Neuropsychiatric Disease and Treatment

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ORIGINAL RESEARCH

Investigation on Awareness of Cognitive Impairment Diseases Among Surgical Practitioners

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Objective: In this study, we assessed the awareness of cognitive dysfunction and the reasons for the lack of awareness among surgical practitioners in Jiaxing.

Methods: Questionnaires were distributed to surgical practitioners covering all Class III and Class II hospitals in Jiaxing. Respondents were asked to make selections regarding the demographic data, clinical attitudes and practices of cognitive dysfunction based on Alzheimer's Disease Assessment Scale (ADKS) of the Chinese version.

Results: A total of 180 questionnaires were distributed, 12 of which were incomplete, with 168 being included for analysis. The respondents were generally under 50 years of age (150, 89.3%), predominantly males (146, 86.9%), and surgeons (153, 91.1%). They generally had a bachelor's or master's degrees (165, 98.2%), and served in Class III hospitals (127, 75.6%). The title of the practitioner was found to impact their attention toward their patients' cognitive status during preoperative preparation ($P<0.05$). Titles and hospital levels were found to influence decisions of surgical practitioners to invite specialist physicians for consultation and assessment when a patient was identified to have cognitive dysfunction ($P<0.05$). Most surgical practitioners had little knowledge or training about Alzheimer's disease and cognitive dysfunction. Among the 168 respondents, the mean ADKS score was 20.14±2.40, and the awareness rate was 67.1%, indicating that the surgical practitioner's title influenced ADKS score ($P<0.001$).

Conclusion: Surgical practitioners, especially young physicians and those in Class II hospitals, had lower awareness of cognitive dysfunction, with low ADKS scores; therefore, they needed to be further trained to recognize cognitive dysfunction.

Keywords: postoperative cognitive dysfunction, surgical practitioners

Introduction

With aging population and improving medical treatment, more senior citizens are willing to undergo surgical treatment. Postoperative cognitive dysfunction (POCD) refers to a syndrome involving persistent decline in cognitive competence (including attention, executive function, memory, visuospatial ability, and psychomotor velocity) identified in a series of preoperative and postoperative neuropsychological tests.[1] It is a perioperative complication with higher incidence among the aged, therefore, it should be assessed by pre- and post-operative neuropsychiatric tests.[2] Age, literacy, preoperative cognitive status, surgery, anesthesia, and complications were identified as the factors affecting POCD.[3,4] The key mechanism of POCD may be similar to Alzheimer's Disease (AD) characterized by an inflammatory response in the central nervous system.[5] However, a recent review of anesthesia and dementia suggests that there is little evidence that anesthesia itself or other surgical and patient factors cause or accelerate cognitive decline and AD. Surgical stress, neuroinflammation and neurotoxicity may be the potential mediators of POCD.[6]

Despite the complexity of changes in brain during the perioperative period, simple measures could reduce the incidence of POCD by 40%.[7] In 2016, the American Society of Anesthesiologists (ASA) issued a public health campaign to improve awareness of neurocognitive dysfunction in the perioperative period.[7–10] However, preoperative cognitive

Received: 24 May 2023
Accepted: 1 September 2023
Published: 15 September 2023

dysfunction was not assessed, risk warnings were not issued to the patients and their families and simple preventive measures were not taken. Since POCD is diverse, the medical staff could not identify and treat the disease promptly, increasing general mortality rate to 25%.[11–14]

Alzheimer's Disease Knowledge Scale (ADKS) is the most up-to-date and authoritative scale for assessing Alzheimer's disease knowledge, with a total score of 30 points, involving 7 aspects, ie, risk factors, assessment and diagnosis, symptoms, course of disease, impact on life, care for patients with AD, and treatment and management. This scale has high reliability and validity, and is applicable to patients with AD and their caregivers, the aged in communities, students and medical staff.[15]

Despite the high incidence and poor prognosis of POCD, it can still not be recognized and prevented in a timely manner.[16,17] Possible reasons in China include: (1) Surgical practitioners paying more attention to surgical methods, rather than the underlying neuropsychiatric disorders. (2) Surgical practitioners had lower awareness of cognitive dysfunction.[18] To explore the status of understanding of cognitive function by surgical practitioners in Jiaxing, we designed a questionnaire to analyze the reasons for their lack of awareness of cognitive dysfunction.

Method

Questionnaire Development

Literature review was done prior to questionnaire development, and keywords pertaining to the awareness of cognitive dysfunction among the surgical practitioners were extracted, including the awareness rate, affecting factors, awareness, and treatment of cognitive dysfunction such as dementia. A self-designed questionnaire included three categories: (1) Demographic data such as respondent's age, gender, education background, title, specialty, hospital level, training on cognitive dysfunction, and cognitive dysfunction among relatives or friends. (2) Attitudes and practices of respondents towards cognitive dysfunction. There are seven questions, with the options of "Always (almost 100%)/Sometimes (about 50%)/Occasionally (about 20%)/Never (0%)". (3) Respondents' knowledge of AD based on the Chinese version of ADKS. The scale consists of 30 items in 7 fields, namely the risk factors (questions 2, 13, 18, 25, 26, and 27, with 6 points in total), assessment and diagnosis (questions 4, 10, 20, and 21, with 4 points in total), symptoms (questions 19, 22, 23, and 30, with 4 points in total), course of disease (questions 3, 8, 14, and 17, with 4 points in total), impact on life (questions 1, 11, and 28, with 3 points in total), care for patients with AD (questions 5, 6, 7, 15, and 16, with 5 points in total), and treatment and management (questions 9, 12, 24, and 29, with 4 points in total). The options for each item are right/wrong. The ADKS score was calculated as follows: 1 point for a correct answer, and 0 for a wrong answer, with a total score of 0–30. This investigation was initiated by Professor Zhang Xiaoling, Director of the Neurology Branch of Jiaxing Medical Association.

Respondents

Jiaxing implements a three-level medical system, in which Class I hospitals are community hospitals for providing general services only. Class II hospitals are regional hospitals for providing medical and health services across several communities and are technical centers for regional medical prevention. Class III hospitals provide medical and health services across regions, provinces, and cities, and even the whole state, they are technical centers for medical prevention with comprehensive medical teaching and research capabilities. Therefore, most patients with surgical indications visit Class II and Class III hospitals that are mostly general hospitals and can provide specialist medical services. This investigation covered surgeons and anesthesiologists in all Class II and Class III hospitals in Jiaxing, Zhejiang Province. It excluded pediatric surgeons as postoperative psychiatric features of children may differ from those of adults. All respondents were willing to complete the investigation. The inclusion criteria were as follows: 1) those who have worked in Grade II or above hospitals in Jiaxing for at least 1 year or more as of January 1, 2022; 2) adult surgeons and anesthesiologists; 3) voluntarily cooperate with investigators. The exclusion criteria were as follows: 1) a pediatric surgeon; 2) refuse to cooperate with investigators.

Questionnaire distribution and recollecting

The self-designed questionnaire was completed digitally using a provided link. Shown in Figure 1, doctors who are standing members of the Neurology Sub-committee of Jiaxing Medical Association shared the self-made questionnaire star link to their

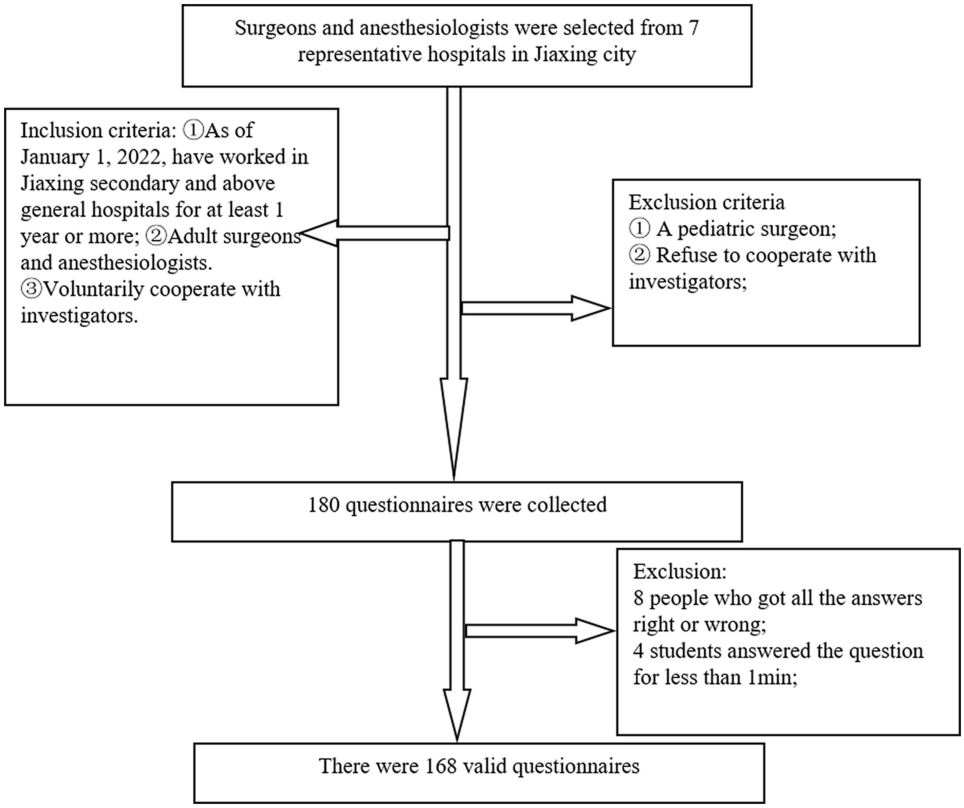

Figure 1 Enrollment of participants.

respective hospitals, and the link is open from January 2022 to September 2022. In Jiaxing city, 7 representative general hospitals were randomly selected according to geographical location and scale, and then surgeons and anesthesiologists from the hospital were selected as a group. A total of 180 questionnaires were collected, 12 random answers were excluded (that is, those with correct or wrong answers and short total answering time), and 168 valid questionnaires were collected.

Statistical Analysis

For statistical convenience, the multiple-choice options of these questions were set as categorical for ordinal variables such as "yes/no/unclear" and "always/sometimes/occasionally/never". IBM SPSS 21.0 was used for statistical analysis. Specific intergroup parameters were compared using chi-squared test or Fisher's exact test. Linear correlation was used when the data was ordinally distributed, the measurement data is expressed by mean ± standard deviation, multiple groups of measurement data were compared by variance analysis, and pairwise comparison was performed with LSD-t method. Finally, independent factors affecting the clinical attitudes and practices of surgical practitioners towards cognitive dysfunction were determined using binary logistic regression. Multiple linear regression analysis was used to analyze independent factors affecting ADKS scores of surgical practitioners.

Results

Demographic Data of Respondents

Surgical practitioners from seven hospitals in Jiaxing participated in the investigation, including two Grade A Class III hospitals, three Grade B Class III hospitals and two Class II hospitals. A total of 180 questionnaires were received, 12 of which were incomplete, and finally 168 were included for statistical analysis. Demographic parameters of the respondents are shown in Table 1. Most respondents were surgeons (153, 91.1%), and there were also 15 anesthetists (8.9%). Among all the respondents, there were 107 (63.7%) from Grade A Class III hospitals, 20 (11.9%) from Grade B Class III hospitals, and 41 (24.4%) from Class II hospitals. The male-female ratio was 146 (86.9%): 22 (13.1%), with males

Table 1 Demographic Data of Respondents

Total n = 168	n (%)
Gender	
Male	146(86.9%)
Female	22(13.1%)
Age (years)	
<30	40(23.8%)
30	62(36.9%)
40	48(28.6%)
50	18(10.7%)
Seniority	
Residents	45(26.8%)
Attendings	50(29.8%)
Associate chief doctors	29(17.3%)
Chief doctors	44(26.2%)
Educational degree	
Secondary	1(0.59%)
College	0(0%)
Bachelor	84(50%)
Master	81(48.2%)
Doctor	2(1.2%)
Specialty	
Surgeons	153(91.1%)
Anesthetist	15(8.9%)
Hospital	
Tertiary hospital	107(63.7%)
Other lower rank third-grade hospital	20(11.9%)
Second-grade hospital	41(24.4%)
Have you received training on cognitive impairment	
Yes	45(26.8%)
No	123(73.2%)
Whether a relative or friend has a cognitive impairment related illness	
Yes	36(21.5%)
No	132(78.5%)

Notes: Residents: obtain a medical certificate and work less than 5 years; Attendings: work for 5 years or more and obtain intermediate technical qualification; Associate chief doctors: 5 years after obtaining intermediate technical qualification and obtain senior technical qualification; Chief doctors: 5 years after obtaining senior technical qualification.

featuring predominantly. As for the age, 40 (23.8%) respondents were < 30, 62 (36.9%) were between 30–39, 48 (28.6%) were between 40–49, and 18 (10.7%) were ≥ 50 years old. There were 45 (26.8%) resident physicians, 50 (29.8%) attending physicians, 29 (17.3%) associate chief physicians, and 44 (26.2%) chief physicians. They generally had a bachelor's and master's degrees, 84 (50%) had a bachelor's degree, and 81 (48.2%) had a master's degree. 73.2% of the respondents (123) had not received any training on cognitive dysfunction, and 78.5% (132) had no friends or relatives with cognitive dysfunction.

Clinical Attitudes and Practices of Surgical Practitioners Towards Cognitive Dysfunction

Overall Impression of Clinical Attitudes and Practices of Surgical Practitioners Towards Cognitive Dysfunction

During the diagnosis and treatment of inpatients, most surgical practitioners (110, 65.5%) asked about the cognitive functions of patients, but a small number of physicians (10, 5.9%) never asked about the same. During the diagnosis and

treatment of outpatients, most surgical practitioners (93, 55.4%) sometimes or always asked about cognitive functions of the patients, but a small number of physicians (15, 8.9%) never asked about the cognition status of the patients.

During preoperative preparation, most surgeons (98, 64.1%) sometimes or always were concerned about the cognition status of the patients, and in the case of cognitive dysfunction identified during routine diagnosis and treatment, or preoperative preparation. Most surgeons (108, 70.6%) sometimes or always invited specialist physicians for consultation and re-assessment. However, during preoperative assessment by anesthetists, all of them (15, 100%) sometimes or always highlighted the cognition status of patients (60% always highlighted, and 40% sometimes highlighted the cognition status of patients). When cognitive dysfunction was identified during preoperative anesthetic assessment, 86.7% (13) of the anesthetists expressed that they sometimes or always invited specialist physicians for consultation assessment and intervention.

As for postoperative delirium, patients undergoing routine surgeries, 86.9% (146) of the surgical practitioners expressed that they occasionally or sometimes encountered such patients. As for the question "Do you understand cognitive dysfunction-related diseases such as Alzheimer's disease?", 72% (121) expressed that they only knew little about them, and 5.9% (10) expressed that they were unaware of such diseases.

Analysis of Isolated Factors Affecting Clinical Attitudes and Practices of Surgical Practitioners Towards Cognitive Dysfunction

Physicians' opinions were compared based on title, specialty, and hospital level of the surgical practitioners. During patient diagnosis and treatment, the chief and associate chief physicians were always concerned about the cognition status of patients, as compared to the attending and resident physicians (Figure 2a, $P<0.05$). During outpatient treatment, the chief and associate chief physicians were more willing to ask the patients of their cognition status than attending and resident physicians (Figure 2b, $P<0.05$); 11.1% of the resident physicians and 10% of the attending physicians were never concerned about the cognition status of patients during outpatient treatment. Compared to attending and resident physicians, the chief and associate chief physicians were always concerned about the cognition status of patients during preoperative preparation (Figure 2c, $P<0.05$). Compared to surgical practitioners, anesthetists tended to pay more attention to cognition assessment of patients during preoperative assessment (Figure 2d, P=0.003). As for the decision to invite specialist physicians for consultation and assessment of cognitive dysfunction, the proportion of chief and associate chief physicians who always invited specialist physicians was much higher than that of attending and resident physicians (Figure 2e, $P<0.05$). Compared to surgical practitioners in Class II hospitals, those in Grade A Class III hospitals were more willing to invite specialist physicians (Figure 2f, P=0.037), however, there was no difference between different specialties (Figure 2g, $P>0.05$). As for meeting postoperative delirium patients post-surgery, the proportion of chief and associate chief physicians who sometimes met patients suffering from postoperative delirium was higher than that of resident physicians (Figure 2h, $P<0.05$). There were more patients suffering from postoperative delirium in Grade B Class III hospitals than Grade A Class III hospitals (Figure 2i, P=0.03). As for the question "Do you understand cognitive dysfunction-related diseases such as Alzheimer's disease?", most physicians expressed that they only knew little about them; there was no difference between titles, specialties, and hospital levels (Figure 2j–l, $P>0.05$).

Logistic Regression Analysis of Multiple Factors Affecting Clinical Attitudes and Practices of Surgical Practitioners Towards Cognitive Dysfunction

The above results show that the impact of title, specialty, and hospital level on clinical attitudes and practices of surgical practitioners towards cognitive dysfunction had statistical significance, therefore, title, specialty, and hospital level were included in the multi-factor logistic regression analysis. The specific assignment of the related factors is shown in Table 2.

There was no statistically significant difference among different hospitals in whether patients' cognitive status was always paid attention to in preoperative preparation ($X^2=3.629$, P=0.163). Therefore, the title and specialty were included in the multi-factor analysis (Table 3). It showed that, as compared to resident physicians, chief and associate chief physicians were always concerned about the cognition status of patients during preoperative preparation (OR=0.158, 95% CI [0.057 to 0.438], P<0.001; OR=0.218, 95% CI [0.084 to 0.565], P=0.002). There was no significant difference between chief physicians and residents (OR=0.686, 95% CI [0.251 to 1.880], P=0.464), while there were no statistically

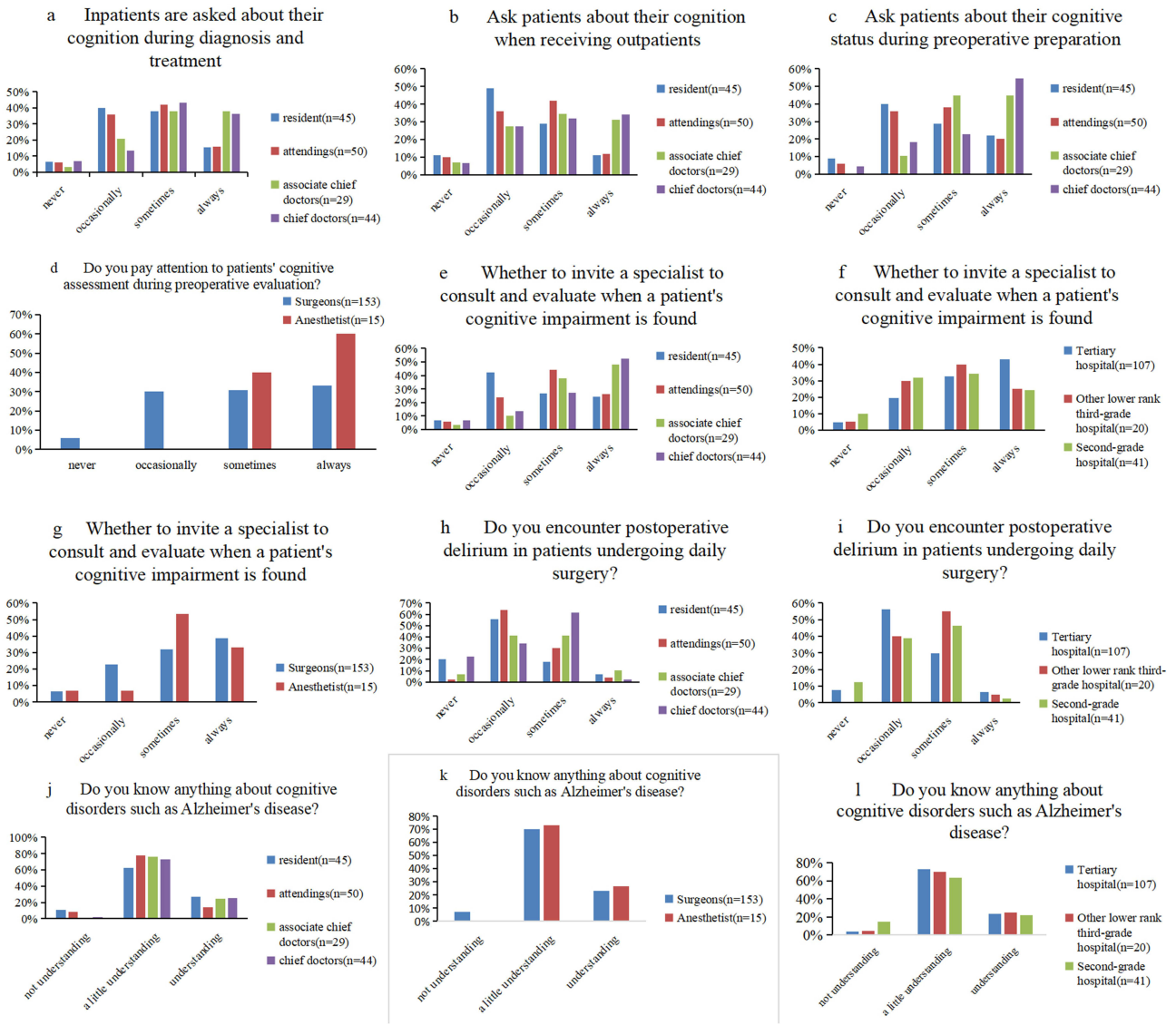

Figure 2 Analysis of isolated factors affecting clinical attitudes and practices of surgical practitioners towards cognitive dysfunction.

Notes: (**a**) Inpatients are asked about their cognition during diagnosis and treatment. (**b**) Ask patients about their cognition when receiving outpatients. (**c**) Ask patients about their cognitive status during preoperative preparation. (**d**) Do you pay attention to patients' cognitive assessment during preoperative evaluation? (**e**) Whether to invite a specialist to consult and evaluate when a patient's cognitive impairment is found. (**f**) Whether to invite a specialist to consult and evaluate when a patient's cognitive impairment is found. (**g**) Whether to invite a specialist to consult and evaluate when a patient's cognitive impairment is found. (**h**) Do you encounter postoperative delirium in patients undergoing daily surgery? (**i**) Do you encounter postoperative delirium in patients undergoing daily surgery? (**j**) Do you know anything about cognitive disorders such as Alzheimer's disease? (**k**) Do you know anything about cognitive disorders such as Alzheimer's disease? (**l**) Do you know anything about cognitive disorders such as Alzheimer's disease?

significant difference between attending and resident physicians (OR=0.791, 95% CI [0.288 to 2.170], P=0.648), and between different specialties (OR=2.478, 95% CI [0.757 to 8.116], P=0.134).

There was no statistical significance in whether specialists were always invited for consultation and assessment of cognitive dysfunction were found (X^2=1.046, P=0.307). Therefore, the professional title and hospital level were included in the multiple-factor analysis (Table 4). It showed that, as compared to resident physicians, the attending physicians and associate chief physicians always invited specialist physicians for consultation and assessment (OR=0.158, 95% CI [0.057 to 0.438], P<0.001; OR=0.218, 95% CI [0.084 to 0.565], P=0.002), but there was no significant difference between chief physicians and residents (OR=0.686, 95% CI [0.251 to 1.880], P=0.464). Compared to Class II hospitals, Grade A Class III hospitals were more willing to invite specialist physicians for consultation and assessment (OR=4.151,

Table 2 Related Factors Affecting Clinical Attitudes and Practices of Surgical Practitioners Towards Cognitive Dysfunction

Related Factors	Assignment Method
Title	Resident physician=0, attending physician=1, associate chief physician=2, chief physician=3
Specialty	Surgery=0, anesthesia=2
Hospital level	Class II Hospital=0, Grade B Class III Hospital=1, Grade A Class III Hospital=2

Table 3 Multi-Factor Regression Analysis on Attention to Cognitive Status During Preoperative Preparation

Variables	Partial Regression coefficient (B)	X^2	P	OR	95% CI
Title (resident physician=0)		17.347	0.001		
Attending physician	−0.235	0.208	0.648	0.791	(0.288, 2.170)
Associate chief physician	1.112	4.512	0.034	3.041	(1.090, 8.487)
Chief physician	1.514	10.108	0.001	4.546	(1.787, 11.564)
Specialty	0.907	2.247	0.134	2.478	(0.757, 8.116)

Table 4 Multi-Factor Regression Analysis on Consultation and Assessment by Specialist Physicians in Cognitive Disorder Cases

Variables	Partial Regression Coefficient (B)	X^2	P	OR	95% CI
Title (resident physician=0)		16.865	0.001		
Attending physician	−1.845	12.610	<0.001	0.158	(0.057, 0.438)
Associate chief physician	−1.525	9.821	0.002	0.218	(0.084, 0.565)
Chief physician	−0.376	0.536	0.464	0.686	(0.251, 1.880)
Hospital level (Class II Hospital=0)		11.488	0.003		
Grade B Class III Hospital	0.076	0.013	0.908	1.079	(0.296, 3.939)
Grade A Class III Hospital	1.423	9.291	0.002	4.151	(1.662, 10.368)

95% CI [1.662 to 10.368], P=0.002), there was no significant difference between secondary hospitals and tertiary hospitals (OR=1.079, 95% CI [0.296 to 3.939], P=0.908).

Investigation of Surgical Practitioners' Understanding of Alzheimer's Disease Based on ADKS (Chinese Version)

Scores of Surgical Practitioners in Various Fields of ADKS with Accurate Awareness Rate

The mean ADKS score of 168 surgical practitioners was 20.14±2.40 points, and the awareness rate was 67.1%. The correct rates of scores ranked from high to low: treatment and management (82.5%), course of disease (72.0%), impact on life (71.7%), risk factors (71.0%), assessment and diagnosis (70.8%), symptoms (55.0%), and care for patients with AD (50.2%). The details are shown in Table 5.

Table 5 ADKS Scores of 168 Surgical Practitioners and Scoring Accuracy

Item	Score Range (Points)	Actual Score ($\bar{x} \pm s$)	Correct Rate (%)
Treatment and management	0–4	3.30±0.63	82.5
Course of disease	0–4	2.88±0.69	72.0
Risk factors	0–6	4.26±0.82	71.0
Assessment and diagnosis	0–4	2.83±0.54	70.8
Impact on life	0–3	2.15±0.78	71.7
Symptoms	0–4	2.20±0.88	55.0
Care for AD patients	0–5	2.51±1.33	50.2
Total	0–30	20.14±2.40	67.1

Analysis of Factors Affecting ADKS Scores of Surgical Practitioners

The specific assignment of the related factors is shown in Table 6. The single-factor analysis on the relationship between ADKS scores and factors such as gender, age, education background, title, specialty, hospital level, participation in cognitive dysfunction-related training, and cognitive dysfunction-related diseases among the relatives or friends showed that age (<40 vs ≥40, t=−3.452, P=0.001, Figure 2b), education background (bachelor's degree and below vs master's degree and above, t=2.343, P=0.020, Figure 2c), title (junior title vs senior title, t=−3.141, P=0.02, Figure 2d), and hospital level (Grade A Class III vs Class II hospitals, t=−2.219, P=0.028, Figure 2f) had statistically significant impact on ADKS scores; while gender (Figure 2a), specialty (Figure 2e), cognitive dysfunction-related training (Figure 2g), and cognitive dysfunction-related diseases among the relatives and friends (Figure 2h) had no statistically significant impact on ADKS scores (for all, $P>0.05$). Therefore, age, education background, title and hospital level were included for multi-factor linear regression analysis (Table 7), and the results showed that the impact of title on ADKS score was statistically significant (β=18.414, t=38.043, P<0.001), and title was positively correlated with ADKS score; while age (β=0.097,

Table 6 Assignment of Factors Affecting ADKS Scores

Related Factors	Assignment Method
Gender	Male=1, Female=2
Age (Years)	<30=1, 30~39=2, 40~49=3, ≥50=4
Education background	Bachelor's degree or below=1, master's degree or above=2
Title	Primary title=1, medium title=2, senior title=3
Specialties	Surgery=1, anesthesia=2
Hospital level	Grade A Class III Hospital=1, Grade B Class III Hospital=2, Grade A Class II Hospital=3, Grade B Class II Hospital=4, Other=5
Training on cognitive dysfunction	Yes=1, No=2
Cognitive dysfunction-related diseases of relatives and friends	Yes=1, No=2

Table 7 Multiple Linear Regression Analysis of Factors Affecting ADKS Scores of Surgical Practitioners

Variables	β	Standard Error	t	P
Title	18.414	0.484	38.043	<0.001
Age	0.097	–	0.824	0.411
Education background	−0.061	–	−0.763	0.447
Hospital level	0.104	–	1.312	0.191

t=0.824, P=0.411), education background (β=−0.061, t=−0.763, P=0.447), and hospital level (β=0.104, t=1.312, P=0.191) had no statistically significant impact on ADKS score.

Analysis of Single Factors Affecting ADKS Scores of Surgical Practitioners in Various Fields

The single-factor analysis of the relationship between ADKS scores and factors such as gender, education background, title, specialty, hospital level, participation in cognitive dysfunction-related training and diseases among the relatives or friends showed that the impact of education background (bachelor vs master) on symptom score (t=2.426, P=0.016) was statistically significant. In other words, surgeons with bachelor's degrees had a higher ADKS score regarding the symptom. The impact of title on symptom score (junior title vs senior title, t=−3.443, P=0.001; intermediate title vs senior title, t=−2.350, P=0.020), score of the course of disease (t=−3.340, P=0.001), score of the care for patients with AD (t=−2.033, P=0.044) was statistically significant, meaning that surgical practitioners with senior titles had higher scores with respect to symptom, course of disease and care for patients with AD.

Discussion

Among the respondents in this investigation, 75.6% were from Class III hospitals, and 24.4% were from Class II hospitals. 24.7% of surgical practitioners always asked about the cognition status of patients during diagnosis and treatment, and 5.8% never asked about the cognition status. Compared to resident and attending physicians, the chief and associate chief physicians paid more attention to the cognition status of inpatient and outpatient cases during diagnosis and treatment, and there were no differences between specialties and hospitals. Investigation results showed that most young physicians ignored the cognition status of patients. The findings of Jorge et al[19] supported our research results. Peden et al[20] pointed out that anesthetists should be the key members of multidisciplinary perioperative brain health care team. In this investigation, we found that anesthetists were more concerned about the cognition status of patients than surgeons during preoperative assessment. However, a multiple-factor analysis showed that it had nothing to do with specialty. A small number of anesthetists may introduce a certain bias, therefore, the sample size should be expanded for further research.

As for the question "whether to invite specialist physicians for consultation and assessment of cognitive dysfunction", as compared to resident physicians, the attending physicians and associate chief physicians always invited specialist physicians for consultation and assessment. Compared to Class II hospitals, Grade A Class III hospitals would be more willing to invite specialist physicians for consultation and assessment. It is evident that title and hospital level affect the handling of cognitive dysfunction by surgical practitioners. However, the proportion of patients with postoperative delirium in Grade B Class III hospitals was higher than that in Grade A Class III hospitals, considering the following possible reasons: (1) Compared with Grade A Class III hospitals, intraoperative anesthesia and postoperative management in Grade B Class III hospitals were weaker; (2) This investigation included more physicians with senior titles from Grade B Class III Hospitals, who could better identify delirium. There may be a bias, and further research with a greater sample size should be conducted.

Due to differences in social culture and educational practices, physicians in different countries and regions would differ from each other in terms of their understanding of AD, hence there is a need to standardize the understanding.[21,22] As per the Scheme for Exploring Special Services for Prevention and Treatment of Dementia issued by the National Health Commission, public awareness rating on prevention and treatment of dementia was 80% in 2022 (GWBJKH [2020] No. 726). Our findings showed that the mean ADKS score amongst 168 surgical practitioners was 20.14±2.40 points, and the awareness rate was 67.1%, which was similar to the observations by Liu et al.[23] They were significantly lower than the public awareness rate required by the National Health Commission, indicating that surgical practitioners in Jiaxing should improve their knowledge of AD. A related study[24] showed that the ADKS score increases with the increase in age. As indicated in this investigation, title affected the scores of the course of disease and care for patients with AD in ADKS, and higher title resulted in higher scores, which may be due to more experience and AD-related knowledge of generally older physicians with senior titles. Training on AD-related knowledge had no effect on the ADKS scores, which was not as expected and is inconsistent with the results of other studies,[25,26] considering the lack of attention from surgical practitioners in Jiaxing. Most (73.2%) respondents were not trained on cognitive dysfunction.

Even if some respondents accepted the related training, they failed to highlight it, and was not satisfactory, or the training contents were not regularly reinforced, leading to forgetfulness. The sample size should be expanded for further validation. In this investigation, it was also found that title and educational background affected the symptom score in ADKS, ie, the higher title and educational background resulted in higher symptom score, which was consistent with the results of Carpenter et al.[27] Results showed that surgical practitioners with senior titles in Jiaxing generally had a bachelor's degree, which reflected the educational background of surgical practitioners in Jiaxing more realistically. In addition, this investigation showed that surgical practitioners from Class II hospitals had higher ADKS scores, and were associated with the higher proportion of surgical practitioners with senior titles.

There were certain limitations in this investigation: (1) Although we investigated surgical practitioners (including surgeons and anesthetists), the small number of anesthetists may lead to a bias in the findings; (2) The small number of Class II hospitals may lead to the potential risk of outcome bias; (3) Limited references limit study of factors affecting postoperative cognitive dysfunction, and some may go unnoticed; (4) As for items involving clinical attitudes and practices of surgical practitioners towards cognitive dysfunction, ie, "always (almost 100%)/sometimes (about 50%)/occasionally (about 20%)/never (0%)", different researchers may have different evaluation criteria, easily leading to misunderstanding. (5) There was no definite evidence for "asking about the cognition status of patients during outpatient treatment", and it was based on the authenticity to be further verified. (6) The effect of the drugs that patients had taken were not investigated which also were important for the risk of developing POCD or delirium. Therefore, investigation on surgical practitioners' understanding of cognitive dysfunction should be verified by further research using a greater sample size.

Conclusion

This questionnaire-based investigation showed that most surgical practitioners, especially younger surgeons, had lower awareness rates of cognitive dysfunction and were not trained on recognizing and diagnosing cognitive dysfunction, which was independent of specialty, seniority and hospital level. However, seniority affected clinical attitudes and practices towards cognitive dysfunction. This investigation reflected the cognition status of surgical practitioners in Jiaxing on cognitive dysfunction, and the results highly indicated the necessity of more related trainings (online, offline or a combination of both repeated and updated to strengthen the training) to improve the surgical practitioners' attention and understanding of cognitive dysfunction, which may help the surgical practitioners to identify and treat patients with postoperative cognitive dysfunction.

Abbreviations

AD, Alzheimer's Disease; ADKS, Alzheimer's Disease Cognition scale; POCD, Postoperative cognitive dysfunction; ASA, American Society of Anesthesiologists.

Data Sharing Statement

The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

Ethics Approval and Consent to Participate

This study was conducted with approval from the Ethics Committee of the Second Affiliated Hospital of Jiaxing University (JXEY-2020JX065). This study was conducted in accordance with the declaration of Helsinki. Written informed consent was obtained from all participants.

Acknowledgments

We would like to acknowledge the hard and dedicated work of all the staff that implemented the intervention and evaluation components of the study.

Funding

The Public Welfare Research Program of Jiaxing (No. 2020AY30016).

Disclosure

The authors declare that they have no competing interests.

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