référentiels cliniques*) to produce a limited number of simple and easily applicable guidelines for the health care professionals concerned.

### 3.1.3. Purpose

The purpose was to draw up formal guidelines on the perioperative management of smoking cessation in patients.

### 3.1.4. Bibliographic search and selection criteria

The literature search related to the last ten years of publications referenced in Medline<sup>®</sup> and the Cochrane database<sup>®</sup>, except for question no. 4. We favored meta-analyses, systematic reviews, and large cohort studies.

### 3.1.5. Populations and comparisons

For adults, smoking-related medical and surgical complications were analyzed as a function of the type of surgery and the efficacy of the different strategies of specific management and of management of smoking cessation. For children, only removal of the child from environmental tobacco smoke was studied.

### 3.1.6. Outcomes

For each question, we defined outcomes classified in order of importance (from crucial to unimportant).

## 3.2. GRADE<sup>®</sup> methodology

GRADE<sup>®</sup> (Grades of Recommendation Assessment, Development and Evaluation) methodology was used to draw up the guidelines. After a quantitative analysis of the literature, this method can be used to determine the quality of the evidence and hence the confidence that can be placed in this analysis, and to determine the strength of the recommendation. The quality of evidence was divided into four categories:

- high: future research will very probably not change confidence in the estimation of the effect;
- moderate: future research will probably change confidence in the estimation of the effect and could alter the estimation of the effect itself;
- low: future research will very probably have an impact on confidence in the estimation of the effect and will probably alter the estimation of the effect itself;
- very low: the estimation of the effect is very uncertain.

The quality of the evidence was analyzed for each endpoint and then an overall level of evidence was defined from the quality of evidence of the crucial criteria.

The final formulation of the guidelines is always binary: either positive or negative and either strong or weak:

- strong: should or should not be done (GRADE 1+ or 1–);
- weak: probably should or should not be done (GRADE 2+ or 2–).

The force of the guideline is determined as a function of four key factors approved by vote by the experts using the GRADE Grid method [16]:

- estimation of the effect;
- the overall level of evidence: the higher the level, the more likely it is that the recommendation will be strong;
- the balance between desirable and undesirable effects: the more favorable the balance, the more likely it is that the recommendation will be strong;
- values and preferences: in the event of uncertainty or great variability, the recommendation will most probably be weak; these values and preferences should ideally be obtained directly from the people concerned (patient, physician, decision-maker);
- costs: the higher the costs or the use of resources, the more likely it is that the recommendation will be weak.

## 4. Recommendations

### 4.1. Recommendation 1: specific management of preoperative smoking cessation

#### 4.1.1. Wording of the question

What are the effects of the different smoking cessation strategies proposed preoperatively?

#### 4.1.2. Rationale

Intensive behavioral intervention (dedicated consultation, 4-week follow-up, prescription of nicotine substitute products...) increased ten-fold (RR: 10.76; 95% CI: 4.55–25.46) the rate of smoking cessation before surgery compared with “no intervention”, reduced complications overall by 60% in 2 randomized controlled trials in 210 patients (RR: 0.42; 95% CI: 0.27–0.65), and increased three-fold the one-year rate of smoking cessation (RR: 2.96; 95% CI: 1.57–5.55). The quality of evidence is moderate due to the imprecision of the results [20] (cf. supplementary material: question n° 1).

Brief behavioral intervention (recommendation to quit without follow-up) increased by 30% (RR: 1.30; 95% CI: 1.16–1.46) the rate of smoking cessation before surgery compared with “no intervention”, did not reduce complications overall (RR: 0.92; 95% CI: 0.72–1.19), but doubled the one-year rate of smoking cessation (RR: 2.29; 95% CI: 1.14–4.61). The quality of evidence is moderate due to the imprecision of the results [20].

Nicotine substitute products did not increase postoperative pain or the consumption of opioids in a small, randomized controlled trial [21].

The desirable effects of smoking cessation therefore clearly outweigh the undesirable effects.

#### 4.1.3. Recommendation

We recommend offering behavioral management and the prescription of a nicotine substitute product for smoking cessation before any scheduled surgical intervention (Grade 1+).

### 4.2. Recommendation 2: minimum effective period for preoperative smoking cessation

#### 4.2.1. Wording of the question

What is the minimum effective period for preoperative smoking cessation?

#### 4.2.2. Rationale

The analysis relates to 21 publications, mainly retrospective observational studies [22]. The overall quality of evidence is moderate because of an evaluation bias between non-smoker and smoker (simple declaration without laboratory testing).

Smoking cessation over 8 weeks before the intervention reduced by close to 50% respiratory complications (bronchospasm requiring treatment, atelectasis necessitating bronchoscopy or assisted ventilation or both, lung infection, pleural effusion, pneumothorax, emphysema, pulmonary embolism, acute respiratory distress syndrome, respiratory insufficiency or arrest, re-intubation and ventilation, tracheotomy, and need for 24-hour breathing of high oxygen concentration) compared with a current smoker (RR: 0.53; 95% CI: 0.37–0.76). Smoking cessation over 4 weeks before the intervention reduced respiratory complications by close to 25% compared with a current smoker (RR: 0.77; 95% CI: 0.61–0.96). Smoking cessation between 2 and 4 weeks before the intervention did not reduce respiratory complications compared with a current smoker (RR: 1.14; 95% CI: 0.90–1.45) and did not differ from smoking cessation of less than 2 weeks (RR: 1.04; 95% CI: 0.83–1.30). There were, however, no deleterious effects of respiratory complications of smoking cessation of < 2 weeks.

In terms of impaired wound healing, the benefits of quitting were apparent after 3–4 weeks of smoking cessation (RR: 0.69; 95% CI: 0.56–0.84).

Lastly, perioperative smoking cessation, of whatever timing with regard to the intervention, increased the final rate of definitive smoking cessation (cf. question n° 1).

The desirable effects of smoking cessation therefore clearly outweigh the undesirable effects (cf. supplementary material: question n° 2).

#### 4.2.3. Recommendation

We recommend preoperative smoking cessation independently of the timing of the intervention, even though the benefits increase proportionally with the length of cessation (Grade 1+).

### 4.3. Recommendation 3: consultative role of the surgeon, anesthetist-intensivist, and carers when the patient is a smoker

#### 4.3.1. Wording of the question

For a patient who smokes, what is the role of the surgeon and/or anesthetist-intensivist and/or carers in the care pathway?

#### 4.3.2. Rationale

Analysis of 17 publications relating to 13,724 patients (cf. supplementary material: question n° 3) showed a 60% increase in smoking abstinence at 6 months in patients given brief advice (interview of less than 20 minutes and no more than one follow-up visit), compared with patients not given advice (RR: 1.66; 95% CI: 1.42–1.94). For the same endpoint, strong advice (interview of over 20 minutes, plus a follow-up visit and use of a brochure) led to an increase in smoking abstinence at 6 months of over 80% (RR: 1.86; 95% CI: 1.60–2.15) (11 studies, 8515 patients). Direct comparison between intensive and brief advice shows that the former was more effective (RR: 1.37; 95% CI: 1.20–1.56) (15 studies, 9775 patients).

The overall quality of the evidence is moderate because of a large risk of bias and the indirect nature of the evidence (no study in a perioperative context) [23].

A recent study on follow-up in 3336 patients included in a lung cancer screening program shows that assistance and advice provided to the patient, including via a dedicated hotline, were independently associated with increased smoking cessation (OR: 1.40; 95% CI: 1.21–1.63 and OR: 1.46; 95% CI: 1.19–1.79) [24].

#### 4.3.3. Recommendation

We recommend that all professionals involved in the care pathway (surgeons, anesthetist-intensivists, carers) inform smokers of the positive effects of quitting and offer them dedicated management and personalized follow-up (Grade 1+).

#### 4.4. Recommendation 4: impact of passive smoking on the child during the perioperative period

##### 4.4.1. Wording of the question

What is the impact of passive smoking on the child in the perioperative period?

##### 4.4.2. Rationale

The analysis relates to 8 publications in 11,275 children, mainly prospective observational studies [25–31]. The 2007 study by von Ungern-Sternberg et al. [32] on the impact of a recent infection of the upper airways was not included. The overall quality of the evidence was moderate, because of the moderate and unexplained heterogeneity of the results ( $I^2 > 50\%$ ).

Passive smoking in the child doubled [RR: 2.02 (95% CI: 1.82–2.23)] the risk of undesirable perioperative effects in the case of general anesthesia (cough, laryngospasm, bronchospasm, and desaturation). We found no studies specifically on the interval required between smoking cessation in the parents and reduction in perioperative morbidity in the child.

The desirable effects of smoking cessation therefore clearly outweigh the undesirable effects (cf. [supplementary material: question n° 4](#)).

#### 4.4.3. Recommendation

We recommend parental smoking cessation or removal of the child from environmental tobacco smoke as long as possible before the intervention (Grade 1+).

#### 4.5. Recommendation 5: electronic cigarettes and preoperative smoking

##### 4.5.1. Wording of the question

What are the effects and the role of electronic cigarettes in the perioperative period?

##### 4.5.2. Rationale

The analysis related to 3 randomized controlled trials in 1246 patients [33] outside a surgical context. Electronic cigarettes doubled the rate of smoking cessation (RR: 2.29; 95% CI: 1.05–4.96). The quality of the evidence is low due to imprecision in the results and the indirect nature of the evidence. The lack of difference between the effects of electronic cigarettes and nicotine substitutes (RR: 1.26; 95% CI: 0.68–2.34) revealed in one trial is uncertain for the same reasons (cf. [supplementary material: question n° 5](#)).

Following a report on electronic cigarettes by Public Health England, the *Haute Autorité de santé* recently issued a report ([http://www.has-sante.fr/portail/upload/docs/application/pdf/2015-11/a\\_2015\\_0100\\_reponse\\_courrier\\_dgs\\_actualisation\\_rbp\\_tabac.pdf](http://www.has-sante.fr/portail/upload/docs/application/pdf/2015-11/a_2015_0100_reponse_courrier_dgs_actualisation_rbp_tabac.pdf)), which found that the literature data on the efficacy and safety of electronic cigarettes are still insufficient to recommend their use in smoking cessation programs.

In its report of 15 May 2014 ([https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/311887/E-cigarettes\\_report.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/311887/E-cigarettes_report.pdf)), Public Health England states the following:

- “electronic cigarettes, and the various new generation nicotine devices in development, clearly have potential to reduce the prevalence of smoking in the UK. The challenges are to harness that potential, maximise the benefits, and minimise risks”;
- “the health risks of passive exposure to electronic cigarette vapor are therefore likely to be extremely low”;
- “studies indicate that electronic cigarettes are moderately effective as smoking cessation and harm reduction aids, but that a significant component of that effect is due to the behavioral rather than nicotine delivery characteristics of the devices. However, most of the available evidence relates to early generation devices of unknown but almost certainly low nicotine delivery. More recent and future devices may prove much more effective”;
- “electronic cigarettes therefore increase smoking cessation to the extent that they draw in smokers who would not otherwise use a nicotine substitute in an attempt to quit, but reduce it to the extent that they take smokers away from Stop Smoking Services (SSS). The optimum solution for population health is to maximise both the use of electronic cigarettes among smokers, and the proportion of users who engage with SSS. This will require some changes to current SSS practice”;
- “electronic cigarettes, and other nicotine devices, therefore offer vast potential health benefits, but maximising those benefits while minimising harms and risks to society requires appropriate regulation, careful monitoring, and risk management. However, the opportunity to harness this potential into public health policy, complementing existing comprehensive tobacco control policies, should not be missed”.

The NHS proposes the use of electronic cigarettes in the framework of a smoking cessation program:

- <http://www.nhs.uk/Livewell/smoking/Pages/e-cigarettes.aspx>;
- <http://www.nhs.uk/smokefree/help-and-advice/e-cigarettes#74wkZypu4vHDkgyW.97>.

Lastly, the *Haut Conseil de la santé publique* (HCSP) updated on 26 February 2016 its recommendations concerning the benefit-risk ratio of electronic cigarettes for the general population (<http://www.hcsp.fr/Explore.cgi/avisrapportsdomaine?clefr=541>).

The work of the HCSP shows that the electronic cigarette:

- can be considered as an aid in helping smokers to quit or reduce their use of tobacco;
- could constitute a port of entry in combatting smoking;
- raises the risk of a renormalization of the use of tobacco, given the positive image conveyed by its marketing and by its visibility in public spaces.

The HCSP recommends:

- informing, without publicity, health care professionals and smokers that electronic cigarettes are an aid in smoking

cessation and, through exclusive use, a way of reducing the risks of tobacco;

- maintaining the sales and publicity restrictions imposed by law and extension of the ban on use in all spaces allocated to collective use.

The HCSP suggests:

- strengthening methods for the gathering of observational data on smoking, conducting robust epidemiological and clinical studies on electronic cigarettes, and the launch of research on these issues in the human and social sciences;
- clarifying the status of the electronic cigarette and cartridge refills;
- pursuing efforts regarding labeling and branding to inform consumers and to ensure their safety;
- thinking about the creation of a “medicalised” electronic cigarette.

Opinions regarding the risk-benefit ratio of electronic cigarettes therefore range from uncertain to probably favorable. These divergent opinions could be due to a different “cultural” approach of the British [34].

We therefore decided to conduct a vote between 2 types of recommendation.

The first considers that the risk-benefit ratio is uncertain and so electronic cigarettes should not be used: “Current understanding does not allow us to recommend the use of electronic cigarettes in perioperative smoking cessation”.

The second considers that the risk-benefit ratio is probably favorable in the perioperative context: “We suggest that the use of electronic cigarettes before scheduled surgery should not be discouraged in patients who are already using them in an ongoing smoking cessation program and in patients who refuse the use of other nicotine substitutes”.

The voting results showed a wide range of opinions among the experts for both types of recommendation (cf. [supplementary material: question n° 5](#)). As GRADE<sup>®</sup> methodology specifies that at least 50% of the participants must be for a recommendation and less than 20% against, no recommendation could be made in this case.

#### 4.5.3. Recommendation

None.
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#### Disclosure of interest

The authors declare that they have no competing interest.

#### Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at [doi:10.1016/j.accpm.2017.02.002](https://doi.org/10.1016/j.accpm.2017.02.002).

#### References

- [1] Willigen, dael EM, Teijink JA, Bartelink M-LL, Peters RJ, Büller HR, et al. Smoking and the patency of lower extremity bypass grafts: a meta-analysis. *J Vasc Surg* 2005;42:67–74.
- [2] Neumayer L, Hosokawa P, Itani K, El-Tamer M, Henderson W, Khuri S. Multi-variable predictors of postoperative surgical site infection after general and vascular surgery: results from the patient safety in surgery study. *J Am Coll Surg* 2007;204:1178–87.
- [3] Campbell D, Henderson W, Englesbe M, Hall B, O'Reilly M, Bratzler D, et al. Surgical site infection prevention: the importance of operative duration and blood transfusion – results of the first American College of Surgeons – National Surgical Quality Improvement Program Best Practices Initiative. *J Am Coll Surg* 2008;207:810–20.
- [4] Turan A, Mascha EJ, Roberman D, Turner PL, You J, Kurz A, et al. Smoking and perioperative outcomes. *Anesthesiology* 2011;114:837–46.
- [5] Hawn M, Houston T, Campagna E, Graham L, Singh J, Bishop M, et al. The attributable risk of smoking on surgical complications. *Ann Surg* 2011;254:914–20.
- [6] Jones R, Nyawo B, Jamieson S, Clark S. Current smoking predicts increased operative mortality and morbidity after cardiac surgery in the elderly. *Interact Cardiovasc Thorac Surg* 2011;12:449–53.
- [7] Mason DP, Subramanian S, Nowicki ER, Grab JD, Murthy SC, Rice TW, et al. Impact of smoking cessation before resection of lung cancer: a Society of Thoracic Surgeons General Thoracic Surgery Database study. *Ann Thorac Surg* 2009;88:362–70 [discussion 370–1].
- [8] Mills E, Eyawo O, Lockhart I, Kelly S, Wu P, Ebbert J. Smoking cessation reduces postoperative complications: a systematic review and meta-analysis. *Am J Med* 2011;124:144154e8.
- [9] Sørensen L. Wound healing and infection in surgery: the clinical impact of smoking and smoking cessation: a systematic review and meta-analysis. *Arch Surg* 2012;147:373–83.
- [10] Lassig A, Yueh B, Joseph A. The effect of smoking on perioperative complications in head and neck oncologic surgery. *Laryngoscope* 2012;122:1800–8.
- [11] Musallam K, Rosendaal F, Zaatari G, Soweid A, Hoballah J, Sfeir P, et al. Smoking and the risk of mortality and vascular and respiratory events in patients undergoing major surgery. *JAMA Surg* 2013;148:755–62.
- [12] Saxena A, Shan L, Reid C, Dinh D, Smith J, Shardey G, et al. Impact of smoking status on early and late outcomes after isolated coronary artery bypass graft surgery. *J Cardiol* 2013;61.
- [13] Grønkjær M, Eliassen M, Skov-Ettrup LS, Tolstrup JS, Christiansen AH, Mikkelsen SS, et al. Preoperative smoking status and postoperative complications: a systematic review and meta-analysis. *Ann Surg* 2014;259:52–71.
- [14] Selvarajah S, Black J, Malas M, Lum Y, Propper B, Abularrage C. Preoperative smoking is associated with early graft failure after infrainguinal bypass surgery. *J Vasc Surg* 2014;59:1308–14.
- [15] Scolaro J, Schenker M, Yannascoli S, Baldwin K, Mehta S, Ahn J. Cigarette smoking increases complications following fracture: a systematic review. *J Bone Joint Surg Am* 2014;96:674–81.
- [16] Pluvy, Panouillères, Garrido, Pauchot, Saboye, Chavoine, et al. Smoking and plastic surgery, part II. Clinical implications: a systematic review with meta-analysis. *Ann Chir Plast Esthet* 2014;60:e15e49.
- [17] Teng S, Yi C, Krettek C, Jagodzinski M. Smoking and risk of prosthesis-related complications after total hip arthroplasty: a meta-analysis of cohort studies. *PLoS One* 2015;10:e0125294.
- [18] Imhoff Lvan, Kranenburg G, Macco S, Nijman N, Overbeeke Evan, Wegner I, et al. The prognostic value of continued smoking on survival and recurrence rates in head and neck cancer patients: a systematic review. *Head Neck* 2015. <http://dx.doi.org/10.1002/hed.24082>.
- [19] Warner S. Surgery as a teachable moment for smoking cessation. *Anesthesiology* 2010;112:102–7.
- [20] Thomsen T, Villebro N, Møller AM. Interventions for preoperative smoking cessation. *Cochrane Database Syst Rev* 2014;3:CD002294.
- [21] Turan A, White P, Koyuncu O, Karamanliodlu B, Kaya G, Apfel C. Transdermal nicotine patch failed to improve postoperative pain management. *Anesth Analg* 2008;107:1011–7.
- [22] Wong J, Lam DP, Abrishami A, Chan MT, Chung F. Short-term preoperative smoking cessation and postoperative complications: a systematic review and meta-analysis. *Can J Anaesth* 2012;59:268–79.
- [23] Stead L, Buitrago D, Preciado N, Sanchez G, Hartmann-Boyce J, Lancaster T. Physician advice for smoking cessation. *Cochrane Database Syst Rev* 2013;5. <http://dx.doi.org/10.1002/14651858.CD000165.pub4> [Art. No.: CD000165].
- [24] Park E, Gareen I, Japuntich S, Lennes I, Hyland K, DeMello S, et al. Primary care provider-delivered smoking cessation interventions and smoking cessation among participants in the National Lung Screening Trial. *JAMA Intern Med* 2015;175:1509.
- [25] Lakshminpathy N, Bokesch P, Cowan D, Lisman S, Schmid C. Environmental tobacco smoke. *Anesth Analg* 1996;82:724–7.
- [26] Lyons B, Frizelle H, Kirby F, Casey W. The effect of passive smoking on the incidence of airway complications in children undergoing general anaesthesia. *Anaesthesia* 1996;51:324–6.
- [27] Skolnick ET, Vomvolakis MA, Buck KA, Mannino SF, Sun LS. Exposure to environmental tobacco smoke and the risk of adverse respiratory events in children receiving general anesthesia. *Anesthesiology* 1998;88:1144–53.
- [28] Drongowski R, Lee D, Reynolds P, Malviya S, Harmon C, Geiger J, et al. Increased respiratory symptoms following surgery in children exposed to environmental tobacco smoke. *Pediatr Anesth* 2003;13:304–10.
- [29] O'Rourke J, Kalish L, McDaniel S, Lyons R. The effects of exposure to environmental tobacco smoke on pulmonary function in children undergoing anesthesia for minor surgery. *Pediatr Anesth* 2006;16:560–7.
- [30] Jones DT, Bhattacharyya N. Passive smoke exposure as a risk factor for airway complications during outpatient pediatric procedures. *Otolaryngol Head Neck Surg* 2006;135:12–6.

- [31] Seyidov T, Elemen L, Solak M, Tugay M, Toker K. Passive smoke exposure is associated with perioperative adverse effects in children. *J Clin Anesth* 2011;23:4752.
- [32] Ungern-Sternberg BS, Boda Kvon, Chambers NA, Rebmann C, Johnson C, Sly PD, et al. Risk assessment for respiratory complications in paediatric anaesthesia: a prospective cohort study. *Lancet* 2010;376:773–83.
- [33] Boyce J, Hajek P. Electronic cigarettes for smoking cessation and reduction. *Cochrane Database Syst Rev* 2014;12. <http://dx.doi.org/10.1002/14651858.CD010216.pub2> [Art. No.: CD010216].
- [34] Green SH, Bayer R, Fairchild AL. Evidence, policy, and e-cigarettes – will England reframe the debate? *N Engl J Med* 2016;374:1301–3.