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SCIENTIFIC ARTICLE

Adverse postoperative cognitive disorders: a national survey of portuguese anesthesiologists



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Abstract

Background and objectives: Postoperative delirium and postoperative cognitive dysfunction are some of the most common complications in older surgical patients and are associated with adverse outcomes. The aim of this study was to evaluate portuguese anesthesiologists' perspectives and knowledge about adverse postoperative cognitive disorders, and routine clinical practice when caring for older surgical patients.

Methods: We used a prospective online survey with questions using a Likert scale from 1 to 5 (completely disagree to completely agree), or yes/no/don't know answer types. Potential participants were portuguese anesthesiologists working in hospitals affiliated with the portuguese national health system and private hospitals.

Results: We analyzed 234 surveys (17.7% of total potential respondents). The majority believed that the risk of cognitive side effects should be considered when choosing the type of anesthesia (87.6%) and that preoperative cognitive function should be routinely assessed (78.6%). When caring for an agitated and confused patient postoperatively, 62.4% would first administer an analgesic and 11.1% an anxiolytic. Protocols to screen and manage postoperative cognitive disorders are rarely used. Nearly all respondents believe that postoperative delirium and postoperative cognitive dysfunction are neglected areas in anesthesiology.

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

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delirium. The majority of hospitals do not have protocols regarding preoperative cognitive assessment, diagnosis, management or follow-up of patients with delirium and postoperative cognitive dysfunction.

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PALAVRAS-CHAVE

Período pós-operatório; Distúrbios neurocognitivos; Disfunção cognitiva; Pesquisas e questionários

Distúrbios cognitivos adversos no pós-operatório: uma pesquisa nacional de anesthesiologistas portugueses

Resumo

Justificativa e objetivos: O delírio pós-operatório e a disfunção cognitiva pós-operatória são algumas das complicações mais comuns em pacientes cirúrgicos mais idosos e estão associados a desfechos adversos. O objetivo deste estudo foi avaliar as perspectivas e conhecimentos de anesthesiologistas portugueses sobre distúrbios cognitivos pós-operatórios e a prática clínica de rotina ao cuidar de pacientes cirúrgicos idosos.

Métodos: Pesquisa prospectiva on-line com perguntas usando uma escala Likert de 1–5 (discordo completamente–concordo completamente), ou respostas como sim/não/não sei. Os potenciais participantes eram anesthesiologistas portugueses que trabalhavam em hospitais afiliados ao sistema nacional de saúde português e hospitais privados.

Resultados: Analisamos 234 resultados (17,7% do total dos potenciais respondentes). A maioria acreditava que o risco de efeitos colaterais cognitivos deveria ser considerado ao escolher o tipo de anestesia (87,6%) e que a função cognitiva pré-operatória deveria ser rotineiramente avaliada (78,6%). Ao cuidar de um paciente agitado e confuso no pós-operatório, 62,4% administraram primeiro um analgésico e 11,1% um ansiolítico. Protocolos para detectar e tratar distúrbios cognitivos pós-operatórios são raramente usados. Quase todos os entrevistados acreditam que o delírio pós-operatório e a disfunção cognitiva pós-operatória são áreas negligenciadas na anestesiologia.

Conclusões: Em geral, os participantes percebem os distúrbios cognitivos pós-operatórios como importantes resultados adversos após a cirurgia e anestesia, estão cientes dos principais fatores de risco para seu desenvolvimento, mas podem não ter informações sobre como prevenir e tratar o delírio pós-operatório. A maioria dos hospitais não possui protocolos de avaliação cognitiva pré-operatória, diagnóstico, tratamento ou acompanhamento de pacientes com delírio e disfunção cognitiva no pós-operatório.

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Introduction

Worldwide the population is aging and the number of older adults undergoing surgery and anesthesia is steadily increasing.¹ Comorbidities and poor baseline functional status put older patients at increased risk for adverse postoperative complications and mortality.² Postoperative cognitive disorders such as postoperative delirium and postoperative cognitive dysfunction are some of the most common complications in older surgical patients.^{3,4}

Postoperative delirium is delirium that occurs in the postoperative period with older patients being at the highest risk.⁴ The incidence of postoperative delirium can be as high as 53.3%.⁵ The hallmark of delirium is inattention yet it is only recognized in a fraction of patients without formal testing.⁶ In contrast to delirium, postoperative cognitive dysfunction is a research classification that requires both pre- and postoperative cognitive assessment with an

incidence of 20–26%.^{7–9} Anesthesia and surgery may increase the risk of both delirium and postoperative cognitive dysfunction especially in older surgical patients.⁷ Postoperative delirium is associated with worse outcomes such as longer hospital length of stay, institutionalization and functional decline.^{4,10,11} Moreover, patients with delirium appear to have an increase long-term risk of death, re-admissions to the hospital, cognitive impairment up to five years after surgery and worsening quality of life.^{12,13} Postoperative cognitive dysfunction is also associated with increased mortality, premature loss of workforce and dependency on social transfer payments.⁸

Guidelines for the prevention and management of postoperative delirium have been suggested^{10,14} but it is unknown whether clinicians utilize these guidelines in their practice. We used a survey to assess the portuguese anesthesiologists' perspectives on adverse postoperative cognitive disorders, identify knowledge gaps and define

routine clinical practice among Portugal's anesthesiologists to aid in identification, prevention and treatment of postoperative delirium and postoperative cognitive dysfunction in both attendings and residents.

Methods

Approval for this study (protocol number 2016.118 [102-DEFI/098-CES]) was provided by the Ethical Committee (Comissão de Ética para a Saúde – CES) of Centro Hospitalar do Porto, Portugal (Chairperson Dr^a Luisa Bernardo) on June 20th 2016. The Ethical Committee waived the requirement for informed consent for participation in the web-based survey. With permission from the authors, we created a survey on a web-based platform based on a previously validated survey by Jildenstal et al.¹⁵

The survey was first translated from English to Portuguese by three residents and three attendings and then modified to better reflect the clinical practice and nomenclature in Portugal (Table 1). The survey was divided in three sections: (1) Demographic data; (2) Questions regarding knowledge, subjective preferences and routine clinical practices; and (3) Management of clinical 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 anesthesia depth; (3) Prevention and management of postoperative delirium and follow-up of patients with postoperative cognitive dysfunction. The survey included 21 questions and the answers were either presented in a Likert-scale from 1 to 5 (completely disagree, disagree, no opinion, partly agree, completely agree), or as close-ended, multiple-choice yes/no/don't know options. Respondents had to answer all questions in order for the survey to be validated.

The survey was available online from September 2016 to January 2017 and a total of three reminders were sent. Potential survey respondents were anesthesiologists working in hospitals affiliated with the Portuguese national health system (1121 anesthesiologists, including 291 residents) and anesthesiologists working solely in the private sector (200 anesthesiologists).¹⁶ In Portugal it is possible to work solely in hospitals affiliated with the Portuguese national health system, solely in private hospitals, or both. 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. Participation was voluntary and anonymous. The national Anesthesiologist's Society sent the link with the survey through their mailing database to active members and maintained its availability on their official website throughout the 5 month period. To increase response rate, we emailed the Heads of all Anesthesiology Departments of the national health system affiliated hospitals so they could incentivise participation and forward the survey to anesthesiologists working in their departments.

We used the IBM SPSS Statistics for Mac OS, version 24.0 (IBM Corp., Armonk, N.Y., USA) to perform the statistical data analysis. Demographic data and results for the multiple-choice questions are presented as frequency and percentage. Responses for the Likert scale questions are presented as frequency and percentage calculated as the number of a positive (4 – Partly agree; 5 – Completely agree)

or negative (1 – Completely disagree; 2 – Disagree) finding. A secondary analysis was conducted to compare results of the Likert scale questions between residents and attendings using the Mann-Whitney test for ordinal variables. Results are shown in mean \pm Standard Deviation (SD) and two-sided statistical significance was set at 0.05.

Results

We analyzed 234 surveys (17.7% of the total potential respondents). Most anesthesiologists were female 158 (67.5%), worked in a teaching hospital 207 (88.5%) and were attendings 172 (73.5%). The comprehensive survey results are shown in Table 1 and detailed demographic data is in Table 2.

When anesthesiologists were asked if they were to have surgery under general anesthesia, 58.9% ($n=138$) would be concerned about possible postoperative cognitive impairment and 94% ($n=220$) noted that they would want depth of anesthesia to be monitored. This was more pronounced amongst residents (4.83 ± 0.54 vs. 4.63 ± 0.74 ; $p=0.019$). Most of them would prefer regional techniques anesthesia for inguinal hernia repair (60.3% ($n=141$)).

The majority of participants agreed that risk of postoperative cognitive disorders should be considered when choosing the type of anesthesia (105 (87.6%)) and that preoperative cognitive assessment should be routinely performed (184 (78.6%)). Nevertheless, the risk of adverse postoperative cognitive disorders was perceived as less important when compared to adverse cardiac 224 (95.8%) and pulmonary 228 (97.4%) complications. Management of postoperative pain (4.79 ± 0.52 vs. 4.54 ± 0.72 ; $p=0.011$) and the patient choice for the anesthesia plan (4.19 ± 0.76 vs. 3.94 ± 0.93 ; $p=0.043$) were more important to residents when compared to attendings (Fig. 1). In the preoperative evaluation, the risk of awareness was valued the most by almost all 228 (97.4%) respondents, followed by postoperative cognitive dysfunction 196 (83.8%), postoperative delirium 188 (80.3%) and emergence agitation 161 (68.8%). Concern for awareness was higher amongst residents than attendings (4.86 ± 0.35 vs. 4.61 ± 0.64 ; $p=0.005$) (Fig. 2). Risk factors thought to be most predictive of postoperative cognitive disorders were: age (229 [97.9%]), major surgery (222 [94.9%]), alcoholism (220 [94%]) and previous stroke (207 [88.4%]). Male gender (78 [33.3%]) and lower education (107 [45.8%]) were considered less important risk factors (Fig. 3). Most hospitals did not have written protocols regarding anxiolytic (196 [83.8%]) or analgesic (203 [86.8%]) medication in high-risk patients for adverse postoperative cognitive disorders.

When asked to propose an anesthesia plan for a patient with increased risk for postoperative delirium, 46.2% ($n=108$) of respondents preferred a spinal, 19.2% ($n=45$) a combined general/regional block and 14.1% ($n=33$) a sequential combined spinal epidural block. In the case of a general anesthesia, 92.7% ($n=217$) would use depth of anesthesia monitoring in a high-risk patient for prevention of postoperative delirium. The most used monitor was the Bispectral Index (BIS) 198 (93%). Almost all 226 (97%) of participants have processed-EEG monitors in their hospitals and 56% ($n=126$) always or almost always use them. About 75%

Table 1 Detailed survey results.

Questions	Answers given as Likert Scale (1 – Completely disagree; 2 – Disagree; 3 – No opinion; 4 – Partly agree; 5 – Completely agree) or Yes, No, Don't know options – n (%)					
1.	If you were to have surgery with general anesthesia, would you feel anxiety about possible postoperative cognitive loss?	1	2	3	4	5
		15 (6.4)	40 (17.1)	41 (17.5)	67 (28.6)	71 (30.3)
2.	If you could choose anesthetic regimen prior to surgery, for inguinal hernia, which method would you prefer? ^a	Combined anesthesia	GA	LA + sedation	Regional anesthesia	TIVA
		20 (8.5)	29 (12.4)	12 (5.1)	141 (60.3)	32 (13.7)
3.	At the time of preoperative assessment, which factors do you think should influence the choice of anesthetic?	1	2	3	4	5
	Patient wish	2 (0.9)	21 (9)	34 (14.5)	106 (45.3)	71 (30.3)
	Risk of postoperative nausea	0 (0)	13 (5.6)	22 (9.4)	98 (41.9)	101 (43.2)
	Risk of postoperative pain	1 (0.4)	4 (1.7)	6 (2.6)	64 (27.4)	159 (67.9)
	Risk of postoperative neurocognitive effects	2 (0.9)	7 (3)	20 (8.5)	73 (31.2)	132 (56.4)
	Risk of adverse cardiac events	1 (0.4)	3 (1.3)	6 (2.6)	35 (15)	189 (80.8)
	Risk of adverse pulmonary events	1 (0.4)	2 (0.9)	3 (1.3)	40 (17.1)	188 (80.3)
4.	During preoperative assessment which of the following cognitive states do you take into account?	1	2	3	4	5
	Postoperative delirium	2 (0.9)	11 (4.7)	33 (14.1)	106 (45.3)	82 (35)
	Postoperative cognitive dysfunction	2 (0.9)	6 (2.6)	30 (12.8)	90 (38.5)	106 (45.3)
	Emergence agitation	1 (0.4)	20 (8.5)	52 (22.2)	104 (44.4)	57 (24.4)
	Awareness	1 (0.4)	1 (0.4)	4 (1.7)	59 (25.2)	169 (72.2)
5.	How important do you consider for the following risk factors in the occurrence for postoperative cognitive disorders? ^a	1	2	3	4	5
	Age >70 years old	0 (0)	3 (1.3)	2 (0.9)	44 (18.8)	185 (79.1)
	Male gender	19 (8.1)	28 (12)	109 (46.6)	56 (23.9)	22 (9.4)
	Lower education ^a	10 (4.3)	28 (12)	89 (38)	72 (30.8)	35 (15)
	Extensive surgery	1 (0.4)	3 (1.3)	8 (3.4)	79 (33.8)	143 (61.1)
	Previous myocardial infarction	11 (4.7)	19 (8.1)	60 (25.6)	78 (33.3)	66 (28.2)
	Previous stroke	1 (0.4)	5 (2.1)	21 (9)	82 (35)	125 (53.4)
	Diabetes	5 (2.1)	16 (6.8)	50 (21.4)	117 (50)	46 (19.7)
	Hypertension ^b	5 (2.1)	22 (9.4)	71 (30.3)	98 (41.9)	38 (16.2)
	Alcohol abuse ^b	0 (0)	4 (1.7)	10 (4.3)	83 (35.5)	137 (58.5)
	Severity scoring in critical ill ^b	0 (0)	7 (3)	27 (11.5)	74 (31.6)	126 (53.8)
	ASA physical score ^b	3 (1.3)	13 (5.6)	34 (14.5)	110 (47)	74 (31.6)

Table 1 (Continued)

Questions	Answers given as Likert Scale (1 – Completely disagree; 2 – Disagree; 3 – No opinion; 4 – Partly agree; 5 – Completely agree) or Yes, No, Don't know options – n (%)					
6.	Are anesthesia depth monitors available at your hospital? ^a	Yes – 226 (96.6)	No – 8 (3.4)			
i)						
ii)	If yes, when do you use them?	Always / almost always 126 (55.8)	When it is available 45 (19.9)	Only in high risk patients 43(19)	Only during GA with muscle relaxation 10 (4.5)	Rarely 2 (0.9)
7.	If you undergo surgery yourself, would you like 1		2	3	4	5
a)	an anesthesia depth monitor to be used? ^a	2 (0.9)	3 (1.3)	9 (3.8)	42 (17.9)	178 (76.1)
b)	Would you use an anesthesia depth monitor to reduce the risk of awareness?	1 (0.4)	3 (1.3)	10 (4.3)	51 (21.8)	169 (72.2)
c)	Do you think that an EEG based monitor is a reliable method for controlling the anesthesia depth? ^a	0 (0)	7 (3)	24 (10.3)	127 (54.3)	76 (32.5)
d)	Do you think they are too expensive to be used? ¹³⁴ (57.3)		60 (25.6)	22 (9.4)	11 (4.7)	7 (3)
8.	In the U.S., anesthetic depth measurement is very common with general anesthesia. In UK, The National institute for Clinical Excellence guidance (NICE) (Nov 2012) recommended anesthetic depth measurement as a possible choice for general anesthesia in patients at risk (for adverse outcomes) and with TIVA. Do you think that anesthesia depth monitors should be used in high risk patients or TIVA? ^a	1	2	3	4	5
i)						
ii)	Or for all patients? ^b	8 (3.4)	22 (9.4)	18 (7.7)	41 (17.5)	145 (62)
9.	Today, we routinely assess patients regarding for example clinical status. Do you think it would be useful to assess neurocognitive function preoperatively (MMSE or other) to detect patients at risk to develop postoperative delirium or postoperative cognitive dysfunction?	5 (2.3)	24 (11.1)	26 (12)	71 (32.9)	90 (41.7)
		1 (0.4)	2	3	4	5
		1 (0.4)	11 (4.7)	38 (16.2)	96 (41)	88 (37.6)
Case study 1: Postoperative delirium. Female patient, 75 years old, no chronic medication; is admitted for urgent femur fracture surgical repair. Pain is relieved with opioids. Oxygen saturation is 88%, blood pressure 160/110 mmHg, heart rate 110 bpm. She has fever, is agitated and confused, has trouble in giving adequate answers.						
10.	Do you have a written protocol regarding preoperative anxiolytics agents for patients at high risk for postoperative delirium?	Yes – 14 (6)	No – 196 (83.8)	Don't know – 24 (10.3)		
a)						
b)	If yes, is this protocol followed?	Yes – 9 (3.8)	No – 1 (7.1)	Don't know – 4 (28.6)		

Table 1 (Continued)

Questions	Answers given as Likert Scale (1 – Completely disagree; 2 – Disagree; 3 – No opinion; 4 – Partly agree; 5 – Completely agree) or Yes, No, Don't know options – n (%)				
11.	Do you have a written protocol regarding preoperative analgesic agents for patients at high risk for postoperative delirium?	Yes – 9 (3.8)	No – 203 (86.8)	Don't know – 22 (9.4)	
a)	If yes, is this protocol followed?	Yes – 8 (88.9)	No – 1 (11.1)		
12.	What anesthetic method would you choose for the above described patient? ^a	Spinal blockade 108 (46.2)	Sequential blockade 33 (14.1)	Combined (GA + PNB) 45 (19.2)	Combined (GA + NB) 7 GA 27 (11.5) (3)
13.	In case of a general anesthesia, would you use an anesthesia depth monitor? ^a	Yes – 217 (92.7)	No – 17 (7.3)		
14.	If yes, which?	BIS – 198 (93)	Entropy – 5 (2.3)	Sedline – 4 (1.9)	CSI – 3 (1.4) Others – 3 (1.4)
15.	In the PACU the patient state worsens, she becomes agitated and tries to pull off the iv access and monitoring. It is not clear if the patient is in pain. What is your first action? ^a	Administer analgesic 146 (62.4)	Administer anxiolytic 26 (11.1)	Administer analgesic and anxiolytic 59 (25.2)	Physical containment 3 (1.3)
16.	If you decide to administer an anxiolytic, which class of drug would you choose? ^a	Benzodiazepine, such as Midazolam 85 (36.5)	alpha-2 agonist, such as clonidine/dexmedetomidine 37 (15.9)	Neuroleptic, such as haloperidol 29 (33.9)	Hypnotic, such as propofol 32 (13.7)
17.	Is there in your hospital protocols to monitor patients that develop POD				
a)	In the PACU	Yes – 68 (29.1)	No – 129 (55.1)	Don't know – 37 (15.8)	
b)	In the surgical ward	Yes – 29 (12.4)	No – 138 (59)	Don't know – 67 (28.6)	
c)	In Intensive Care Units ^b	Yes – 89 (38)	No – 57 (24.4)	Don't know – 88 (37.6)	
18.	Is CAM, CAM-ICU, NuDesc or ICDSC used to screen for POD in the PACU in your hospital? ^a	Yes – 35 (15.2)	No – 143 (62.2)	Don't know – 52 (22.6)	
19.	Do you recall any episode of postoperative delirium in your practice during the last year? ^b	Yes – 140 (59.8)	No – 94 (40.2)		
i)	If yes, how many?	1 to 5 – 111 (79.3)	5 to 10 – 20 (14.3)	More than 10 – 9 (6.4)	
ii)					

Table 1 (Continued)

Questions	Answers given as Likert Scale (1 – Completely disagree; 2 – Disagree; 3 – No opinion; 4 – Partly agree; 5 – Completely agree) or Yes, No, Don't know options – n (%)			
Case study 2: Postoperative cognitive dysfunction. 55 years old male patient, farmer, with moderate alcohol consumption and previous coronary bypass. The patient also had a minor stroke but with no functional impact. Recently he had been submitted to gastric resection due to a gastric tumor and in now returning 4 weeks later. The patient is upset, angry, sad and frustrated because he can't plan the day as he previously used to. Says memory is short, it fails, and it that it takes time to figure out what he planned to do. Requires adequate treatment of neurocognitive symptoms. How would a similar patient be handled at your hospital?				
20.	Is there a written protocol?	Yes – 4 (1.7)	No – 185 (79.1)	Don't know – 45 (19.2)
a)				
b)	Would the patient be submitted to a neurocognitive evaluation?	Yes – 87 (37.2)	No – 67 (28.6)	Don't know – 80 (34.2)
c)	Would the patient be referred to a neurologist/ neuropsychologist?	Yes – 103 (44)	No – 41 (17.5)	Don't know – 90 (38.5)
d)	Are you aware of any cases of persisting cognitive impairment in your daily practice?	Yes – 87 (37.2)	No – 147 (62.8)	
21.	Do you believe that postoperative delirium is a neglect area within the field of anesthesia? ^b	Yes – 229 (97.9)	No – 5 (2.1)	
a)				
b)	Do you believe that postoperative cognitive dysfunction is a neglect area within the field of anesthesia?	Yes – 227 (97)	No – 7 (3)	
c)	Do you believe that awareness is a neglect area within the field of anesthesia? ^b	Yes – 124 (53)	No – 110 (47)	

%, Percentage; LA, Local Anesthesia; GA, General Anesthesia; POD, Postoperative Delirium; POCD, Postoperative Cognitive Dysfunction; yo: years old; ASA, American Society of Anesthesiologists; TIVA, Total Intravenous Anesthesia; MMSE, Mini Mental State Examination; PNB, Peripheral Nerve Block; NB, Neuroaxial Block; BIS, Bispectral Index; CSI, Cerebral State Index; PACU, Post Anesthesia Care Unit; CAM, Confusion Assessment Method; CAM-ICU, Confusion Assessment Method-Intensive Care Unit; NuDesc, Nursing Delirium Screening Scale; ICDS-C, Intensive Care Delirium Screening Checklist.

Question number 17 was deleted from original survey (not shown).

^a Question modified from original survey.

^b Question added to the original survey.

Table 2 Demographic characteristics.

Characteristics		n (%)
Gender	Male	76 (32.5)
	Female	158 (67.5)
Residents	62 (26.5)	1st – 2nd year 22 (35.5) 3rd – 5th year 40 (64.5)
	Attendings	172 (73.5)
Region	North	114 (48.7)
	Center	39 (16.7)
	South	73 (31.2)
	Islands	8 (3.4)
Teaching hospital	Yes	207 (88.5)
	No	27 (11.5)

(%), Percentage.

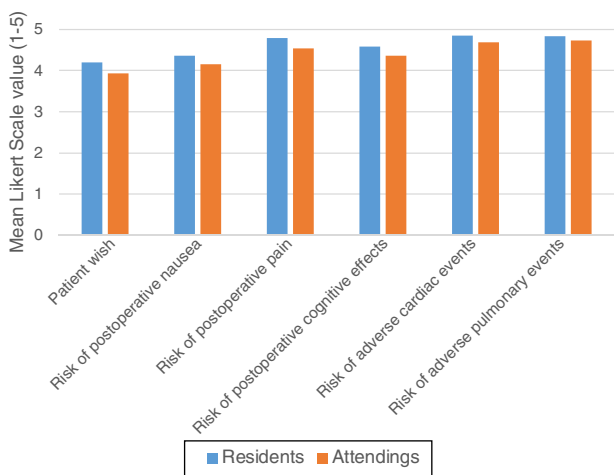


Figure 1 At the time of preoperative assessment, which factors do you think should influence the choice of anesthetic?

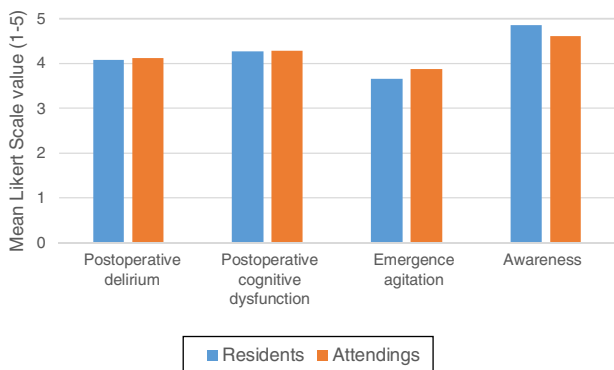


Figure 2 During preoperative assessment which of the following cognitive states do you take into account?

(*n* = 161) of anesthesiologists believe that anesthesia depth should be monitored in all patients. When asked if they would use a depth of anesthesia monitor to reduce the risk of awareness, 94% (*n* = 220) agreed; 86.8% (*n* = 161) believe that

a processed-EEG monitor is a reliable method for controlling anesthesia depth and only 8% (*n* = 18) consider it too expensive to be used. Residents when compared to attendings, more strongly believe in the usefulness of depth of anesthesia monitors in reducing the risk of awareness (4.83 ± 0.46 vs. 4.34 ± 0.70 ; *p* = 0.007) and controlling the depth of anesthesia (4.34 ± 0.66 vs. 4.11 ± 0.73 ; *p* = 0.012) (Fig. 4).

Almost 60% (*n* = 140) recalled at least one episode of postoperative delirium in the last year (79.3% from 1 to 5 episodes and 6.4% more than 10 episodes) but only 15.2% (*n* = 35) regularly used screening tools to assess delirium after surgery. When asked how they would manage a delirious older patient in the recovery room, 62.4% (*n* = 146) would first administer an analgesic and 11.1% (*n* = 26) an anxiolytic. If the participants had to administered an anxiolytic, most would choose a benzodiazepine such as midazolam 85 (36.5%), and 33.9% (*n* = 79) a neuroleptic such as haloperidol. Most hospitals do not have protocols to manage patients who develop delirium in Post-Anesthesia Care Unit 129 (55.1%) or surgical wards 138 (59%). When managing a patient with postoperative cognitive dysfunction, only 4 (1.7%) had institutional written protocols. In their clinical practice, 37.2% (*n* = 87) of participants recall a case of postoperative cognitive dysfunction; 37.2% (*n* = 87) answered that patients with recent memory loss would be submitted to a neuropsychological evaluation and 44% (*n* = 103) would refer those patients to a neurologist or neuropsychologist for further evaluation and treatment.

Around 98% (*n* = 229) and 97% (*n* = 227) of respondents believe that postoperative delirium and postoperative cognitive dysfunction, respectively, are neglected fields in anesthesiology.

Discussion

Our results emphasize that portuguese anesthesiologists recognized postoperative cognitive disorders as important outcomes that are frequently ignored in anesthesiology. Respondents were aware of the major risk factors and most believe that it would be useful to preoperatively screen cognitive function. Depth of anesthesia monitors are available in most hospitals and are widely used. Most participants, especially residents, believe they are useful in reducing the risk of awareness and a reliable method for controlling anesthesia depth. Very few hospitals have protocols for identification, prevention and treatment of postoperative cognitive disorders.

The original survey to Swedish anesthesiologists and nurse anesthetists indicate that health care professionals are concerned about the risk of adverse postoperative cognitive disorders and the majority was not convinced about the use of monitors to control anesthesia depth. Moreover, they concluded that it is necessary to implement strategies to improve knowledge about risk factors, prevention and treatment for adverse postoperative cognitive disorders.¹⁵

The increased risk for postoperative cognitive disorders was perceived as an important factor to take into account when evaluating patients to undergo anesthesia and surgery, although not as important as cardiac or pulmonary events. These results are in line with the Jildenstal et al.¹⁵ original survey results: 69% of the respondents considered the "risk

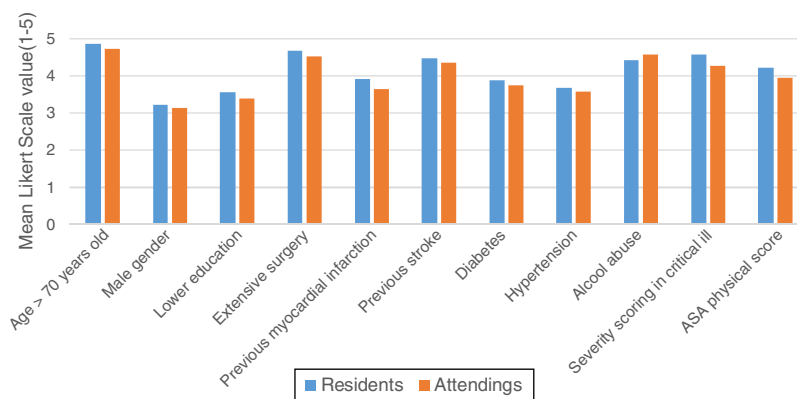


Figure 3 How important do you consider for the following risk factors in the occurrence for postoperative cognitive disorders?

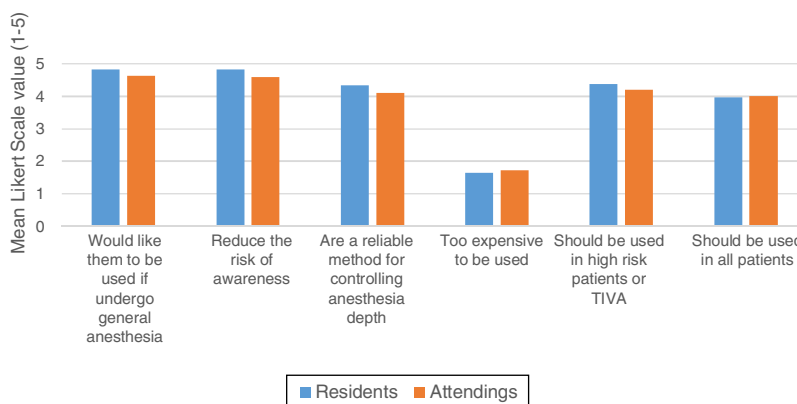


Figure 4 What do you think about the anesthesia depth monitors?

for neurocognitive side effects'' of importance during the preoperative assessment, while 97% and 98% considered the risk for cardiac and pulmonary events of importance, respectively. Contrary to the original survey,¹⁵ most portuguese anesthesiologists would be concern about possible postoperative cognitive loss if having anesthesia themselves. Adverse postoperative cognitive disorders have a recognizable impact on postoperative recovery, rehabilitation and mortality.^{4,8,10-13} Interestingly, the patient's wish was only considered to be an important factor for the anesthesia plan by 75.6% of participants and was significantly different between residents and attendings.

We found that most portuguese anesthesiologists were concerned with awareness as an adverse outcome when proposing an anesthesia plan, especially residents. This was also observed in the Jildenstal et al.¹⁵ study. The authors explained that this concern might be related to the general perception of a general failure in providing adequate anesthesia and the bad publicity associated with recall of intraoperative pain and/or paralysis. The incidence of awareness is 1:15,414 anesthetics,¹⁷ much lower than other postoperative cognitive disorders.^{5,7,8,18} Awareness may be perceived by the anesthesiologist as a direct consequence of his anesthesia management (e.g. the patient was not receiving sufficient hypnotics) whereas postoperative delirium and postoperative cognitive dysfunction follow a much more complex and comprehensive pathogenic model.^{4,14,19}

It is thought that delirium development follows a pathogenic model in which predisposing conditions (risk factors) and precipitant factors (stressor events) can be identified.⁴ Not all risk factors were considered in the original survey¹⁵ and we added others that were considered pertinent based on the previous literature.¹⁴ The participants of this survey considered age, major surgery, alcoholism and previous stroke as the most important predictors of postoperative cognitive disorders and these results are in line with current literature.^{7,14,20,21} Most respondents believed that preoperative cognitive assessment would be useful, although protocols for patients at high-risk for postoperative cognitive disorders seldom exist. Dementia and mild cognitive impairment are common in older adults and are proven independent risk factors for postoperative delirium.¹⁴ Moreover, impaired executive function without impairments in activities of daily living is a predictor of postoperative delirium.²² Cognitive impairment is also associated with worse outcomes including increased postoperative complications, longer hospital length of stay, discharge to a higher level of care, persistent postoperative cognitive dysfunction and mortality after surgery.²³⁻²⁷ Cognitive impairment often goes unrecognized unless formally assessed and several guidelines recommend screening older patients before surgery.^{10,14,28-31} There are multiple quick and easy preoperative cognitive screening tools available that can be used to highlight patients at risk for

adverse postoperative outcomes, including postoperative delirium.^{32,33}

The precipitating factors are potentially modifiable factors associated with hospitalization and with the intra and postoperative periods. Guidelines recommended the use of electroencephalographic monitors of anesthetic depth to avoid burst suppression and unnecessary deep anesthesia to prevent postoperative delirium.^{10,14} In contrast to the Jildenstal et al.,¹⁵ these results show that there is a monitor available in almost every hospital; most participants always or almost always use them; and they don't believe they are too expensive to be used. Residents strongly agree that depth of anesthesia monitors may reduce the risk of awareness and are a reliable method for controlling anesthesia depth. Interestingly, 94% of anesthesiologists would like a depth of anesthesia monitor to be used if they were undergoing general anesthesia but only 75% agreed they should be used in all patients undergoing anesthesia. It is unknown if participants were worried about awareness or the development of postoperative cognitive disorders. Evidence suggests that a deeper anesthesia state or longer time in burst suppression might be associated with an increased risk of postoperative delirium and postoperative cognitive dysfunction.³⁴⁻³⁹ Intraoperative monitoring may reduce the risk postoperative delirium and postoperative cognitive dysfunction^{40,41} but its usefulness on preventing awareness is still controversial.^{42,43}

Our results also showed that protocols for managing patients at risk for postoperative cognitive disorders are rarely used although dedicated pathways improve quality of care and outcomes in the geriatric surgical population.^{10,30} Delirium may be unrecognized in up to 50% of the times, so clinicians should have a high suspicion degree, especially in the case of vulnerable patients.⁴ According to the recent European Society of Anesthesiologists guidelines, patients should not leave the recovery room without being screened for postoperative delirium.¹⁴ Although the gold standard to diagnose delirium is a psychiatric evaluation according to the DMS criteria, the Confusion Assessment Method or the Nursing Delirium Screening Scale can be used effectively.^{6,44} More than half of the participants recalled at least one episode of postoperative delirium in the last year but only 6% of respondents recalled more than ten. This might indicate that portuguese anesthesiologist are aware of the importance and implications of adverse postoperative cognitive disorders on older patient's outcomes but are unable to recognize every case in clinical practice.

When managing a patient with postoperative delirium in the recovery room, most said they would either give first an analgesic or an analgesic in combination with an anxiolytic. Both pain and opioids are known risk factors for delirium and an adequate pain assessment and treatment is highly recommended.^{10,14} If they were to administer an anxiolytic, most stated that a benzodiazepine would be their first choice. Benzodiazepines are well known precipitating factors for delirium and should be avoided, particularly in older patients.^{10,14} Current evidence supports antipsychotics for the treatment of patients who are severely agitated or distressed, and are threatening substantial harm to self and others.¹⁴ Above all, recommendations highlight the importance of performing a medical evaluation, making medication and environmental adjustments and ordering

appropriate diagnostic tests to identify and manage underlying contributors to delirium.^{10,14}

The limitations to this study are inherent to its methodology. The survey was sent through the mailing list of professional organizations and institutions. As the list of members is dynamic and often incomplete, the sample of potential survey respondents was certainly not achieved and we had no mechanism to ensure that participants only completed the survey once. The rate of non-responders might have led to nonresponse bias and those with more interest in the topic will more readily participate (self-selection and participation bias). Although the demographic characteristics of participants were similar to the potential survey respondents, participation was geographically uneven.¹⁶ Moreover, this survey was intended to gain insight how anesthesiologists manage cases and the answers may differ from actual practice. Nevertheless, this survey was based on a previously validated questionnaire made to the Swedish health care professionals, where results were overall similar. This study was conducted to understand the portuguese anesthesiologists' perspectives on postoperative delirium and postoperative cognitive dysfunction and, as so, it contributes for further understanding current clinical practice in Portugal. These results will serve as background for future interventions to prevent and manage postoperative cognitive disorders.

In conclusion, portuguese anesthesiologists perceive postoperative cognitive disorders as important adverse outcomes following surgery and anesthesia are aware of the main risk factors but may lack some information on prevention and management of postoperative delirium. Most hospitals have depth of anesthesia monitors available and those are used by most participants but efforts should be made to increase its usage, especially in high risk patients for postoperative cognitive disorders. The majority of hospitals do not have protocols regarding preoperative cognitive assessment, diagnosis, management and follow-up of patients with delirium and postoperative cognitive dysfunction. Dedicated pathways for older surgical patients may improve outcomes and, as so, it is important to identify high-risk patients and establish preventive interventions.

Conflicts of interest

The authors declare no conflicts of interest.

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