



Original Article

Use of volatile anaesthetic agents in anaesthesia: A survey of practice in France in 2012[☆]



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ABSTRACT

Volatile anaesthetic agents are used in the vast majority of general anaesthetics performed in France. We assessed the degree of understanding of French anaesthetists with regard to the general pharmacology of these products and their understanding of the factors that govern selection of the different agents available for use in adults. A validated 13-item questionnaire was sent electronically in 2012 using files from the *Société française d'anesthésie et de réanimation* (Sfar). It covered four categories: general characteristics of the respondent; practical aspects of anaesthesia with volatile agents; pharmacological properties and criteria for choosing a volatile agent; risk of intra-operative awareness. Among the 981 respondents, the anaesthetic technique used by 50% was that of an intravenous induction followed by maintenance with sevoflurane. The concepts relating to the practical use of these products are well known. A fresh gas flow of less than 2 L/min is used by 96% of the respondents. However, knowledge levels are often inadequate (rate of correct answers often < 50%). This lack of knowledge pertains to current themes (climate pollution), those of debatable clinical significance, e.g. pre-conditioning, hypoxic vasoconstriction and those that concern scientific theory (medullary action). However, a lack of knowledge is also observed with regard to basic pharmacology (respiratory, vascular, neurological or pharmacokinetic effects). There is no significant difference in the mode of practice. The experience of the anaesthetist (measured by number of years post diploma) resulted in a number of differences in response to many aspects of the questionnaire but these were minor. These results suggest the need for an improvement both in the initial and continued training of anaesthetists with respect to volatile anaesthetic agents.

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1. Introduction

Volatile anaesthetics agents are used daily in the vast majority of general anaesthetics performed in France. The “new” volatile anaesthetic agents (desflurane and sevoflurane) have in fact been available for quite some time [1,2] and if there was initially some resistance to their use [3], mainly due to the extra cost with which

they were associated, they are now widely used. As commonly used products, they are no longer widely questioned. We wanted to assess the degree of knowledge of practitioners concerning the general pharmacology of these products and understand those factors that govern their selection of different products. An electronic survey was therefore carried out in 2012 in order to answer these questions.

2. Methods

The questionnaire¹ was prepared by a working group of experts in the pharmacology of anaesthesia. The questionnaire was

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¹ <http://enquetes.sfar.org/limesurvey/index.php?sid=89117&lang=fr>.

preceded by a short text explaining that the survey was being conducted under the auspices of the Sfar, the goal being to test theoretical knowledge about these products and to determine the methods used when choosing a volatile anaesthetic agent. The time to complete the questionnaire was short, being approximately 5 minutes. The questionnaire was designed to explore practice in adults, the paediatric field having recently been evaluated by Constant et al. [4]. Thus, the questionnaire included only one specific paediatric question to test the comparability with previous data. The issues explored were the pharmacological effects of volatile anaesthetic agents in general and the specific effects of desflurane and sevoflurane. Questions about other volatile anaesthetic agents were not included.

The questionnaire included 13 questions and was divided into four categories: general characteristics of the respondent; practical aspects of anaesthesia with volatile anaesthetic agents and their pharmacological properties; the criteria employed when choosing a volatile anaesthetic agent; the risk of intra-operative awareness. The later two questions, although not specifically related to the use of volatile anaesthetic agents, were approved by the working group in order to determine whether a future survey on this subject would yield interesting results. We subsequently show that this is indeed the case.

The questionnaire was converted into an electronic version using LimeSurvey[®]. Prior to the launch of the study, the questionnaire was trialled by ten anaesthetists working in Sfar committees to validate and ensure understanding of the questions, and ensure there were no difficulties in filling out the questionnaire. No changes were necessary after the test phase. An e-mail was then sent to all anaesthetists on the mailing list for the Sfar, which is approximately 14,000 email addresses. On receiving the email, a link to the questionnaire allowed the respondent to anonymously complete the survey. The online questionnaire was conducted in July 2012, with a re-launch performed one month later.

Responses were compared either to a reference when possible or to answers generated by the expert working group. In the latter case, the appropriate response was the result of a consensus among experts if responses initially differed. Results were requested either in a descriptive manner or, for all closed questions, in absolute numbers or percentages. The Chi² test was used when comparing the results according to location performance and seniority of diploma. A difference was considered to be significant for a value of $P < 0.05$.

3. Results

Characteristics of the 981 anaesthetists who responded to the questionnaire are summarised in Table 1. Two-thirds of anaesthetists were working in the public sector and more than half had been board certified anaesthetists for more than ten years. One question explored the technique of general anaesthesia most commonly used in adult patients requiring inpatient surgery. The method used by nearly 50% of respondents was intravenous induction followed by sevoflurane maintenance. Intravenous induction followed by desflurane maintenance was used by 24% of respondents while total intravenous anaesthesia (TIVA) was used regularly by 17% of respondents. The distribution of responses for day-case surgery shows minor differences (Table 2). In children, 88% of practitioners do not switch to desflurane after induction with sevoflurane. Desflurane was used by 10% when the duration of anaesthesia was expected to be longer than 90 minutes and if the child did not have bronchial hyperactivity. Questions assessing the comparative pharmacological properties of the two products are shown in Table 3. Broadly speaking, desflurane was considered

Table 1
Respondents characteristics.

Questions	Responses (n)	Responses (%)
<i>Current Status</i>		
Internship	91	9
Fellowship post-internship	91	9
Hospital practitioner or other "full-time practitioner"	474	27
Professor	61	6
Private practitioner	264	26
<i>Location of practice</i>		
Public hospital	615	63
Private hospital	258	26
Mixture of private and public hospitals	44	5
Non-profit private institutions (e.g. ESPIC ^a)	44	5
Locum	14	1
<i>Number of years with diploma</i>		
< 5 years	292	30
5–10 years	119	12
> 10 years	570	58

Percentages are rounded to the nearest whole number depending on whether the value after the decimal is greater than or less than 5.

^a *Établissements de santé privés à but non lucratif.*

to be expensive, allow a rapid recovery, and to be irritating to the airways. Half of the respondents associated it with good haemodynamic and metabolic tolerance. Approximately 20% of respondents thought that desflurane was associated with effective pharmacological pre-conditioning. Responses to questions about sevoflurane mirrored that of desflurane with respect to time to emergence from anaesthesia and effects on the airways. With respect to other properties, haemodynamic and metabolic tolerance was thought to well describe both drugs for 50% of respondents. Approximately half of the respondents said sevoflurane provides haemodynamic stability, is well tolerated metabolically and confers a degree of pre-conditioning and is not expensive. Comparing desflurane and sevoflurane did not disclose a frank difference in favour of one drug, except for rapid awakening and metabolic tolerance, both properties favouring desflurane. In addition, except for the irritating effect of volatile agents, no other property clearly differentiated them from intravenous agents, with almost half of respondents preferring volatile and the other half preferring intravenous agents.

More than half (54%) of respondents said that increased heart rate accelerates the induction of anaesthesia induced by volatile anaesthetic agents. A majority (75%) of respondents said that formation of compound A results from sevoflurane coming into contact with soda lime. Approximately 19% know that a rapid increase in desflurane concentration is associated with blood pressure elevation and 42% responded that volatile anaesthetic

Table 2
General anaesthesia technique in adults according to mode of hospitalisation.

Responses (%)	Conventional hospitalisation	Day-case surgery
IV induction and maintenance with sevoflurane	48	42
IV induction and maintenance with desflurane	24	23
Total intravenous anaesthesia (TIVA)	17	22
Induction with sevoflurane and maintenance with sevoflurane	2	–
Other	8	11

Percentages are rounded to the nearest whole number depending on whether the value after the decimal is greater than or less than 5.

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