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**THE IMPACT OF COVID-19 PANDEMIA ON ETHICAL DILEMMAS IN
PREHOSPITAL RESUSCITATION PRACTICES**

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ABSTRACT

Introduction: This study aims to evaluate the impact of the COVID-19 pandemic process on ethical dilemmas experienced in prehospital resuscitation practices.

Material and methods: The study was conducted on 695 emergency medical services employees. A “questionnaire form” consisting of 20 questions developed by the researchers in line with the literature was used as a data collection tool.

Results: In the pandemic period, ethical dilemmas in deciding to perform CPR on suspected or identified COVID-19 patients have increased in 52.5% of the participants, whereas ethical dilemmas in deciding to terminate CPR have increased in 41.3%. Moreover, a statistically significant difference was found between the increasing status of the ethical dilemmas of the participants in making the decision to start CPR in EMS and terminate CPR in the COVID-19 pandemic process and the status of having a diagnosis of COVID-19, the state of having complete personal protective equipment during CPR, and the state of applying advanced airway techniques on suspected or identified COVID-19 patients.

Conclusions: Although the COVID-19 pandemic process has increased the ethical dilemmas of emergency medical services employees in relation to CPR application, such dilemmas do not affect their decision to start or end CPR.

Keywords: cardiopulmonary resuscitation; COVID-19; ethical dilemma; personal protective equipment; prehospital emergency medical services

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INTRODUCTION

Ethics are value judgments in human behaviour that suggest what should or should not be done and consist of more concrete behavioural principles than morality [1]. One of the fields that are most affected by the COVID-19 pandemic process is health services. The sustainability of health services has become a very important criterion for managing the pandemic, as both the workload and responsibilities of the healthcare professionals and the risks they are exposed to have increased [2, 3]. However, regardless of the situation and environment, healthcare professionals are expected to fulfil their duties and responsibilities according to professional, ethical, and legal norms in combating the COVID-19 pandemic [4, 5]. The main purpose of prehospital emergency medical services (EMS) is to save lives. Therefore, the application of cardiopulmonary resuscitation (CPR) plays an important role [6]. CPR practices are applications that include the initial evaluation of the patient, chest compression, and providing airway patency and ventilation to maintain effective circulation and ventilation until the underlying cause is reversed [7]. EMS personnel may be faced with ethical dilemmas due to the fact that prehospital EMS are performed under extraordinary conditions and time pressure, and most of the decisions to be made are directly related to human life [1, 8, 9]. These ethical dilemmas can be listed as the dilemmas related to making a death decision and ending resuscitation and deciding whether or not to continue resuscitation in the presence of risk factors for the healthcare professionals themselves and their patients [2].

While most of the patients served during the COVID-19 pandemic process are suspected patients, very few are diagnosed with COVID-19. This situation puts pressure on EMS employees in the service they will provide and their decision-making. Based on this information, the present study aims to evaluate the impact of the COVID-19 pandemic process on the ethical dilemmas experienced in prehospital resuscitation practices during the first wave of the COVID-19 pandemic when vaccination had not started yet. The possibility of irreparable damages due to ethical dilemmas to be experienced in a service area directly related to human life negatively affects the efficiency of the service and makes this study relevant.

MATERIAL AND METHODS

This descriptive study was conducted between January and May 2021 with 695 paramedics and emergency medical technicians working in EMS and members of the

Paramedic and Prehospital Emergency Medicine Association (PARHAD) in Türkiye (N = 3800). The number of samples that should be reached with the sample formula with a known universe was found to be 349 [10]. In the present study, 695 participants were reached in total. For the cross-sectional research, a simple random probable sampling method has been used. A post hoc power analysis was performed using the G-Power Data Analysis program [11]. The calculated sample size for the power analysis was 695 participants. The power analysis was conducted with a 95% confidence interval and a significance level of $p < 0.05$. While the study's power was determined to be 0.98, the effect size was moderate (0.5), and the sample was determined to be a good representation of the population [11, 12].

Data collection tool

A “questionnaire form” consisting of 20 questions, which was developed by researchers in line with the literature, was used as a data collection tool. It assesses sociodemographic characteristics (age and gender) and thoughts of the participants during the intervention in suspected or identified COVID-19 cases.

Data collection

First of all, written permission was obtained from PARHAD's management prior to the study. The e-mail addresses actively used by the paramedic and emergency medical technicians who were members of the association were obtained, and the data collection tools of the research were sent to the active e-mail addresses of the paramedic and emergency medical technicians with the support of a professional survey company (www.surveymonkey.com). In the e-mail sent to the participants, a voluntary consent form that defines the questionnaire and explains the purpose and scope of the study was attached. The paramedic and emergency medical technicians who accepted the questionnaire answered the data collection tool online. The questionnaire was applied with necessary precautions to not allow more than one answer by address blockage.

Statistical analysis

SPSS (IBM SPSS Statistics version 22.0; SPSS Inc., Chicago, IL) was used for statistical analysis. The continuous variables were reported as mean and standard deviation, whereas the categorical variables were reported as number and percentage. The link between

the independent and dependent variables was determined using the chi-square test. A 95 per cent confidence interval was used to assess the results. For all statistical analyses, a p-value of 05 was considered statistically significant.

Ethical consideration

The research was conducted following the ethical standards of the Declaration of Helsinki. The relevant written authorization was received from the University's Scientific Research Ethics Council before the study. All participants were aware that they were participating in the study based on secrecy and voluntarism. All of the participants gave their consent before the data collection. Before submission, the following statements were included to assure understanding: "Submitting the information form signifies consent to participate" and "Proceed to the survey."

RESULTS

When the sociodemographic characteristics of the participants and their distribution according to certain variables were examined, it was determined that 46.5% of them were in the 20–29 age group, 52.8% were men, and 45.5% worked in the profession between 1–9 years. The average age of the participants was 31.43 ± 6.67 (min = 21, max = 53), and the years of employment in the profession were 10.55 ± 6.73 (min = 1, max = 38) (Table 1).

It was determined that 63.0% of the participants were diagnosed with COVID-19, 93.1% regularly used PPE during the COVID-19 pandemic, 79.6% were acquainted with the advanced life support guidelines that should be applied to suspected or identified COVID-19 patients, and 51.7% received information about the updated CPR guidelines shared by the institution they worked for. It was determined that 74.4% of the participants performed CPR on suspected or identified COVID-19 patients, 57.0% of these had complete PPE during CPR application, 13.4% of those who did not have complete PPE did not use PPE during CPR because of the urgency of the situation. 38.3% of CPR performers to suspected cases were in a dilemma about starting CPR even though their PPE was complete but applied CPR anyway for the benefit of the patient (Tab. 1).

It was found that 67.2% of the participants applied advanced airway techniques on suspected or defined COVID-19 patients, 59.9% of these ventilated the patient with a balloon-valve mask, and 46.9% of those who ventilated the patient with a balloon-valve mask put a filter to the outlet of the mask. Moreover, the COVID-19 pandemic process had increased

ethical dilemmas in deciding to start CPR in EMS in 52.5% of the participants as well as increased ethical dilemmas in deciding to terminate CPR in EMS in 41.3% of them (Table 1).

A statistically significant difference was found between the increase in ethical dilemmas of the participants during the COVID-19 pandemic process in making the decision to start CPR in EMS and the status of working years in the profession, the status of being diagnosed with COVID-19, and the state of having complete PPE during CPR application ($p < 0.05$) ($p < 0.05$) (Tab. 2).

A statistically significant difference was found between the increase in ethical dilemmas of the participants in the decision to terminate CPR in EMS and the state of having complete PPE during CPR and applying advanced airway techniques on suspected or identified COVID-19 patients ($p < 0.05$) (Tab. 3).

DISCUSSION

While the COVID-19 pandemic process creates both social and physical damage for healthcare professionals, this process has undoubtedly increased the ethical dilemmas experienced by healthcare professionals [2, 13]. Therefore, this study aimed to evaluate the impact of the COVID-19 pandemic process on ethical dilemmas experienced in prehospital resuscitation practices in the first wave phase of the COVID-19 pandemic and in this critical period when vaccination has not started yet. In the first wave phase, what makes emergency intervention difficult in both out-of-hospital and in-hospital cardiac arrest is that COVID-19 is highly contagious during CPR application and causes high morbidity and mortality in case of transmission [14]. Moreover, COVID-19 predisposes patients to sudden cardiac arrest by causing acute hypoxemic respiratory failure, myocardial damage, ventricular arrhythmias, and shock. Drugs, such as hydroxychloroquine and azithromycin, used in the treatment of COVID-19 can cause QT prolongation [15–17]. Due to all these conditions, an increase in cases of sudden cardiac arrest has been observed during the COVID-19 pandemic [18]. In accordance with the literature, the rate of CPR application in suspected or identified COVID-19 patients among EMS workers participating in this study was quite high (74.4%).

Cardiac arrest cases whose status is unknown in EMS should be considered infected until proven otherwise [19]. It has been suggested in the literature discussions conducted at the beginning of the pandemic that if CPR is to be applied to suspected or identified COVID-19 patients, the primary condition is that all healthcare professionals who will intervene should have full PPE and that healthcare workers who do not have complete PPE should not

be involved in the intervention [2, 20, 21]. All authorities accept that EMS providers should wear PPE to avoid contact with airborne droplet particles before managing out-of-hospital suspected or identified COVID-19 patients suffering from cardiac arrest [8, 9]. However, it is known that EMS healthcare professionals may fail to follow the infection control procedures or have a high risk of making mistakes during CPR applications due to the urgency of the situation [14]. EMS employees often have dilemmas about patient intervention when PPE is not complete [5]. In the present study, the rate of regular use of PPE during the COVID-19 pandemic process among EMS employees was 93.1%. However, 17.4% of EMS employees who practice CPR stated that they cannot use PPE fully. EMS employees stated that they could not use PPE due to the urgency of the situation with the highest rate of 13.4% due to their inability to use PPE, 1.3% stated that they could not use PPE due to the lack of equipment, and 1.2% stated that they did not prefer to use PPE. This indicated that EMS employees do not use complete PPE for various reasons during their CPR application. Considering the high risk of COVID-19 transmission during CPR application in EMS, this is an important risk factor for EMS employees.

From the very beginning of the COVID-19 pandemic, organizations such as the AHA and the ERC have announced their existing suggestions other than standard practices regarding COVID-19 [8, 9]. In the present study, the vast majority of EMS employees stated that they had received information about the recommended CPR guidelines for suspected or identified COVID-19 patients, whereas more than half of these people stated that they had access to this information through the institution they worked for. Although a significant portion of EMS employees stated that they were informed about the special conditions related to COVID-19 in CPR practices, it is also noteworthy that more than 20% of those working in an area, such as EMS, where the risk is very high have not received up-to-date information.

It is recommended to minimize the risk of aerosolization in advanced airway applications in COVID-19 patients [22]. EMS employees face a high risk of aerosol transmission of the coronavirus, especially during intubation [23, 24]. Therefore, using a high-efficiency particulate air (HEPA) filter for exhaled air while the patient is ventilated will reduce the risk of aerosolization [25, 26]. The vast majority of EMS personnel participating in this study stated that they had to perform advanced airway intervention on suspected or identified COVID-19 patients. More than half of the personnel who attempted advanced airway intervention reported that they ventilated the patient with a balloon-valve mask, whereas 12.9% of them could not use a HEPA filter during ventilation. Therefore, some of the

EMS personnel were faced with a high risk of aerosolization during advanced airway application.

Discussions in the literature consider that reservations about starting CPR are acceptable if the safety of healthcare personnel cannot be ensured during the COVID-19 pandemic process [14, 23]. Under crisis standards of care, healthcare professionals may outweigh the significant risks they face rather than implement practices with little chance of benefiting the patient. Kramer et al. stated in the study they conducted in 2020 that responders with appropriate PPE and sufficient training should not be allowed to refuse CPR due to personal safety concerns, except for patients with refractory deterioration [23]. According to the results of the study, a very small proportion of EMS employees with full PPE equipment avoid CPR application, whereas about a quarter of the employees avoid advanced airway application or the use of balloon-valve masks during CPR application.

The dilemma of performing CPR on suspected or identified COVID-19 patients as a result of the many uncertainties about the virus and the myths that emerged during the first period of the pandemic was one of the most discussed topics [8]. The discussions at the beginning of the pandemic were about the protection of healthcare workers and priorities in the use of scarce resources rather than the success of the patient's resuscitation. The low rate of resuscitation in out-of-hospital cardiac arrests, as well as the scarce resources problem due to the high rate of patients who need to be admitted to an intensive care unit, has undoubtedly led to new ethical dilemmas in healthcare professionals [27]. In the present study, a significant number of EMS workers who performed CPR on suspected or identified COVID-19 patients stated that they experienced an ethical dilemma during the application. Although most of the personnel participating in the study stated that they were in a dilemma about starting CPR even though their PPE was complete but started to apply it anyway for the benefit of the patient, the rate of those who stated that they were in a dilemma about starting CPR even though their PPE was complete and did not perform CPR on the patient due to safety risk was only 1.2%. However, the rate of those who said that they started CPR for the benefit of the patient, although their PPE was not complete, was 26.2%. Moreover, 7.3% stated that they terminated their CPR application earlier than expected due to the dilemmas they faced. It has been observed that the majority of EMS employees experience ethical dilemmas when performing CPR on suspected or identified COVID-19 patients, and although they took additional risks, they acted for the patient's benefit. Ethical dilemmas do not significantly affect their decision to start or end CPR.

One of the most frequently discussed topics in EMS is the starting and termination criteria of CPR. EMS employees may experience ethical dilemmas at many stages of the decision to start and terminate CPR [28]. Terminating the resuscitation of suspected or identified COVID-19 patients suffering from cardiopulmonary arrest in the field creates new ethical discussions [29]. EMS systems recommend keeping the duration of the CPR short, taking into account the arrest variables witnessed or not witnessed [30]. Suggestions are made to terminate CPR according to the start of basic life support firstly in the EMS intervention, the presence of a shockable rhythm, response to resuscitative intervention, and capnometry trends [31, 32]. In the present study, more than half of the participants stated that the COVID-19 pandemic process had increased ethical dilemmas in deciding to start CPR in EMS, whereas 41.3% of them stated that the COVID-19 pandemic process had increased ethical dilemmas in deciding to terminate CPR. Variables, such as professional experience, the state of the staff to be diagnosed with COVID-19, and the state of having the complete PPE during CPR, are determinants among the situations that increase the ethical dilemmas in the decision to start and end CPR.

Limitations

The current research is cross-sectional and uses a basic random probability sampling method. This study has some limitations. The data used in the analysis of this study were collected from paramedics and emergency medical technicians (PHEH workers), and the data relied on self-reporting by these participants. The results obtained from the analysis of the data from 695 participants cannot be generalized to all the PHEH workers. Moreover, the data used in the study were collected within a specific period, and economic, social, and cultural changes that occurred over time may influence the study's findings. It should also be noted as a limitation that the study was conducted only on healthcare workers who voluntarily agreed to participate. The participants may have intentionally provided misleading answers to the questions. In addition, since the data were collected online, there may be some drawbacks related to electronic security concerns, uncertainty of respondents, access issues to the survey questions, misinterpretation of the sensitivity of the research, and access problems to the web page.

CONCLUSIONS

The rate of EMS employees managing suspected or identified COVID-19 patients

suffering from cardiac arrest and the situation of applying CPR is high. EMS employees begin resuscitation of COVID-19 patients for the patient's benefit, even if their PPE is not complete. One-fifth of the EMS workers were not knowledgeable about the updated CPR guidelines for COVID-19 patients. While few EMS personnel with full PPE avoided CPR, the rate of those who avoided advanced airway application or the use of balloon-valve masks was much higher. Although the COVID-19 pandemic process has increased the ethical dilemmas of EMS employees during CPR application, the dilemmas did not affect their decision to start or terminate CPR. Considering the fact that most of the COVID-19 patients encountered in EMS are undiagnosed patients and the possibility that cardiac arrest or peri-arrest conditions are not related to COVID-19, ethical dilemmas should not be allowed to adversely affect the effectiveness of EMS delivery.

Article information and declarations

Data availability statement

Data available is on request due to privacy/ethical restrictions. The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to (restrictions such as information that could compromise the privacy of research participants).

Ethics statement

The research was conducted in accordance with the ethical standards of the Declaration of Helsinki. The relevant written authorization was received from the university's scientific research ethics council prior to the study. All participants were aware that they were participating in the study on the basis of secrecy and voluntarism. All of the participants gave their consent before the data collection. Prior to submission, the following statements were included to assure understanding: "Submitting the information form signifies consent to participate" and "Proceed to the survey."

Author contributions

Study design: AE, SG, SÖ; data collection: AE, SG, SÖ; data analysis: SG, AE; study supervision: AE, SG, SÖ; manuscript writing: AE, SG, SÖ; critical revisions for important intellectual content: AE, SG, SÖ

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Conflict of interest

No conflict of interest to declare.

Supplementary material

Not applicable

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TABLE 1. Sociodemographic characteristics of the participants and their distribution according to some variables (n = 695).

Variables	n	%
Age		
20–29	323	46.5
30–39	294	42.3
40 years and older	78	11.2
Gender		
Men	367	52.8
Women	328	47.2
Work in the profession		
1–9	316	45.5
10–19	309	44.5
20–29	67	9.6
30–39	3	4
Regularly used personal protective equipment during the COVID-19 pandemic		
Yes	647	93.1
No	48	6.9
Diagnosed with COVID-19		
Yes	257	37.0
No	438	63.0
Knowledgeable about the COVID-19 advanced life support guidelines		
Yes	553	79.6
No	142	20.4
How the information on the updated CPR guidelines^a was disseminated (n = 553)		
Sharing the updated CPR guidelines from the institution they worked for	40	5.8
The institution I work for shared their updated CPR guidelines	359	51.7
I followed myself	130	18.7
The association/association I am a member of shared their guide updates	24	3.5
Performed CPR on suspected or identified COVID-19 patients		
Yes	517	74.4
No	178	25.6
Using personal protective equipment during CPR^b (n = 517)		
Yes	396	57.0
No	121	17.4
Reason for incomplete PPE during resuscitation^c (n = 121)		
The urgency of the situation	93	13.4
I did not want to use PPE	8	1.2
PPE was missing/missing	9	1.3
I could not use it due to misinformation	11	1.6
During the pandemic period, ethical dilemmas were experienced in relation to CPR^b (n = 517)		
Because the PPE was not complete, I had a dilemma about starting resuscitation but started to apply it anyway for the benefit of the patient	182	26.2
I had a dilemma about starting resuscitation because the PPE was not	10	1.4

complete. I did not practice it because it was risky in terms of occupational health and safety.		
I started resuscitation, but due to the risks, I ended the resuscitation practice earlier than it should have.	51	7.3
Although the PPE was complete, I had a dilemma about starting resuscitation but started to apply it anyway for the benefit of the patient.	266	38.3
Although the PPE was complete, I had a dilemma about starting resuscitation. I did not practice it because it was risky in terms of occupational health and safety.	8	1.2
Application of advanced airway techniques to a suspected or identified COVID-19 patient		
Yes	467	67.2
No	50	7.2
Ventilated the patient with a balloon-valve mask^d (n = 467)		
Yes	416	59.9
No	51	7.3
Ventilated the patient with a balloon-valve mask with a filter attached to the outlet of the mask^e (n = 416)		
Yes	326	46.9
No	90	12.9
The COVID-19 pandemic process had increased ethical dilemmas in deciding to start CPR in EMS		
Yes	365	52.5
No	330	47.5
Increasing status of ethical dilemmas in the decision to end CPR in EMS during the COVID-19 pandemic process		
Yes	287	41.3
No	408	58.7

^aOnly those who were knowledgeable about the advanced life support guidelines that should be applied to suspected or identified COVID-19 patients were included.

^bOnly those who performed CPR on suspected or identified COVID-19 patients were included.

^cOnly those with incomplete PPE during CPR application to suspected or identified COVID-19 patients were included.

^dOnly those applying advanced airway techniques to suspected or identified COVID-19 patients were included.

^eOnly those who ventilated suspected or identified COVID-19 patients with a balloon-valve mask were included.

TABLE 2. Comparison of some variables according to the increase of ethical dilemmas in the decision of the participants to start CPR in EMS during the COVID-19 pandemic process (N = 695).

			Increasing state of ethical dilemmas in the decision to start CPR in EMS during the COVID-19 pandemic process					
Variables			Yes n %		No n %		X ²	P
Age								
20–29			17 7	48. 5	146	44.2	1.281	0.52 7
30–39			14 8	40. 5	146	44.2		
40 years and older			40	11. 0	38	11.5		
Gender								
Men			19 2	52. 6	175	53.0	0.013	0.93 9
Women			17 3	47. 4	155	47.0		
Work in the profession								
1–5			10 0	27. 4	78	23.6	18.141	0.00 3
6–10			10 1	27. 7	105	31.8		
11–15			92	25. 2	51	15.5		
16–20			48	13. 2	72	21.8		
21–25			18	4.9	20	6.1		
26 years and older			6	1.6	4	1.2		
Regularly used personal protective equipment during the COVID-19 pandemic								
Yes			33 7	92. 3	310	93.9	0.699	0.24 7
No			28	7.7	20	6.1		
Diagnosed with COVID-19								
Yes			12 2	33. 4	135	40.9	4.166	0.02 5
No			24 3	66. 6	195	59.1		

Knowledgeable about the CPR guidelines for suspected or identified COVID-19 patients						
Yes	29 9	81. 9	254	77.0	2.610	0.06 4
No	66	18. 1	76	23.0		
Performing CPR on a suspected or identified COVID-19 patient						
Yes	26 7	73. 2	250	75.8	0.618	0.24 2
No	98	26. 8	80	24.2		
Using personal protective equipment during CPR ^b (n = 517)						
Yes	21 8	59. 7	178	53.9	8.491	0.01 4
No	49	13. 4	72	21.8		
Application of advanced airway techniques to a patient with suspected or identified COVID-19						
Yes	24 1	66. 0	226	68.5	0.475	0.27 2
No	12 4	34. 0	104	31.5		
Ventilated the patient with a balloon-valve mask ^d (n = 467)						
Yes	22 1	60. 5	195	59.1	3.999	0.13 5
No	20	5.5	31	9.4		
Ventilated the patient with a balloon-valve mask with a filter attached to the outlet of the mask ^e (n = 416)						
Yes	18 2	49. 9	144	43.6	4.569	0.10 2
No	39	10. 7	51	15.5		

^aOnly those who were knowledgeable about the advanced life support guidelines that should be applied to suspected or identified COVID-19 patients were included.

^bOnly those who performed CPR on suspected or identified COVID-19 patients were included.

^cOnly those with incomplete PPE during CPR application to suspected or identified COVID-19 patients were included.

^dOnly those applying advanced airway techniques to suspected or identified COVID-19 patients were included.

*Only those who ventilated suspected or identified COVID-19 patients with a balloon-valve mask were included.

TABLE 3. Comparison of some variables according to the increase of ethical dilemmas in the decision of the participants to terminate CPR in EMS during the pandemic process (N = 695).

			Increasing ethical dilemmas in the decision to end CPR in EMS during the COVID-19 pandemic process					
Variables			Yes		No		X ²	P
			n %		n %			
Age								
20–29			136	47.4	187	45.8	0.283	0.868
30–39			118	41.1	176	43.1		
40 years and older			335	11.5	45	11.0		
Gender								
Men			156	54.4	211	51.7	0.471	0.271
Women			131	45.6	197	48.3		
Work in the profession								
1–5			77	26.8	101	24.8	6.375	0.271
6–10			79	27.5	127	31.1		
11–15			70	24.4	73	17.9		
16–20			44	15.3	76	18.6		
21–25			14	4.9	24	5.9		
26 years and older			3	1.0	1.7	1.2		
Regularly used personal protective equipment during the COVID-19 pandemic								
Yes			262	91.3	385	94.4	2.475	0.078
No			25	8.7	23	5.6		
Diagnosed with COVID-19								
Yes			10	36.	151	37.0	0.000	0.52

	6	9				
No	18	63.	257	63.0		4
	1	1				
Knowledgeable about the CPR guidelines for suspected or identified COVID-19 patients						
Yes	23	81.	320	78.4		
	3	2			0.786	0.21
No	54	18.	88	21.6		5
		8				
Performing CPR to a suspected or identified COVID-19 patient						
Yes	21	73.	306	75.0		
	1	5			0.194	0.36
No	76	26.	102	25.6		2
		5				
Using personal protective equipment during CPR ^b (n = 517)						
Yes	17	60.	222	54.4		
	4	6			7.019	0.03
No	37	12.	84	20.6		0
		9				
Application of advanced airway techniques to a suspected or identified COVID-19 patient						
Yes	18	63.	285	69.9		
	2	4			3.168	0.04
No	10	36.	123	30.1		5
	5	6				
Ventilated the patient with a balloon-valve mask ^d (n = 467)						
Yes	16	57.	251	61.5		
	5	5			3.919	0.14
No	17	5.9	34	8.3		1
Ventilated the patient with a balloon-valve mask with a filter attached to the outlet of the mask ^e (n = 416)						
Yes	12	44.	197	48.3		
	9	9			1.143	0.56
No	36	12.	54	13.2		5
		5				

^aOnly fields practising the advanced life support guidelines for suspected or identified COVID-19 patients were included.

^bOnly those who performed CPR on suspected or identified COVID-19 patients were included.

^cOnly those with incomplete PPE during CPR application to suspected or identified COVID-19 patients were included.

^dOnly those applying advanced airway techniques to suspected or identified COVID-19 patients were included.

^eOnly those who ventilated suspected or identified COVID-19 patients with a balloon-valve mask were included.