DOI: 10.14744/cm.2023.49092
Comprehensive Medicine 2023;15(2):96-101

RESEARCH ARTICLE

Retraction Notice
The following article is retracted from publication in Comprehensive Medicine by decision of editors of the journal upon the authors' request.

Analysis of the Knowledge Level of the Surgical Residents Regarding the Pre-Operative Assessment of the Adult Elective Non-Cardiac Surgery Patients with Specific Clinical Conditions

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ABSTRACT

Objective: We aimed to analyze the knowledge level of the surgical residents regarding pre-operative assessment and increase their collaboration with other teams in optimizing general medical status of the patients to reduce the duration of hospital stay and complication rates.

Materials and Methods: Our study was conducted with the residents of eight surgical divisions in our institution. Eighty surgical residents enrolled in the study. The 2018 update of the European Society of Anesthesiology (ESA) was used during the preparation of the survey questions. The questions were categorized based on the specific clinical conditions and medications noted in the ESA guideline. Answer choices were "correct", "wrong," or "no idea."

Results: Sixty-five (81.2%) of the respondents were male and 15 (18.8%) were female. Analysis of distribution of the mean correct answer rates (%) revealed that the question regarding "herbal medications" led to the lowest correct answer (13.75%), while the category "bridging and anticoagulation" was associated with the highest (72.5%) correct answer. Total mean correct answer was calculated as 50.8%. There was no significant correlation between the residents' seniority level (i.e., postgraduate year) and their correct answer rates in neurosurgery, general surgery, ear-nose-throat (ENT), and plastic surgery divisions. However, there were statistically significant differences in ophthalmology, urology, orthopedic surgery, and obstetrics and gynecology divisions.

Conclusion: The general medical status of the patients should be optimized to reduce the risk of complications. To achieve this goal, surgical residents should collaborate with the other teams in each perioperative stage. In addition, we suggest that the curriculum be reviewed to increase the knowledge level of the surgical residents regarding pre-operative care.

Keywords: Elective non-cardiac surgery, knowledge level, pre-operative assessment, survey

How to cite this article: Altun G, Aksun M, Şahin AS. Analysis of the Knowledge Level of the Surgical Residents Regarding the Pre-Operative Assessment of the Adult Elective Non-Cardiac Surgery Patients with Specific Clinical Conditions. CM 2023;15(2):96-101

INTRODUCTION

Today, the anesthesiologists' pre-operative assessment of the patients is considered critical due to the comorbid diseases accompanying the patients' clinical conditions necessitating surgical treatment. Novel strategies and preparation methods emerge in the health systems with developing technology. The primary aim of pre-operative anesthesia assessment is to optimize the patient's medical condition before surgery and anesthesia administration.[1]

The pre-operative anesthesia assessment is implemented after the patient's referral to the anesthesiologist. The American Society of Anesthesiologists (ASA) recommended that pre-operative anesthesia assessment be performed before the day of surgery in patients with high risk, while it could be

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Received date: 01.12.2022
Accepted date: 01.02.2023
Online date: 22.03.2023

implemented on the morning of the day of surgery in other patient groups. Although there are no standardized pre-operative anesthesia assessment criteria, determination of the specific clinical conditions of the patients, anesthesia management, and follow-up during recovery are the responsibilities of the anesthesiologist.[2]

It was determined that a pre-operative anesthesia assessment performed before the day of surgery in close collaboration with the surgeon reduced the risk of complications and duration of hospital and intensive care unit (ICU) stays, provided that the comorbid clinical conditions of the patients are optimized. Therefore, this approach leads to the effective use of ICU resources. Besides, during the pre-operative anesthesia assessment, the patient can be counseled by the anesthesiologist and the surgeon regarding the surgical procedure, anesthesia, and perioperative analgesia. It was suggested that this strategy could reduce the anxiety of the patients.[3,4]

The knowledge level of the surgery residents is essential for the initial assessment of the surgery patients, management of their comorbidities, and intraoperative and post-operative medical treatments. The relevant cooperation can reduce the rates of perioperative complications and duration of hospital stay, lead to effective use of the ICUs, and decrease treatment costs. In our study, we aimed to analyze the knowledge level of the surgery residents regarding pre-operative anesthesia assessment.

MATERIALS and METHODS

This study was conducted as a prospective, observational, and single-center study. It was approved by the Non-interventional Clinical Studies Ethical Council of the Izmir Katip Celebi University Ataturk Training and Research Hospital (May 12, 2020/692). A Likert-type survey including 41 questions was prepared and applied to the surgical residents. This questionnaire was prepared based on the European Society of Anesthesiology (ESA) guideline for the pre-operative evaluation of adults undergoing elective non-cardiac surgery, which was updated in 2018. The survey questions were categorized according to the specific clinical conditions and medications mentioned in the ESA guideline (Table 1). The answer choices were "correct", "wrong," and "no idea." Demographic data of the surgery residents, such as age and gender and their specialties and postgraduate years, were also recorded. Overall, 100 surgery residents were enrolled in this study.

The surgery residents under training in cardiovascular surgery, basic science, or medical specialties were not included in this survey study. On the other hand, residents under training in a surgical residency training program in our hospital other than cardiovascular surgery were included. In total, residents from eight different surgical programs were enrolled in our study (Table 2).

Statistical Analysis

Statistical analysis of the data was performed by the IBM SPSS Statics Version 24 software. Pearson Chi-square and Fisher's exact tests were used for comparing the groups regarding categorical data. The continuous data were non-normally distributed; Kolmogorov–Smirnov ($p<0.05$) and Mann–Whitney U tests were used for intergroup comparisons. The relationship between the postgraduate years of the residents and the number of correct answers to the specific questions was analyzed by the Spearman rho correlation analysis. A p value of lower than 0.05 was considered significant.

RESULTS

This study was conducted with the surgery residents of eight different surgical residency programs. Overall, 80 residents were included in the study.

Analysis of the demographic data revealed that 73 (91.3%) residents were aged between 26 and 35. Sixty-five (81.2%) of the respondents were male, while 15 (18.8%) were female. Most (n=20, 25%) of the residents were postgraduate year 4 (Table 2).

Investigation of the categorical distribution (%) of the rate of correct answers to the questions on specific clinical conditions showed that the mean correct answer rate was lowest in the "herbal medications" (13.8%), "kidney diseases" (22.5%), and "anemia and pre-operative blood-saving strategies" (25.6%) categories. On the other hand, the mean correct answer rates were highest in the "bridging and anticoagulation" (72.5%), neuromuscular diseases" (67.5%), and "coagulation disorders" (65.8%) categories (Table 1).

The correlation analysis between the rates of correct answers to the questions regarding specific clinical conditions and the surgical residents' postgraduate year (i.e., seniority level) revealed no significant correlation between these two parameters in neurosurgery, general surgery, ear-nose-throat surgery, and plastic surgery programs ($p>0.05$) (Table 3).

On the other hand, a positive, perfect, and statistically significant correlation was found between the correct answer rates of the ophthalmology residents to the questions regarding "bridging and anticoagulation" and their seniority level ($p<0.05$).

There was a moderate positive correlation between the correct answer rate of the obstetrics and gynecology residents to the cardiovascular system (CVS) disease questions and

Table 1. Distribution of the mean answer rates of the subjects to the questions regarding specific clinical conditions

Specific clinical conditions	Mean	SD	Median	Min	Max
CVS diseases (seven questions)	61.59	20.39	57.1	0	100
Respiratory diseases and OSAS (three questions)	53.76	22.83	66.7	0	100
Kidney diseases (two questions)	22.50	30.71	0	0	100
Diabetes (two questions)	40.00	24.39	50	0	100
Obesity (two questions)	48.13	35.08	50	0	100
Koagulation disorders (three questions)	65.84	29.05	66.7	0	100
Anemia and pre-operative blood saving strategies (four questions)	25.63	23.86	25	0	100
Geriatric patients (two questions)	48.75	21.01	50	0	100
Neuromuscular diseases (three questions)	67.52	20.53	66.7	0	100
Herbal medications (one question)	13.75	34.65	0	0	100
Psychotropic medications (six questions)	42.92	27.14	33.3	0	100
Bridging and Anticoagulation (two questions)	72.50	35.49	100	0	100
Correct answers (Total) (37 questions)	50.84	14.92	50	19.4	102.8

SD: Standard deviation; Min: Minimum; Max: Maximum; CVS: Cardiovascular system; OSAS: Obstructive sleep apnea syndrome

their seniority levels and a positive, good-level, and statistically significant correlation between the rate of correct answers to the "kidney diseases" and diabetes questions and their seniority levels. ($p<0.05$)

There was a negative, good-level, and statistically significant correlation between the rate of correct answers of the orthopedic surgery residents to the "kidney diseases" questions and the residents' seniority levels ($p<0.05$). On the other hand, there was a positive and good-level correlation between the correct answer rates of the urology residents to the obesity questions, total correct answer rates, and these residents' seniority levels ($p<0.05$). Analysis of these residents' answers to the questions regarding psychotropic medications revealed a negative, good-level, and statistically significant correlation between the correct answer rates and the postgraduate year of the residents ($p<0.05$).

There was no statistically significant correlation between the rates of correct answers of the ophthalmology, obstetrics and gynecology, orthopedic surgery, and urology residents to the questions from other categories and the residents' seniority levels ($p>0.05$).

Table 2. Distribution of the subjects based on demographic data

	n	%
Age		
18–25	4	5.0
26–35	73	91.3
36–45	3	3.8
Gender		
Male	65	81.3
Female	15	18.8
Residency program		
Neurosurgery	11	13.8
General Surgery	15	18.8
Opthalmology	5	6.3
Obstetrics and Gynecology	15	18.8
ENT	7	8.8
Orthopedic Surgery	11	13.8
Plastic Surgery	7	8.8
Urology	9	11.3
Postgraduate year		
1	16	20.0
2	19	23.8
3	17	21.3
4	20	25.0
5	8	10.0

ENT: Ear, nose and throat surgery

DISCUSSION

There has yet to be a consensus regarding the pre-operative assessment standards, pre-operative investigations, and their timing in patients undergoing elective non-cardiac surgery. In our country, the pre-operative assessment guide prepared by Turkish Society of Anesthesiology and Reanimation is in line with those of ASA and ESA. Although pre-operative investigations target the best standard of care, their benefits are debatable in the setting of low-risk surgeries.[2,5]

Table 3. Correlation between the rate of correct answers to the questions regarding specific conditions and the surgical residents' seniority levels

	Neurosurgery	General surgery	Opth	Obs&Gyn	ENT	Ortopedic surgery	Plastic surgery	Urology
CVS diseases								
r	0.371	0.260	0.763	0.552	0.404	0.296	−0.265	0.203
p	0.261	0.349	0.133	0.033	0.369	0.376	0.566	0.600
Respiratory diseases and OSAS								
r	−0.528	0.033	0.263	0.032	0.163	−0.451	−0.438	−0.101
p	0.095	0.907	0.669	0.910	0.728	0.163	0.325	0.796
Kidney diseases								
r	0.077	0.064	−0.115	0.642	–	−0.680	−0.535	−0.206
p	0.822	0.821	0.854	0.010	–	0.021	0.216	0.595
Diabetes								
r	−0.166	0.386	0.344	0.604	0.105	0.082	−0.663	–
p	0.625	0.156	0.571	0.017	0.823	0.811	0.105	–
Obesity								
r	0.599	−0.137	0.487	−0.438	0.000	−0.224	−0.384	0.772
p	0.052	0.626	0.406	0.103	1.000	0.508	0.395	0.015
Koagulation disorders								
r	−0.484	0.033	0.803	0.047	0.278	0.024	−0.407	0.642
p	0.131	0.907	0.102	0.867	0.547	0.943	0.365	0.063
Anemia and pre-operative blood saving strategies								
r	−0.063	−0.116	0.158	0.474	0.297	−0.145	−0.642	−0.419
p	0.854	0.680	0.800	0.074	0.518	0.670	0.120	0.262
Geriatric patients								
r	−0.206	0.192	0.344	0.091	0.105	−0.131	0.642	–
p	0.543	0.494	0.571	0.746	0.823	0.702	0.120	–
Neuromuscular diseases								
r	−0.591	0.098	0.287	0.379	−0.010	−0.122	–	−0.303
p	0.056	0.729	0.640	0.164	0.984	0.722	–	0.428
Herbal medications								
r	−0.103	0.281	0.363	0.203	–	−0.256	–	−0.303
p	0.763	0.310	0.548	0.467	–	0.448	–	0.428
Psychotropic medications								
r	−0.377	0.302	0.553	0.140	0.481	−0.212	0.135	−0.681
p	0.253	0.273	0.334	0.619	0.274	0.530	0.773	0.044
Bridging and Anticoagulation								
r	−0.051	0.383	0.892	−0.230	0.488	−0.414	0.000	–
p	0.882	0.158	0.042	0.409	0.267	0.206	1.000	–
Correct answers (total)								
r	−0.363	0.291	0.462	0.288	0.352	−0.329	−0.252	0.057
p	0.272	0.293	0.434	0.298	0.439	0.324	0.585	0.885

Spearman Rho correlation. ENT: Ear, nose and throat surgery; CVS: Cardiovascular system; OSAS: Obstructive sleep apnea syndrome

In our study, the analysis regarding the distribution (%) of the correct answers of the surgery residents to specific clinical conditions revealed that the correct answer rate was lowest in the "herbal medications" category (13.8%) while it was highest (72.5%) in the "bridging and anticoagulation" category. Furthermore, these rates were 22.5% in "kidney diseases," 25.6% in "anemia and blood-saving strategies," 48.1% in "obesity," 40% in "diabetes," 48.8% in "geriatrics" categories, and 50.8% in total. Since the correct answer rates were low in questions related to vital topics, we suggest that surgical residents collaborate closely with the anesthesiology teams and the other branches in the pre-operative period.

The rate of surgical procedures is increasing in the geriatric patient population. Furthermore, this patient group has comorbidities and "polypharmacy" (i.e., the use of multiple medications). Thus, the risk of post-operative delirium and other complications is higher in these patients than the younger patients.[6]

In our study, we found that the correct answer rate of the surgery residents to the questions about "geriatric patients" was 48.8%. This rate was lowest (40%) in the obstetrics and gynecology residents' group, while it was highest (57%) in the plastic surgery residents' group. We suggest that the perioperative complication risk will be reduced if the surgical residents have more profound knowledge about the unique aspects of the geriatric patient population and geriatric physiopathology during pre-operative patient management.

There is an approximately 50% risk of perioperative myocardial damage in patients undergoing major non-cardiac surgery. In patients with cardiac risks, pre-operative optimization of the general medical status and stabilizing the patient regarding comorbidities can improve the outcomes. On the other hand, the decision concerning the cessation of aspirin treatment should be given by an individualized approach considering the pros and cons for the patients based on ESA and European Society of Cardiology guidelines.[7,8]

Our survey contained seven questions on CVS diseases with a 61.6% correct answer rate. The correct answer rate was highest (66.7%) for the urology residents and lowest (54.5%) for the orthopedic surgery residents. There was a positive, moderate level, and statistically significant correlation between the correct answer rates of the obstetrics and gynecology residents to the CVS disease questions and their seniority levels (i.e., postgraduate year) ($p<0.05$). We suggest that perioperative cardiac complication rates can be reduced if surgeons keep themselves updated regarding the most recent medical innovations and current practice guidelines.

A study by Mutter et al. determined that the pre-operative administration of continuous positive airway pressure led to a decrease in the rate of post-operative complications. Therefore, patients should be screened preoperatively regarding obstructive sleep apnea syndrome (OSAS).[9,10] Smoking cessation at least 4 weeks before the surgery is critical concerning respiratory complications, wound healing, and wound infections.[11,12] Since most patients are not referred to the anesthesiologist at that stage, surgeons should know the importance of pre-operative smoking cessation.

In our study, three questions were asked regarding OSAS and respiratory diseases. One question was asked regarding smoking. The correct answer rate was 53.76%. While the highest (60%) correct answer rate was detected in general surgery, ophthalmology residents had the lowest (46.7%) correct answer rate.

The pre-operative cessation of anticoagulant medications or maintenance of anticoagulation at this stage is a critical topic, and there are several studies on this subject. Yamamoto et al.[13] determined that patients who were put on a dual antiplatelet treatment after coronary angiogram and underwent a non-cardiac surgery had a higher risk of bleeding than those on a single antiplatelet drug.

Our survey had two questions regarding bridging and anticoagulation; the mean correct answer rate was 72.5%. While orthopedic surgery residents had the highest (86.4%) correct answer rate, plastic surgery and ophthalmology residents had the lowest (50%) correct answer rates.

In the study of Tunay, which analyzed the knowledge level and attitudes of the family physicians regarding pre-operative patient management, it was reported that relatively more comprehensive pre-operative patient care protocols should be used in medical school curriculums.[14]

In our study, the mean correct answer rate of the eight surgical divisions was calculated as 50.8%. Therefore, we suggest that a more comprehensive pre-operative patient management curriculum should be followed during surgical residency training to heighten the surgical residents' knowledge levels.

CONCLUSION

The pre-operative assessment of the patients is vital for anesthesiologists, other medical doctors, and surgeons. We suggest that to decrease the rates of potential complications and optimize the pre-operative general medical status of the patients, surgical residents should be knowledgeable about pre-operative patient care and collaborate closely with the

anesthesia teams. In addition, the medical school and surgical residency training curriculums should be revised to heighten their knowledge in pre-operative patient management.

Disclosures

Ethics Committee Approval: The study was approved by the Izmir Katip Celebi University Non-interventional Clinical Studies Ethics Committee (No: 692, Date: 12/05/2020).

Informed Consent: Written informed consent was obtained from surgical residents.

Peer-review: Externally peer reviewed.

Authorship Contributions: Concept: M.A.; Design: M.A.; Supervision: M.A.; Funding: G.A.; Materials: G.A.; Data Collection or Processing: G.A.; Analysis or Interpretation: G.A.; Literature Search: G.A.; Writing: G.A.; Critical review: A.S.Ş.

Conflict of Interest: No conflict of interest was declared by the authors.

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

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