



Assessment of Postoperative Cognitive Dysfunction: Results From a Survey of Turkish Anaesthesiologists

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Cite this article as: Tire Y, Aydoğan E, Sargın M, Kozanhan B. Assessment of Postoperative Cognitive Dysfunction: Results From a Survey of Turkish Anaesthesiologists. Turk J Anaesthesiol Reanim 2020; 48(4): 300-7.

Abstract

Objective: Postoperative cognitive dysfunction (POCD) is one of the most common complications in elderly surgical patients. We conducted a survey study to evaluate the perspectives of Turkish anaesthesiologists on postoperative cognitive disorders.

Methods: We conducted a prospective online survey with questions and answers were recorded either in a Likert scale from 1 to 5 (completely disagree to completely agree) or as yes/no/do not know types of answers. Potential participants were contacted through an e-mail that included a brief introductory note, instructions, a link to the survey and the authors' contact information.

Results: We analysed 129 surveys (9.9% of total potential respondents). The majority believed that the risk of cognitive side effects should be considered when choosing the type of anaesthesia (87.6%) and that preoperative cognitive function should be routinely assessed (74.4%). When caring for an agitated and confused patient postoperatively, 56.6%, protocols to screen and manage postoperative cognitive disorders were rarely used. Nearly all respondents believe that postoperative delirium and POCD are neglected areas in anaesthesiology.

Conclusion: Overall, participants perceive postoperative cognitive disorders as important adverse outcomes following surgery and anaesthesia. They are aware of the main risk factors for their development but may lack information on the prevention and management postoperatively.

Keywords: Delirium, perioperative management, postoperative cognitive dysfunction

Introduction

The number of elderly individuals who are undergoing surgery and anaesthesia is increasing around the world (1). Additional diseases and poor basal functional status of elderly patients lead to postoperative complications and mortality (2). Postoperative cognitive dysfunction (POCD) is one of the most common complications in elderly surgical patients (3, 4). Postoperative delirium occurs in older patients who are at the highest risk (3). The incidence of postoperative delirium is up to 53.3% (5). Distinctive diagnosis of delirium is quite difficult (6). Contrary to delirium, POCD is a condition that needs to be assessed both preoperatively and postoperatively with preoperative delirium prevention and management guidelines (7). However, it is unknown whether anaesthetists use these guidelines in clinical practice.

We conducted a questionnaire to evaluate perspectives of Turkish anaesthesiologists for postoperative cognitive disorders, determine information gaps and routine clinical practice among Turkish anaesthesiologists and identify, prevent and treat POCD.

Methods

Approval for this study (protocol number 2018/1387) was provided by the Clinical Research Ethics Committee Necmettin Erbakan University Meram Faculty of Medicine on June 1, 2018. With permission from the au-

Age (years (25–34/35–44/45–54/55 and older))	26 (20.2)/67 (51.9)/35 (27.1)/1 (0.8)
Institution (state hospital/private hospital/training and research hospital/university hospital)	34 (26.4)/10 (7.8)/53 (41.1)/32 (24.8)
Experience, years (1–5/6–10/11–15/16 and more)	36 (27.9)/40 (31.0)/26 (20.2)/27 (20.9)
Current position (Specialist/Assist. Prof./Assoc. Prof./Prof.)	95 (73.6)/14 (10.9)/13 (10.1)/7 (5.4)
Data are presented as n (%)	

thors, we created a web-based survey based on a previously validated survey by Jildenstal et al. (Table 1). The study has been divided into three sections: 1-demographic data; 2-questions regarding knowledge, subjective preferences and routine clinical practices and 3-management of cases. The three main topics of interest were: 1-preoperative evaluation, risk assessment and risk factors for postoperative cognitive disorders; 2-intraoperative management and monitoring of depth of anaesthesia and 3-prevention and management of postoperative delirium and follow-up of patients with POCD. The survey included 30 questions, and the answers were recorded either in a Likert scale format from 1 to 5 (completely disagree, disagree, no opinion, partly agree and completely agree) or as close-ended, multiple-choice yes/no/do not know options.

Respondents had to answer all questions for the survey to be validated. The study was available online from May 2018 to August 2018 and a total of three reminders have been sent. Potential respondents were anaesthesiologists working in hospitals affiliated with the Turkey national health system. The questionnaire consisting of 30 questions was prepared using the Google forms programme and was sent to anaesthesiologists working in clinics. Potential participants have been contacted through an e-mail that included a brief introductory note, instructions, a link to the survey and the authors' contact information. Participation was voluntary and anonymous. The National Anaesthesiologists' Society sent the connexion with the study through their mailing database to active members and maintained its availability on their official website throughout the three months. Increasing the response rate, a call e-mail was sent to the heads of all anaesthesiology departments of the national health system affiliated hospitals, so that they could incentivise participation and forward the survey to anaesthesiologists working in their departments. Participants were asked to respond to a web-based questionnaire consisting of questions about POCD, and feedback was received from 129 participants.

Statistical analysis

The IBM Statistical Package for the Social Sciences Statistics for Windows 10, version 24.0 (IBM SPSS Corp., Armonk, NY, USA) was used to perform the statistical data analysis. Demographic data and results for the multiple-choice ques-

tions are presented as frequency and percentage. Responses for the Likert scale questions are recorded as frequency and rate calculated as the number of a positive (4-partly agree and 5-completely agree) or negative (1-completely disagree and 2-disagree) finding. Mann-Whitney U test was used for ordinal variables and was conducted to compare the results of the Likert scale questions between residents and attendings. Results are shown in mean \pm standard deviation and two-sided statistical significance was set at 0.05.

Results

We analysed 129 surveys (9.9% of the total potential respondents). The rate of study in the anaesthesiologist training hospital is 65.8%. The study included two groups: state hospital and training hospital groups. The demographic data of the participants are provided in Table 1.

When anaesthesiologists were asked 'Which of the following will affect your preference of anaesthesia technique?', most of them responded that they believed that cardiovascular and pulmonary risks would affect the choice of anaesthesia [74.4% (n=96)]. There were no statistically significant differences between the two groups in the answers to question 7 in Table 2.

When anaesthesiologists were asked 'Which preoperative evaluation of the patient characteristics does your anaesthetic technique affect?', most of them replied that 'Older than 70-year patients' risks' would affect the choice of anaesthesia [57.4% (n=74)]. A small number of anaesthesiologists believed that the 'male gender' and 'hypertension risks' would affect the choice of anaesthesia [15.5% (n=20)] (Table 3). It was statistically significant to state that diabetes would affect the choice of anaesthesia (3.45 \pm 0.92 vs. 3.76 \pm 0.81; p=0.049) when the two groups were compared (Figure 1).

In the intraoperative evaluation, the question of 'Is your clinic performing anaesthesia depth monitoring?', 33.3% of the participants preferred the answer YES (Table 4). Most of the anaesthesiologists reported that they use anaesthesia depth monitoring only in high-risk patients [15.5% (n=20)] and a small number of the anaesthesiologists reported that they use anaesthesia depth monitoring only in patients who had

Table 2. Question 7: In which preoperative evaluation, which of the following will affect your preference of anaesthesia technique?

	Strongly disagree	Disagree	No idea	Partly agree	Strongly agree
Patients' preference	6 (4.7)	13 (10.1)	8 (6.2)	49 (38.0)	53 (41.1)
Postoperative nausea and vomiting risk	10 (7.8)	18 (14.0)	16 (12.4)	56 (43.4)	29 (22.5)
Postoperative pain risk	8 (6.2)	4 (3.1)	9 (7.0)	34 (26.4)	74 (57.4)
POCD	7 (5.4)	11 (8.5)	26 (20.2)	49 (38.0)	36 (27.9)
Postoperative cardiovascular and pulmonary risks	12 (9.3)	6 (4.7)	2 (1.6)	13 (10.1)	96 (74.4)

Data are presented as n (%), POCD: postoperative cognitive dysfunction

Table 3. Question 9: Which preoperative evaluation of the patient characteristics does your anaesthetic technique affect?

	Strongly disagree	Disagree	No idea	Partly agree	Strongly agree
Older than 70 years	4 (3.1)	8 (6.2)	8 (6.2)	35 (27.1)	74 (57.4)
Male gender	4 (3.1)	15 (11.6)	47 (36.4)	43 (33.3)	20 (15.5)
Low education level	7 (5.4)	27 (20.9)	34 (26.4)	37 (28.7)	24 (18.6)
Major surgery	4 (3.1)	6 (4.7)	9 (7.0)	41 (31.8)	69 (53.5)
History of myocardial infarction	2 (1.6)	12 (9.3)	37 (28.7)	47 (36.4)	31 (24.0)
History of cerebrovascular disease	4 (3.1)	5 (3.9)	10 (7.8)	53 (41.1)	23 (17.8)
Diabetes	2 (1.6)	11 (8.5)	42 (32.6)	51 (39.5)	23 (17.8)
Hypertension	2 (1.6)	13 (10.1)	42 (32.6)	52 (40.3)	20 (15.5)
ASA score	4 (3.1)	17 (13.2)	20 (15.5)	51 (39.6)	37 (28.7)

Data are presented as n (%)

Table 4. Questions 10 and 11: Is your clinic performing anaesthesia depth monitoring?

YES, 43 (33.3)	NO, 86 (66.7)
If the answer is YES, 'What is the frequency of anaesthesia depth monitoring?'	
→Always, 5 (3.9)	
→If required equipment is present, 13 (10.1)	
→Only in high-risk patients, 20 (15.5)	
→Only in patients who had undergone general anaesthesia with neuromuscular blockers, 2 (1.6)	
→Very rare, 3 (2.3)	

Data are presented as n (%)

undergone general anaesthesia with neuromuscular blockers [1.6% (n=2)]. There were no statistically significant differences between the two groups in the answers to question 11 in Table 4.

When anaesthesiologists were asked 'Which of the following cognitive disorders do you experience in your clinical practice?', most of them replied that POCD was experienced in

their clinical practice very rarely [56.6% (n=73)] and a small number of them replied that postoperative delirium and anaesthetic awareness were experienced in their clinical practice every day and once a week [0.8% (n=1)] (Table 5). The POCD experiences of the respondents of the state hospital (1.95 ± 0.83 vs. 2.42 ± 0.85 ; $p=0.001$) were statistically significant to state when compared to those of the respondents of the training hospital (Figure 2).

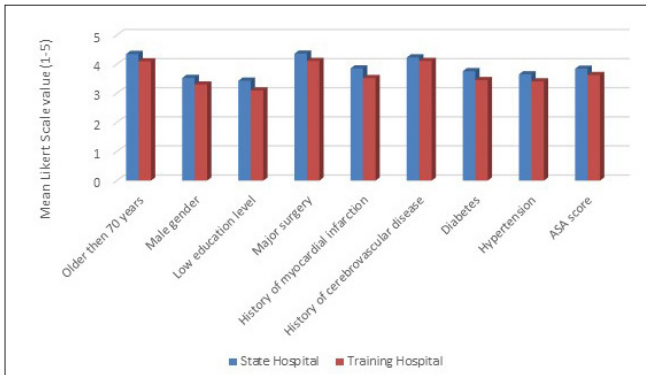


Figure 1. Question 9: Which preoperative evaluation of the patient characteristics does your anaesthetic technique affect?

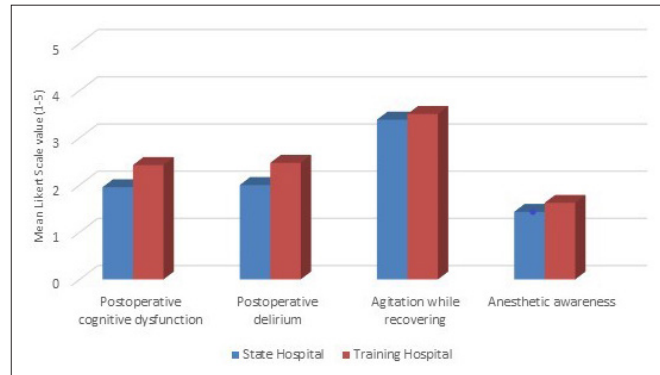


Figure 2. Question 8: Which of the following cognitive disorders do you experience in your clinical practice?

Table 5. Question 8: Which of the following cognitive disorders do you experience in your clinical practice?

	Never encounter	Very rare	Once a month	Once a week	Everyday
POCD	18 (14.0)	73 (56.6)	28 (21.7)	6 (4.7)	4 (3.1)
Postoperative delirium	18 (14.0)	63 (48.8)	39 (30.2)	8 (6.2)	1 (0.8)
Agitation while recovering	6 (4.7)	16 (12.4)	35 (27.1)	56 (43.4)	16 (12.4)
Anaesthetic awareness	71 (55.0)	45 (34.9)	12 (9.3)	1 (0.8)	0 (0)

Data are presented as n (%), POCD: postoperative cognitive dysfunction

Table 6. Questions 12–17: Anaesthesia depth monitorisation

	Strongly disagree	Disagree	No idea	Partly agree	Strongly agree
Do you want to have anaesthesia depth monitorisation if you or your relative is operated?	3 (2.3)	6 (4.7)	19 (14.7)	44 (34.1)	57 (44.2)
Do you think that anaesthesia depth monitoring reduces awareness?	1 (0.8)	4 (3.1)	11 (8.5)	59 (45.7)	54 (41.9)
Do you think EEG-based anaesthesia depth monitoring is a reliable method for controlling the depth of anaesthesia?	2 (1.6)	8 (6.2)	22 (17)	62 (48.1)	35 (27.1)
Do you think the reason for not using anaesthesia depth monitoring is cost?	3 (2.4)	8 (6.2)	17 (13.2)	57 (44.2)	34 (26.4)
Do you think that the depth of anaesthesia monitoring should be used routinely in our country, as recommended in the US and UK guidelines, in the risky patients undergoing TIVA (total intravenous anaesthesia)?	2 (1.6)	2 (1.6)	11 (8.5)	54 (41.9)	60 (46.5)
Do you think that preoperative neurocognitive function assessment may be useful to detect patients at risk of POCD*?	0 (0)	4 (3.1)	16 (12.4)	48 (37.2)	61 (47.3)

Data are presented as n (%), POCD: postoperative cognitive dysfunction; EEG: electroencephalogram; TIVA: total intravenous anaesthesia

The questions 12-17, regarding the anaesthesia depth monitoring choice of the anaesthesiologists, are shown in Table 6. The question ‘Do you think EEG-based anaesthesia depth monitoring is a reliable method for controlling the depth of anaesthesia?’ was asked. The answer ‘partly agreed’

(3.79±1.13 vs. 4.30±0.85; p=0.003) was statistically significant to state (Figure 3).

The questions 18-24, regarding the anaesthesia depth monitoring choice of the anaesthesiologists, are shown in Table 7. There were no statistically significant differences

Table 7. Questions 18–24: Case 1 Assessment				
Answer the following questions by considering the following case of postoperative delirium. Case 1: A 75-year-old female patient was admitted for emergency femoral fracture operation. An opioid analgesic was applied for pain. SpO₂: 88%, arterial blood pressure: 160/110 mmHg, heart rate: 110 / min. The patient had fever, she was agitated, confused and having problems in responding to the questions.				
	Yes we have and we use	Yes we have but we do not use	No we do not have	I do not know
Do you have a written protocol for the use of preoperative analgesic agents for patients at high risk of postoperative delirium? Do you use it if present?	10 (7.8)	2 (1.6)	111 (86.0)	6 (4.7)
Do you have a written protocol on the use of preoperative anxiolytic agents for patients at high risk of postoperative delirium? Do you use it if present?	12 (9.3)	3 (2.3)	105 (81.4)	9 (7.0)
What is your preference for anaesthesia in the case above?				
Inhalation 6 (4.7)	TIVA, 14 (10.9)	Spinal block, 72 (55.8)	Epidural block, 21 (16.3)	Peripheral block, 16 (12.4)
Do you apply anaesthesia depth monitoring in case of general anaesthesia in the above case?				
Yes, 67 (51.9)		No, 62 (48.1)		
If yes, which anaesthesia depth monitoring method do you apply?				
→AED, 1 (1.5)				
→BIS, 52 (77.6)				
→Entropy, 7 (10.4)				
→CSI, 4 (5.9)				
→Others, 3 (4.4)				
In the above case, the patient removed the venous access and monitors, but it is unclear if the patient has pain. What would be your first approach to this patient?				
Apply pain killer, 19 (14.7)	Apply anxiolytic, 39 (30.2)	Both pain killer and anxiolytic 71 (55.0)		
If you prefer to apply an anxiolytic agent in the above case, which of the following will you choose?				
Benzodiazepine group, such as midazolam, 67 (51.9)	Alfa 2 agonists, such as clonidine/dexmedetomidine, 28 (21.7)	Neuroleptics, such as haloperidol, 28 (21.7)	Hypnotics, such as propofol, 6 (4.7)	
What would you do if there were no change in the patient's condition after 2 hours in the above case?				
I prefer to keep in PACU until the patient stabilises, 85 (65.9)				
I prefer to send the patient to a clinic which has a written protocol about postoperative delirium, 37 (28.7)				
I prefer to send the patient to a clinic even if the clinic does not have a written protocol about POCD, because of the absence of PACU beds, 7 (5.4)				
AED: auditory evoked potential; BIS bispectral index; CSI: cerebral status indicator monitor				

between the two groups in the answers for the questions 18-24.

When anaesthesiologists were asked for whether they have a protocol in postanesthesia care unit (PACU), service or ICU to monitor patients with POCD (questions 25 and 26) (Table 8), most of them answered NO. There were no statistically significant differences between the two groups in the responses to the questions 25 and 26.

The questions 27-30, regarding the anaesthesia depth monitoring choice of the anaesthesiologists, are shown in Table 9. There were no statistically significant differences between the two groups in the answers for the questions 27-30.

Discussion

Our study results demonstrate the awareness of postoperative cognitive disorders among anaesthesiologists in Turkey. In-

Table 8. Question 25 and 26: POCD protocol

Do you have a protocol to monitor patients with POCD?			
	Yes	No	No idea
PACU	16 (12.4)	104 (80.6)	9 (7.0)
Service	4 (3.1)	99 (76.7)	26 (20.2)
Intensive care	27 (20.9)	78 (60.5)	24 (18.6)

Do you use the confusion evaluation scale and the intensive care delirium-screening checklist in the evaluation of POCD in PACU?

Yes, 17 (13.2)	No, 97 (75.2)	No idea, 15 (11.6)
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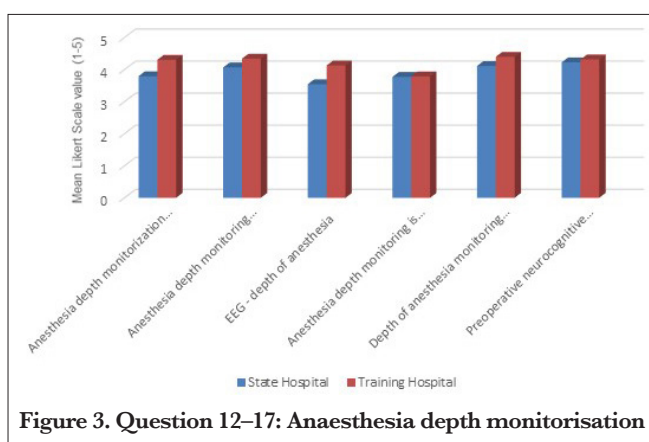
Data are presented as n (%)
PACU: post anesthesia care unit

Table 9. Questions 27–30: Case 2 Assessment

Answer the following questions by considering the following case of POCD. Case 2: A 55-year-old male farmer, who is an alcohol addict and has history of coronary artery bypass grafting (CABG), functional limitation of minor cerebrovascular event, has admitted 4 weeks later after gastric resection. He is sad and angry, as in the past, he had amnesia and neurocognitive dysfunction. What is the approach for your patient in your hospital?

	Yes	No	No idea
Do you have a written treatment/care protocol?	6 (4.7)	109 (84.5)	14 (10.9)
Is cognitive function assessment performed?	48 (37.2)	63 (48.8)	18 (14.0)
Would you like a psychiatry/neurology consultation?	122 (94.6)	2 (1.6)	5 (3.9)
Do you experience cases with persistent cognitive dysfunction in your daily practice?	52 (40.3)	50 (38.8)	27 (20.9)
		Yes	No
Do you think POCD is a neglected issue in anaesthesia practice?		124 (96.1)	5 (3.9)
Do you think postoperative delirium is a neglected issue in anaesthesia practice?		109 (84.5)	20 (15.6)
Do you think there is a neglected issue in the field of anaesthesia for awareness during anaesthesia?		90 (69.8)	39 (30.2)

POCD: postoperative cognitive dysfunction



creased cardiovascular complications, pulmonary complications, central nervous system complications and many other complications were seen with the application of anaesthesia to elderly patients (1, 8). Postoperative mortality and morbidity

rates have decreased significantly in years. One of the most important factors in this development is to identify the risks in the perioperative period and take the necessary measures (8). The results of our study coincide with the findings of other studies. Most of the participants reported that they preferred patient preference, the risk of postoperative nausea and vomiting, postoperative pain and cardiovascular and pulmonary risks for the choice of anaesthesia technique. However, the results of this decision were taken to a lesser extent in the risk of POCD. According to the results of our study, anaesthesiologists are aware of high-risk patients and evaluate the possible complications when making decisions. However, the importance of POCD in this evaluation is still a question mark. According to the results of our study, in the selection of anaesthesia technique, over 70 years of age and significant surgical planning were considered more important. The American Society of Anesthesiology (ASA) score was less critical for male gender, low education level, myocardial infarction,

cerebrovascular event, diabetes and hypertension. However, people with diabetes were statistically different in the participants in the state hospital. We think that this difference is not clinically significant.

Participants were asked about the most common neurocognitive dysfunction. Participants from the state hospital stated that they were more likely to encounter POCD. Long-term studies have also indicated that POCD is the most common (9). There were no statistically significant differences between the two groups. The reason for this situation is that the participants, who are not academic, except for the education hospital, may have evaluated each neurocognitive disorder as POCD without considering the differential diagnosis. In a study conducted by Rundshagen (10), it was emphasised that the determination of POCD might be confused with other differential diagnoses.

Considering the frequency of complications, the risk increases in the geriatric population and patients undergoing major surgery. It was also emphasised in the same study that postoperative delirium should be prevented (1). Our current results suggest that participants were more focussed on cardiovascular complications and major surgery. According to the results of our study, anaesthesia depth monitoring was not performed in the clinic where 66.7% of the participants were working. A study conducted in Sweden (11) reported that only 3.9% had a routine and 15.5% had anaesthesia depth monitoring in only high-risk patients. As can be seen in Table 6, participants agreed that anaesthesia depth monitoring should be used to reduce awareness during anaesthesia of their relatives. However, the reason for not performing anaesthesia depth monitoring was that electroencephalograms (EEG) are expensive. Participants also agreed that routine anaesthesia depth monitoring should be used routinely. Studies have also reported that EEG is critical data that can provide health information about anaesthesia depth monitoring (12). These results suggest that the anaesthesiologists are in favour of applying anaesthesia depth monitoring, but they cannot do it because of cost, or they cannot reach the monitors.

Participants reported that they had rarely encountered cognitive deficits such as POCD and postoperative delirium. The rate of respondents who said that they met at least once a week during agitation was 43.4%. The rate of unawareness of the participants during anaesthesia was 55%. In the study of Orhan et al. (13), it was reported that the diagnosis of POCD was difficult to rely on, and therefore, the right frequency of POCD was not known. However, another study indicated that the incidence of POCD could be as high as 40% (10). Current studies, which contradict with the results of our research, suggest that the awareness of POCD should be questioned with Turkish anaesthesiologists. In Table 7,

it was stated that a written protocol is not applied in a high proportion to prevent postoperative delirium in high-risk patients. These findings were supported by the idea that there is a written protocol requirement.

For POCD, although age is a leading risk factor, many factors are primarily responsible (13). At this point, it was considered that the protocol should be prepared by taking into consideration other factors as well as age. They have agreed that the evaluation of the preoperative neurocognitive function is useful in determining the risk of postoperative neurocognitive dysfunction. It is one of our limitations that it was not questioned. At this point, we believe that new studies to be carried out regarding workload, cost and efficiency will be useful. In the study of Sung et al. (14), the preoperative evaluation was reported to decrease postoperative neurocognitive complications.

The majority of the participants said that they did not have preoperative analgesic or anxiolytic application for patients with postoperative delirium risk in their institution. For patients with a high risk of POCD, the majority of the participants stated that they would prefer spinal anaesthesia. However, the reason for this circumstance not being questioned is one of the limitations of our survey study. In the study of Rasmussen et al. (15), there was no significant relationship between benzodiazepine group and POCD.

In patients with a high risk of POCD, 51.9% of the participants preferred general anaesthesia with depth monitoring using bispectral index (BIS). The rate of those who prefer to monitor the depth of anaesthesia is 48.1%. Although not directly asked, considering the above results, we think that the cost or the effectiveness level of the method may be the reason for this. In the study of Bryson et al. (16), the effect of general anaesthesia and regional anaesthesia on POCD was investigated. There was no difference between the two anaesthesia methods and the impact of POCD.

In cases where the postoperative agitation is not apparent, 55% of the participants prefer both anxiolytic and analgesic, whereas those who prefer anxiolytic are only 30.2% and the rate of those who prefer analgesic is 14.7%. However, we think that this choice may be caused by 'the idea that the agitation is because it is a pain.' In the study of de Cosmo et al. (17), fentanyl and remifentanyl were compared regarding the POCD effect, and no significant difference was found between the two.

Most of the participants preferred midazolam for an anxiolytic agent. Easy access and relatively fewer complications are considered to be preferences. According to the studies, it was emphasised that there was no significant difference between benzodiazepine and POCD (15).

If the patients were agitated, 65.9% of the participants reported that they preferred to keep them in the PACU until they were stable. However, the increased workload and delay of the diagnosis are considered disadvantages of this choice. The fact that most of the participants reported that there was no POCD follow-up protocol and confusion evaluation checklist in PACU, in service and intensive care unit suggests that this situation was not adequately considered.

Most of the participants reported that there was no written follow-up/treatment protocol for patients with a high risk of POCD and congenital function evaluation was performed. Participants agree to seek psychiatric or neurological consultation for patients with a high risk of POCD. Moreover, the majority of the participants stated that more attention should be paid to awareness during POCD, postoperative delirium and anaesthesia. The reason for the negligence is that cognitive evaluation is the subject of neurology or psychiatry, and we think that the reason for the risk of POCD is that they refer patients to neurology or psychiatry consultation. In the study of Chow et al. (18), preoperative evaluation protocols of POCD and postoperative delirium were presented by the American Geriatrics Society and the benefits of the postoperative period were discussed.

Conclusion

There is a need for protocols to be taken perioperatively to protect elderly patients from neurocognitive complications such as POCD and postoperative delirium, devices to be used and, more importantly, evaluation criteria. Considering the burden on health care for elderly patients, we believe that this study and other studies will bring positive feedback on behalf of health professionals and patients.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Necmettin Erbakan University (Protocol number 2018/1387).

Informed Consent: Written informed consent was obtained from all colleagues who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - Y.T.; Design - Y.T.; Supervision - B.K.; Resources - M.S.; Materials - M.S.; Data Collection and/or Processing - Y.T.; Analysis and/or Interpretation - E.A.; Literature Search - E.A.; Writing Manuscript - B.K., Y.T.; Critical Review - E.A., M.S., B.K., Y.T.

Conflict of Interest: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

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