

Perception and knowledge of anesthesia and the role of anesthesiologists : a Belgian single-center cross-sectional survey

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Abstract : Study Objective : To assess the knowledge of anesthesia and the role of anesthesiologists and evaluate the prevalence of concerns of certain risks of anesthesia and surgery in Belgian patients.

Design : Observational mono-center cross-sectional survey.

Setting : Preoperative patients planned for elective surgery in Jessa Hospital, Belgium.

Interventions : An observational survey in Dutch.

Measurements : Patient demographics and characteristics, perception of the expertise, role, and responsibility of the anesthesiologist, knowledge of the patient regarding anesthesia, and patients' fear of specific risks and side effects of anesthesia and surgery. Associations were analyzed with the Pearson correlation coefficient or the Spearman rank's correlation coefficient.

Main Results : In total 361 patients completed the survey. Patient demographics were as follows : 54.8% males, mean age (\pm SD) $58,84 \pm 16,38$ years. Most patients (87.3%) recognized anesthesiologists as specially trained medical doctors but more than 50% underestimated their different perioperative responsibilities. Patients underestimated the duration of education of an anesthesiologist in 84.2%. Their role at the intensive care unit (69.3%), the emergency department (71.2%), and the delivery room (71.2%) were relatively well known. Their role at the chronic pain management clinic (44.8%) and the preoperative anesthesia consultation (40.7%) was less well known. Some patients thought that general anesthesia frequently results in brain damage (22.7%). Older age and lower educational level were associated with lower knowledge. In general, 8.3% of all patients were very anxious about anesthesia, 22.7% somewhat, and 69% not at all. Female gender and lower educational level were positively correlated with a higher risk of fear. : Most patients in this single-center Belgian cohort were aware that anesthesiologists are specialized medical doctors. Overall, the patient's knowledge of the anesthesiologist's expertise and responsibilities and anesthesia was rather limited.

independent field of medicine. However, research in Europe and the United States has shown that the awareness of patients concerning the role, education, and expertise of anesthesiologists is rather limited in the general population (1-3). Patients tend to underestimate the role of the anesthesiologist in comparison to the surgeon (2). Knowledge may also be different for reasons such as educational level, age, and former exposure to the health care system. Furthermore, anesthesiologists play a key role in the operation room (OR), but their role outside of the OR is not universally defined. Their role can vary depending on the country where they practice and may include teaching assignments, administrative tasks, and key roles at the intensive care unit, emergency department, and pain clinic (4).

A lack of knowledge of anesthesia may result in unrealistic concerns and fear before surgery (5, 6).

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Authors' contributions : K. Nijs conceived of the study. K. Nijs and B. Stessel initiated the study design and L. Salimans helped with implementation. N. Castelein, I. Depauw and V. Swinnen were responsible for the data collection. L. Salimans provided statistical expertise. I. Callebaut was responsible for the figure creation and M. Van de Velde was responsible for the data interpretation. All authors were responsible for the writing of the paper and approved the final manuscript.

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INTRODUCTION

Since the first anesthesia in 1846, anesthesiology has developed from an experimental area with non-specialist practitioners into a highly specialized and

This may potentially have negative outcomes and can have an impact on patient's general satisfaction after surgery (5, 6).

Additionally, surveys have revealed that some population groups have unrealistic concerns about certain risks of anesthesia and surgery (5). Fear of anesthesia may contribute to preoperative anxiety and consequently to postoperative pain (5, 7).

Patients' knowledge and awareness of the role of the anesthesiologists and concerns of certain risks of anesthesia and surgery have already been investigated in several countries (1, 8). To our knowledge, no study in Belgium has been performed on this topic. With the increasing demand for the skills of an anesthesiologist in all stages of surgery (pre-, per-, and postoperative), it is important to evaluate patients' knowledge, experience, and concerns regarding anesthesia.

The primary objective is to assess the perception and knowledge of anesthesia and the role of anesthesiologists. Furthermore, we want to measure the prevalence of concerns of certain risks of anesthesia and surgery.

MATERIAL AND METHODS

This mono-center, investigator-initiated, observational, cross-sectional survey was approved by the ethical committee of JESSA Hospital Hasselt, Belgium (Chairperson Dr. Koen Magerman, registration number 18.04/ANESTH18.01) on 17 January 2018. The study was registered on ClinicalTrials.gov (NCT03411694) and was executed based on the Declaration of Helsinki. All patients with an American Society of Anesthesiologists' (ASA) physical status of 1-3 scheduled for elective, inpatient, or outpatient surgery at the Jessa Hospital, Hasselt, Belgium were eligible to participate. Exclusion criteria were patient's age <18 years, inability to express themselves, or insufficient understanding of the Dutch, French or English language.

After obtaining written informed consent, the survey was taken by residents in anesthesiology during the pre-operative visit. The patients received a brochure on anesthesia-related topics after the survey was taken. During the survey, family or other relatives present in the hospital room were not allowed to help the patient. In hospital rooms with more than 1 patient present, the survey was taken from only one patient to minimize the risk of bias. There was no follow-up of patients after the survey.

Study Questionnaire

Questions used in the survey were based on previous research (1-3, 5, 9). The survey consisted of 6 parts. First, patient demographics and characteristics were recorded. Demographic data included gender, age, education, nationality, native language, generally perceived health status, presence of chronic disease, and the number of previous surgical procedures. Second, the patients' perception of the expertise and responsibilities of the anesthesiologist was assessed with 8 questions. Third, the patients' perception of the education of anesthesiologists and surgeons as well as on their interrelationships was assessed with 6 questions. The fourth part of the questionnaire gauged to the different roles of the anesthesiologist in a Belgian hospital and included 9 questions. The fifth part of the survey included 14 questions related to patients' knowledge of anesthesia and the anesthesiologist. The final part of the survey included 13 questions assessing patients' fear of specific risks and side effects of anesthesia and surgery.

Primary and secondary outcomes

The primary objective is to assess the perception and knowledge of anesthesia and the role of anesthesiologists.

The secondary objectives are :

- 1) to study the influence of demographic variables (i.e. age, gender, and level of education) and former exposure to the health system (previous surgery) on both knowledge and fear
- 2) to measure the prevalence of concerns of certain risks of anesthesia and surgery.

Statistical analyses

Descriptive statistics were presented as frequencies and percentages for categorical variables and as median \pm interquartile range for numerical variables. Questions related to the knowledge of patients were grouped in two categories, i.e. correct versus incorrect/unknown, and recoded by a score of 1 versus 0. Three questions were left out of this analysis (questions difficult to interpret and/or more than one correct answer). Based on these recorded scores, the scores of all 34 questions included in the analysis were summed up. The sum of the knowledge scores ranged from zero to 34, with a higher score reflecting a higher level of knowledge of the patient. The association between the knowledge of the patient/ fear of the patient and

the independent variable age was analyzed with the Pearson correlation coefficient. The Spearman rank's correlation coefficient was used to examine the association between the independent variables gender, education, and previous surgery. A p-value < 0.05 was considered statistically significant. All analyses were performed using the statistical software SPSS version 25 (IBM, Chicago, Illinois, USA).

RESULTS

A flow chart of patient selection and exclusion is presented in Figure 1. In total, 361 patients scheduled for a surgical procedure in Jessa Hospital were included from January 2018 until November 2018.

Patient demographics

Patient demographics and characteristics are shown in Table 1.

1. Patients' perception of anesthesiologist expertise and responsibilities

Patients' perception of anesthesiologist expertise and responsibilities is presented in table 2. Most patients were aware that an anesthesiologist is responsible for the induction of general anesthesia.

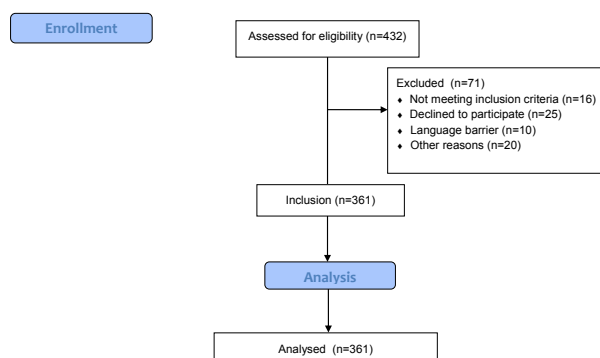


Fig. 1 – Study flow chart.

Half of the patients believed that an anesthesiologist is responsible for monitoring parameters such as blood pressure during surgery and 20% believed that an anesthesiologist is responsible for blood transfusion during surgery if necessary. More than half of the patients answered that a nurse has the leadership in direct care after surgery (Table 2).

2. Patients' perception of the education of anesthesiologist and surgeon and their inter-relationships

More than 80% underestimated the duration of education of an anesthesiologist (12 years) and a surgeon (13 years) (Table 3A). The length of training of a residentsip in anesthesiology (5 years) and surgery (6 years) were correctly answered in

Table 1
Demographic data and patient characteristics

		Number of patients (n=361)
Gender	Male / Female	198 (54.8%) / 163 (45.2%)
Age	Years	58.8 ± 16.4
Education	Lower secondary education	55 (15.2%)
	Upper secondary education	219 (60.7%)
	Higher education (not university)	68 (18.8%)
	University	19 (5.3%)
Ethnicity	Belgian	341 (94.5%)
	Dutch	7 (1.9%)
	Other	13 (3.6%)
Primary language	Dutch	352 (97.5%)
	French	1 (0.3%)
	English	1 (0.3%)
	Other	7 (1.9%)
Chronic disease	Yes	89 (24.7%)
	No	272 (75.3%)
General perceived health	Very good	54 (15%)
	Good	275 (76.2%)
	Bad	32 (8.9%)
Previous Surgery	None	31 (8.6%)
	1	73 (20.2%)
	2 or more	257 (71.2%)

Data are represented as the number of patients (%). Age is expressed as mean ± standard deviation.

Table II

Patients' perception of anesthesiologists' expertise, role, and responsibilities. The correct answer is in bold

	Surgeon	Anesthesiologist	Nurse	Unknown
Who puts you asleep during general anesthesia?	3 (0.8%)	305 (84.5%)	21 (5.8%)	32 (8.9%)
Who decides if a patient get surgery?	293 (81.2%)	47 (13.0%)	4 (1.1%)	17 (4.7%)
Who is responsible for waking you up after general anesthesia?	7 (1.9%)	222 (61.5%)	89 (24.7%)	43 (11.9%)
Who is responsible for monitoring the parameters (blood pressure, breathing) during surgery?	12 (3.3%)	184 (51.0%)	132 (36.6%)	33 (9.1%)
Who monitors blood loss during surgery?	114 (31.6%)	61 (16.9%)	107 (29.6%)	79 (21.9%)
Who gives the patient blood during surgery, if necessary?	80 (22.2%)	75 (20.8%)	153 (42.4%)	53 (14.6%)
Who gives medication and fluid during anesthesia when necessary?	28 (7.8%)	159 (44.0%)	130 (36.0%)	44 (12.2%)
Who takes care of the patient in recovery and has the leadership about the direct care after surgery?	14 (3.9%)	84 (23.3%)	238 (65.9%)	25 (6.9%)

Table III A

Estimation of study time required after high school to become an anesthesiologist and surgeon. The correct answer is in bold.

	3 years	5 years	7 years	9 years	12 years	13 years
Study time necessary to become an anesthesiologist after high school?	24 (6.6%)	82 (22.7%)	122 (33.8%)	76 (21.1%)	43 (11.9%)	14 (3.9%)
Study time necessary to become a surgeon after high school?	8 (2.2%)	17 (4.7%)	104 (28.8%)	100 (27.7%)	88 (24.4%)	44 (12.2%)

Table III B

Patient's perception of the years of resident training required to become an anesthesiologist and surgeon. The correct answer is in bold

	2 years	3 years	4 years	5 years	6 years
How many years is a resident anesthesiologist in training?	85 (23.6%)	124 (34.3%)	57 (15.8%)	71 (19.7%)	24 (6.6%)
How many years is an assistant surgeon in training?	48 (13.3%)	86 (23.8%)	49 (13.6%)	94 (26.0%)	84 (23.3%)

Data are represented as the number of patients (%)

Table III C

Patients' perception of the role of an anesthesiologist and the relationship between an anesthesiologist and a surgeon.

The correct answer is in bold.

The anesthesiologist is...	An assistant of the surgeon	15 (3.5%)
	A medical doctor specialized in anesthesia	397 (68.6%)
	A nurse with special education in anesthesia	18 (4.2%)
	A medical worker who is not a nurse or a medical doctor	2 (0.5%)
	A technician	1 (0.2%)
	I don't know	28 (6.5%)
During surgery: What is the relation between the surgeon and the anesthesiologist?	The anesthesiologist works under the supervision of the surgeon	16 (3.7%)
	The surgeon works under the supervision of the anesthesiologist	12 (2.8%)
	Both have their responsibilities during surgery and work together as equals	320 (73.9%)
	I don't know	13 (3.0%)

19.7% and 23.3%, respectively (Table 3B). The relationship between anesthesiologist and surgeon during surgery was correctly perceived by the majority of patients (73.9%) (Table 3C).

Data are represented as the number of patients (%).

3. Different roles of the anesthesiologist in a Belgian hospital

Almost all patients were aware of the role of an anesthesiologist in the operating theater (Table 4). The role of an anesthesiologist at the intensive care unit, the emergency department, and the delivery room were relatively well known (Table 4). The role of an anesthesiologist in other domains was less well known (Table 4).

Table IV

The different roles of the anesthesiologist in a hospital in Belgium. The correct answer is in bold

	Yes	No	Unknown
Operating theater	344 (95.3%)	4 (1.1%)	13 (3.6%)
Pain management center	162 (44.8%)	110 (30.5%)	89 (24.7%)
Intensive care unit	250 (69.3%)	73 (20.2%)	38 (10.5%)
Blood bank	35 (9.7%)	262 (72.6%)	64 (17.7%)
Emergency department	257 (71.2%)	73 (20.2%)	31 (8.6%)
Delivery room	258 (71.5%)	56 (15.5%)	47 (13.0%)
Preoperative consultation	147 (40.7%)	162 (44.9%)	52 (14.4%)
Cardiology intervention center	175 (48.5%)	117 (32.4%)	69 (19.1%)
Resuscitation, everywhere in the hospital	197 (54.6%)	117 (32.4%)	47 (13.0%)

Data are represented as the number of patients (%).

Table V

Patients' knowledge concerning anesthesia and the anesthesiologist. The correct answer is in bold

	Yes	No	Unknown
An anesthesiologist is a specially trained doctor	315 (87.3%)	33 (9.1%)	13 (3.6%)
A specially trained nurse may administer anesthesia (in Belgium) under the supervision of an anesthesiologist	64 (17.7%)	235 (65.1%)	62 (17.2%)
An anesthesiologist is an expert in the treatment of pain and takes care of pain after surgery	144 (39.9%)	166 (46.0%)	51 (14.1%)
An anesthesiologist takes care of an epidural during delivery	305 (84.5%)	17 (4.7%)	19 (5.8%)
Every type of surgery requires that the patient is put asleep	97 (26.9%)	252 (69.8%)	12 (3.3%)
Certain types of surgeries can be done by blocking nerves with local anesthetics without needing to be completely put to sleep	314 (87.0%)	17 (4.7%)	30 (8.3%)
It is important for the anesthesiologist to know your medical history and your medication history before surgery	352 (97.5%)	2 (0.6%)	7 (1.9%)
Fasting prior surgery means absolutely nothing by mouth	348 (96.4%)	12 (3.3%)	1 (0.3%)
Fasting before surgery means you cannot have anything by mouth except water	69 (19.1%)	281 (77.9%)	11 (3.0%)
Overall, anesthesia is extremely safe	323 (89.5%)	13 (3.6%)	25 (6.9%)
General anesthesia frequently results in brain damage	82 (22.7%)	221 (61.2%)	58 (16.1%)
Overall risks of anesthesia is higher in sick patients	268 (74.2%)	63 (17.5%)	30 (8.3%)
Nausea and vomiting are frequent side effects of general anesthesia	263 (72.9%)	61 (16.9%)	37 (10.2%)
There is an occasional chance of being aware of what's going on under general anesthesia	234 (64.8%)	94 (26.1%)	33 (9.1%)

Data are represented as the number of patients (%).

4. Patients' knowledge concerning anesthesia and the anesthesiologist

Most patients were aware that an anesthesiologist is a specially trained medical doctor (87.3%) and is responsible for epidural analgesia during obstetric labor (Table 5). Almost all patients believed that fasting before surgery means having absolutely nothing by mouth and believed that anesthesia is overall safe. More than half of patients believed that there is an occasional chance of awareness under general anesthesia. In total, 22.7% of patients thought that general anesthesia frequently results in brain damage.

Correlations

Age was negatively correlated with the patients' knowledge of anesthesia and the role of anesthesiologists ($r_s = -0.141$, $p = 0.004$). The highest educational level was positively correlated with patients' knowledge ($r_s = 0.264$, $p < 0.001$).

The independent variables gender ($r_s = -0.057$, $p = 0.139$) and previous surgery ($r_s = 0.023$, $p = 0.329$) were not significantly correlated with knowledge.

5. Patients' fear of specific risks and side effects of anesthesia and surgery

In general, 8.3% of all patients were very anxious about anesthesia, 22.7% somewhat, and 69% not at all. Fear of specific risks and side effects of anesthesia and surgery are presented in Table 6. Overall, 357 patients (98.8%) were confident that the anesthesiologist would take good care of them during general anesthesia. Only 2 patients didn't trust the anesthesiologist and 2 didn't know.

Correlations

Women were significantly more anxious than men ($r_s = 0.283$, $p < 0.01$). Higher education of patients resulted in a lower fear before the surgery ($r_s = 0.092$, $p < 0.05$). There was no significant

Table VI
Fear of specific risks and side effects of anesthesia and surgery

	Very anxious	S o m e w h a t anxious	Not anxious	Do not know
Fear of pain	45 (12.5)	105 (29.1)	210 (58.15)	1 (0.3)
Fear of dying during anesthesia	52 (14.4)	66 (18.3)	240 (66.5)	3 (0.8)
Fear of brain damage	75 (20.8)	67 (18.55)	218 (60.35)	1 (0.3)
Fear of waking up in the middle of surgery	65 (18.0)	51 (14.1)	240 (66.5)	5 (1.4)
Fear of memory loss	65 (18.0)	67 (18.6)	225 (62.3)	4 (1.1)
Fear of loss of control	47 (13.0)	45 (12.5)	265 (73.4)	4 (1.1)
Fear of headache afterwards	27 (7.5)	43 (11.9)	288 (79.8)	3 (0.8)
Fear of nausea and vomiting	57 (15.8)	73 (20.2)	230 (63.7)	1 (0.3)
Fear of needles	30 (8.3)	39 (10.8)	292 (80.9)	0 (0)
Fear of being naked	14 (3.9)	27 (7.5)	317 (87.8)	3 (0.8)
Fear of talking in sleep	5 (1.4)	18 (5.0)	328 (90.9)	10 (2.8)
Fear of infections after surgery	86 (23.8)	80 (22.2)	193 (53.5)	2 (0.6)

Data are represented as the number of patients (%).

relationship between the level of fear and the independent variables age and previous surgery.

DISCUSSION

This survey assesses the knowledge of anesthesia and the role of anesthesiologists and evaluating the prevalence of concerns of certain risks of anesthesia and surgery in a Belgian patient population.

Overall, the patient's knowledge of the anesthesiologist's expertise and responsibilities in this Belgian cohort was rather limited. The vast majority of patients underestimated the duration of education of an anesthesiologist and their different roles within the hospital outside the operating theater environment. Finally, patients' knowledge about anesthesia-related topics was also limited.

Our findings may be explained by the short encounter with an anesthesiologist during a hospital stay and are in line with previous publications (2, 5, 10).

Concerning responsibility for intraoperative tasks, the role of the anesthesiologist was undervalued compared to the operating room (OR) nurse. These results echo those of previous research findings of the ASA. They pointed out that patients and even medical personnel are often unaware of the important role and responsibilities of anesthesiologists (5). These findings triggered the ASA in 2008 to launch an information campaign to enhance the public understanding of the important role of anesthesiologists in modern medicine (5).

In this Belgian cohort, almost 90% of patients recognized anesthesiologists as specialized medical doctors. Previous studies in other countries reported results ranging from 59% to 99% (1, 2, 5, 8, 11, 12). Our better-than-expected results may be explained

by the fact that the concept of nurse anesthetists is not well established in the Belgian health care system.

The role of an anesthesiologist at the operating theater, the ICU, the emergency department, and the delivery room was relatively well recognized in this cohort. However, less than half of the respondents were aware of the role of an anesthesiologist at the chronic pain management clinic and surprisingly also the preoperative anesthesia consultation. Evidently, most of the respondents in this survey probably never visited a chronic pain management clinic and preoperative evaluation facilities are still in their infancy in many Belgian hospitals.

Almost all our respondents answered correctly on the question that fasting before surgery means absolutely no intake by mouth. This result suggests that the preoperative education by surgeons, anesthesiologists, and hospital staff on the dos and don'ts before anesthesia is quite good. Interestingly more than half of the patients believed that there is an occasional chance of awareness under general anesthesia and almost a quarter of the patients thought that general anesthesia frequently results in brain damage. These results point out that there is room for progress in information provision and patient reassurance on the risks of anesthesia.

Expectedly, older age and lower educational level were associated with lower knowledge of anesthesia and the role of anesthesiologists. Surprisingly, patients who had surgery previously did not have higher knowledge scores. This is inconsistent with the findings of a survey taken in Los Angeles (5). An explanation may be that the first steps in structural financing of preoperative anesthesia consultation facilities in Belgium have been taken only recently (2020).

In general, less than 10% of patients in this cohort were very anxious about anesthesia, almost a quarter somewhat, and almost 70% not at all. Female gender and lower educational level were positively correlated with a higher risk of fear. These results are in line with the literature. Nagrampa et al. also found that women are more likely to be concerned about the risks of anesthesia (5) and the relationship between low educational level and risk of fear is widely recognized.

A public information campaign to educate the general population on the importance of the anesthesiologist in modern medicine was never performed in Belgium. The results of this survey suggest that patients' knowledge of the role of anesthesiologists is limited. The appropriateness of a Belgian media campaign in imitation of the 2008 ASA campaign may be an issue that can be discussed and reflected on by the board members of the Belgian professional anesthesia society. Other strategies may include preoperative anesthesia consultation facilities and implementation of web-based tools.

The present study also contains some limitations. First, this is a single-center study and as a result, the generalizability of our results can be questioned. Second, patients were included in the study during the preoperative anesthesia visit on the ward. Not all patients scheduled for surgery were always enrolled due to organizational difficulties eliciting a potential selection bias.

Third, the questions in this survey were not validated and may need to be validated in the future.

CONCLUSION

Most patients in this single-center Belgian cohort were aware that anesthesiologists are specialized medical doctors. Overall, the patient's knowledge of the anesthesiologist's expertise and responsibilities was rather limited. Patients' knowledge concerning anesthesia-related topics was also limited.

Acknowledgements

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