Original Article

Opinion and Knowledge of Anesthesiology Personnel Regarding the Current Practice Guidelines for Anesthesia Management in COVID-19 Cases

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Background: COVID-19 is a newly emerging-disease. Anesthesiology personnel are at substantial risk of infection due to the nature of aerosol generating procedure. The Royal College of Anesthesiologists of Thailand (RCAT) has published a clinical practice guideline (CPG) named "current practice guidelines for anesthesia management in COVID-19 case (April 24, 2020)" to prevent disease transmission, which might not be practical in some settings due to resource limitation.

Objective: To explore knowledge and opinions of anesthesiology personnel toward current practice guidelines. Real world practice and factors that may affect it were also surveyed.

Material and Methods: The present study was a cross-sectional descriptive study. Anesthesiology personnel from institutions in Thailand were asked to fill an online self-administered questionnaire via Google Form between July 11 and August 15, 2021. The questionnaire consisted of four main parts, demographic data, hospital settings, knowledge about RCAT COVID-19 CPG, and other opinions regarding real-world practice. SPSS version 22.0 was used for statistical analysis and descriptive statistics were used to analyze participants' comments.

Results: Two hundred fifty-one anesthesiology specialists, residents, and anesthetist nurses from 44 provinces participated in the present study. Although 55.4% of participants were trained to perform general anesthesia in COVID-19 patients, 80.5% knew about RCAT CPG and had sufficient basic knowledge. The lack of personal protective equipment (PPE) was the main reason participants could not follow RCAT CPG.

Conclusion: The participants had sufficient knowledge of RCAT CPG and were able to use PPE correctly according to WHO standard. However, based on participants' opinion, inadequate resources, human errors, conflicts in the workplace, and staffing shortage may be the reasons that prevent practice according to RCAT CPG. As a part of effective infection control, three factors that play large roles were previous training, knowledge of COVID-19 transmission, and adequate supply of PPE.

Keywords: Anesthesiology; COVID-19; Opinion; Practice; Guidelines; Personal protective equipment

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Coronavirus disease 2019 (COVID-19) is a newly emerging-disease caused by Severe Acute Respiratory Syndrome Virus 2 (SARS-CoV-2). The disease's main transmission routes are respiratory droplets and close contact. It also can spread via aerosol in some medical procedures[1]. The clinical presentations of patients are varied, with the majority having mild disease at 81% with 14% being considered moderately-severe, and up to 5% can progress to respiratory failure[2]. Currently, there are about 470 million infected cases around the world, with 3.3 million from Thailand[3,4]. With a mortality rate of approximately 2%, COVID-19 posed itself as a major public health burden, earning its recognition as a global health emergency by the World Health Organization (WHO)[5].

Aerosol-generating procedures such as intubation are mandatory in various settings. For instance, patients with severe clinical manifestations requiring admission to intensive care unit and patients requiring general anesthesia (GA) before undergoing an operation all require intubation by experienced personnel, especially in the field of anesthesiology[6]. Therefore, anesthesiology specialists, residents, and anesthetist nurses are considered very high risk in

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terms of COVID-19 exposure[7].

Articles have shown the impact of COVID-19 on the anesthesiology community. For example, in Singapore, Wong et al pointed out about the stress that health care personnel are facing caused by not only the fear of disease contraction but also disease transmission to loved ones[8]. In Turkey, Dost et al highlighted the importance of team communication, personnel training, simulations, constantly updated clinical practice guidelines (CPGs), and algorithm-based procedures published by local health authorities[9]. All of the mentioned items will help minimize disease exposure, reduce personnel risk of infection, and boost personnel confidence in managing COVID-19 cases. One interesting observation by Meng and McDonagh is about the reallocation of anesthesiology personnel beyond intraoperative setting due to resource gaps created by the sudden increase in COVID-19 patients[10].

To prevent transmission of COVID-19 among health care personnel and patients, the Royal College of Anesthesiologists of Thailand (RCAT) has published a CPG named "current practice guidelines for anesthesia management in COVID-19 case"[11]. However, this practice guideline is merely a recommendation that might be difficult to follow, especially in the resource-limited settings. The authors suspected that this might be due to inadequate supply of equipment and facility, shortage of human resources, and emergency nature of the required procedures. Coupled with an increasing demand of medical supply and workforce during the pandemic, scarcity problem can become more severe than ever.

The present study aimed to explore knowledge and opinions of anesthesiology specialists, residents, and anesthetist nurses regarding current practice guidelines for anesthesia management in COVID-19 case (April 24, 2020, issued by RCAT). Real world practice and factors that may affect it were also surveyed.

Materials and Methods

The present cross-sectional descriptive study included anesthesiology specialists, residents, and anesthetist nurses currently working in Thailand. The study protocol was approved by the Institutional Review Board, Faculty of Medicine, Chulalongkorn University (IRB No. 428/64).

Two authors, the first and second author, who were six-year medical students generated a questionnaire under supervision of an experienced anesthesiologist with COVID-19 patient care experiences in a university hospital setting, the third and fourth author. The questionnaire was written in Thai and consisted of four main parts, demographic data (12 items), hospital settings (6 items), knowledge about RCAT COVID-19 CPG (10 items), and other opinions regarding real-world practice (12 items). The third part of the questionnaire, "Knowledge about RCAT COVID-19 CPG", was prepared by researchers following Thai RCAT guidelines including one question to determine whether the participants knew about the existence of RCAT CPG and nine multiple choice questions to test their knowledge. After a discussion with experienced personnel in COVID-19 patient care, a minimum score of seven was used to determine if participants had sufficient knowledge about COVID-19 CPG to safely perform aerosol-generating procedures during care of COVID-19 patients.

Sample size was calculated based on the primary objective, which was the knowledge about RCAT COVID-19 CPG, using a formula for estimating a single mean[12]. A pilot study of 20 participants, which are included in the analysis, was conducted. Out of a total score of 9 points, the pilot study revealed a mean score of 7.85 and a standard deviation of 1.089. With 95% confidence interval and a margin of error of 0.2. Therefore, the present study would require a sample size of at least 117.

Using convenience sampling, participants were reached by social media platforms, including Facebook and Line official accounts of RCAT, and asked to complete a self-administered questionnaire after reading an information sheet and giving consent via Google Form between July 11 and August 15, 2021.

Content validity testing of the questionnaire was done by consulting with three subject matter experts rating each question based on its relevancy. Then the questionnaire was modified until mutual agreement in questionnaire interpretation among experts was reached. To prove the reliability of the knowledge part of the questionnaire, internal consistency was calculated based on answers of 20 medical students not included in the present study analysis.

The results of the questionnaire were analyzed using IBM SPSS Statistics, version 22 (IBM Corp., Armonk, NY, USA). Categorical variables were presented with percentages, while continuous variables were presented with mean and standard deviation. Comparison between groups of data was performed using a diagram and Chi-square test, Fisher's exact test, and/or Kruskal-Wallis test

depending on the data type. A p-value of less than 0.05 was considered statistically significant. Comments from the participants were analyzed using descriptive statistics.

Results

Two hundred fifty-three participants from 44 provinces participated in the present study questionnaire, 251 of which gave consent to participate. Due to the nature of online distribution, the authors could not know the total sending numbers, therefore response rate could not be calculated. There were few missing data in the preoperative evaluation section, which were not included in statistical analysis. The mean age of participants was 38.43±9.10 years and 78.9% were female. Half of the participants were anesthesiologists (50.2%), 28.7% were anesthetist nurses, and 21.1% were anesthesiology residents. The majority of participants (38.6%) have been working for more than 10 years, with an average of 9.91±9.245 years. Seventy-three points seven percent of all the participants worked in a specialist hospital such as a secondary and tertiary care including a university hospital or a regional hospital, 17.1% in a non-specialist hospital such as a general hospital or a community hospital, and 9.2% in private hospital. The demographic data of all participants are presented in Table 1.

Table 1. Demographic data (n=251)

Parameter	n (%)
Sex	
Male	53 (21.1)
Female	198 (78.9)
Age	
21 to 30	63 (25.1)
31 to 40	96 (38.2)
41 to 50	58 (23.1)
51 to 60	32 (12.7)
61 and above	2 (0.8)
Position	
Anesthesiologist	126 (50.2)
Resident	53 (21.1)
Nurse	72 (28.7)
Experience (years)	
0 to 1	51 (20.3)
2 to 3	41 (16.3)
4 to 10	62 (24.7)
11 or more	97 (38.6)
Type of hospital	
Specialty	185 (73.7)
Non-specialty	43 (17.1)
Private	23 (9.2)
Provincial zoning	
Yellow	10 (4.0)
Orange	27 (10.8)
Red	56 (22.3)
Dark red	158 (62.9)

The authors stratified years of experience into four unequal intervals, 0 to 1 year, 2 to 3 years, 4 to 10 years, and 11 years or more. This was due to an assumption that each interval had a unique way of practice. The 0 to 1 year group, having limited experience, may require supervision under challenging circumstances. For the 2 to 3 years group, they practice according to the latest CPG. The 4 to 10 years group's way of practice resulted from a combination of CPG and their own preference based on personal experience. And lastly, experienced personnel in the more than 10 years group tended to practice based on their own experience. This assumption was derived after consultation with experienced anesthesiologists with more than 10 years of working experience.

Of all the participants, 55.4% had been trained to perform GA in COVID-19 patients. Of all the trained participants, 82.7% worked in a specialist hospital, 11.5% in non-specialist hospital, and 5.8% in private sectors.

Using independent-samples Kruskal-Wallis test, there was a difference in terms of distribution of COVID-19 cases exposure to each position and experience groups ($p<0.01$ and 0.001, respectively). When grouped by their experience, participants with 2 to 3 years of experience were most exposed to COVID-19 cases followed by groups with 4 to 10 years, more than 10 years, and 0 to 1 years of experience with a mean exposure of 3.95, 3.74, 2.45, and 1.94 times, respectively. Categorized by position, anesthesiologist had the highest exposure to COVID-19 cases followed by anesthetist nurse and resident with a mean exposure of 3.5, 2.82, and 1.64 times, respectively.

According to the COVID-19 province zoning announced by The Center for COVID-19 Situation Administration (CCSA) at the time of the participants' response date, 62.9% of all the participants resided in dark red zone with maximum and strict control, 22.3% in red zone with maximum control, 10.8% in orange zone with controlled areas, and 4% in yellow zone with high surveillance. There were five announcements from CCSA during the response acceptance period, on June 18, June 26, July 10, July

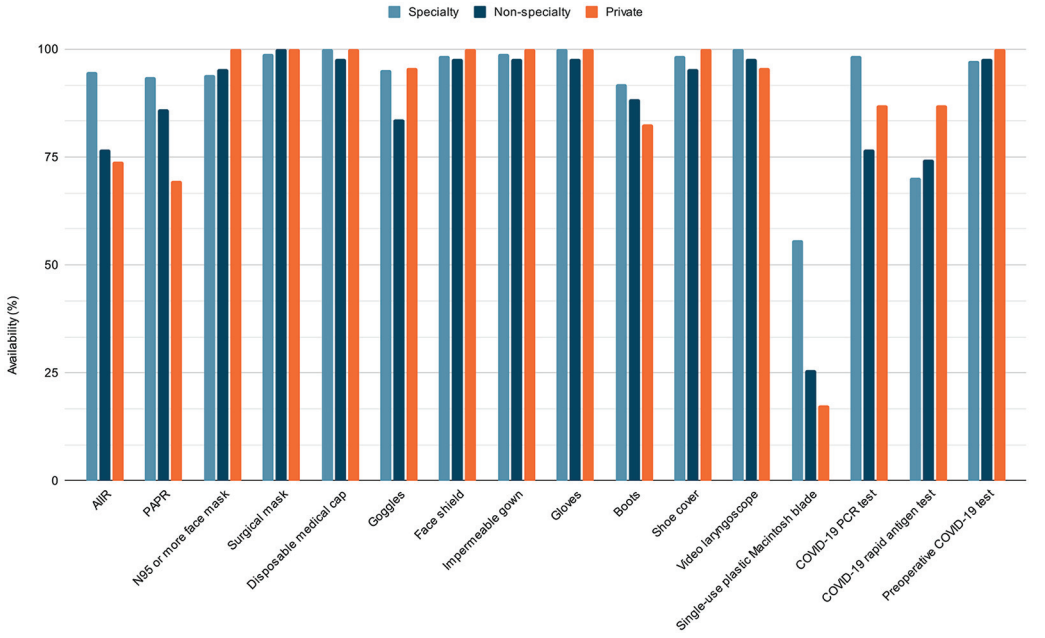

Figure 1. The hospital availability of all infection control equipment in different hospital type.

AIIR=airborne infection isolation room; PAPR=powered air-purifying respirator; COVID-19=coronavirus 2019; PCR=polymerase chain reaction

17, and August 1, 2021.

The authors asked participants to evaluate their hospital PPE availability including airborne infection isolation room (AIIR), medical-grade powered air-purifying respirator (PAPR), N95 or more respirator, surgical mask, disposable medical cap, goggles, face shield, impermeable gown, gloves, boots, and shoe cover. The authors found that 10.4% of participants had no AIIR at their hospitals, PAPR was not enough for 10% of the participants, N95 mask was not enough for 5.2% of the participants, and boots were not enough for 9.6% of the participants. The distribution of participants' hospital availability according to the type of hospital and COVID-19 provincial color code zoning are shown in Figure 1 and 2.

Availability of medical equipment required in giving GA in COVID-19 patients were also surveyed, including video laryngoscope (VL), single-use plastic blade for VL, and single-use plastic blade for Macintosh laryngoscope. When asked whether the participants' hospital had a VL, 70.5% reported that their hospital had single-use plastic blade VL, while 28.7% reported that they had a VL without single-use plastic blade, and 0.8% reported that they did not have a VL at all. However, only 47% of the participants had a single-use Macintosh blade at their hospital.

For COVID-19 diagnostic test, polymerase chain reaction (PCR) was available in 93.6% of the participants' hospitals and rapid test was available in 72.5%. Three participants (1.2%) said that they did not have any method for COVID-19 diagnosis and 13 participants (5.2%) only had a rapid test. Preoperative COVID-19 screening was mandatory in 97.6% of participants' hospitals. Subgroup analysis using Chi-square test showed statistically difference in availability of PCR and rapid test in different provincial zoning ($p=0.043$ and <0.001, respectively).

Of all the participants, 80.5% knew about Thai CPG on GA for patients suspected of COVID-19. Participants were asked with 9-item RCAT CPG-based questions, whose internal consistency revealed Cronbach's alpha of 0.816. They answered correctly between four and nine items with an average score of 7.91±0.986. Anesthesiology residents scored the highest, followed by anesthesiologists and anesthetist nurses at 8.17±0.975, 8.03±0.903, and 7.5±1.021, respectively. The distribution of mean scores grouped by position, years of experience, prior training, and prior COVID-19 patient GA experience are shown in Table 2. Only participant's positions and years of experience showed statistically significant differences in the average score and were further analyzed individually by each question item. When using a minimum cut-off score of seven, 90.44% of participants seemed to have sufficient knowledge about the guidelines. Table 3 shows a detailed

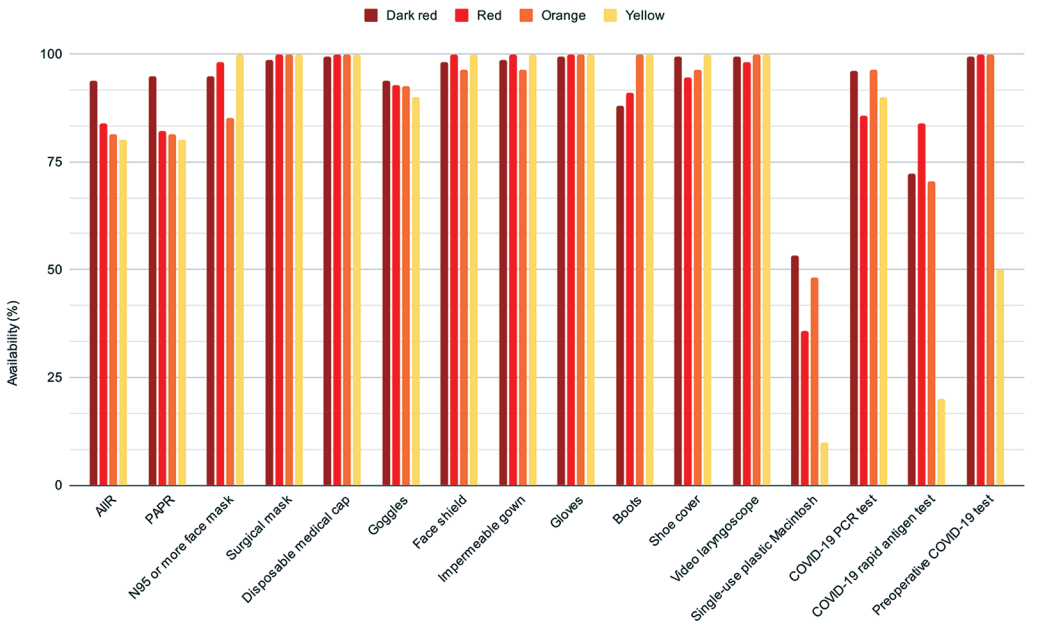

Figure 2. The hospital availability of all infection control equipment in differential provincial zoning.

AIIR=airborne infection isolation room; PAPR=powered air-purifying respirator; COVID-19=coronavirus 2019; PCR=polymerase chain reaction

Table 2. Mean score from participant's answers in a 9-item multiple choice questions regarding knowledge about "The Royal College of Anesthesiologists of Thailand (RCAT) Coronavirus 2019 (COVID-19) clinical practice guideline (CPG)" categorized by the following parameters (n=251)

Parameter	Score; mean±SD	p-value
Have you heard of Thai RCAT COVID-19 CPG?		0.46
Yes	7.93±0.10	
No	7.82±0.95	
Position		<0.001
Anesthesiologist	8.03±0.90	
Resident	8.17±0.98	
Nurse	7.50±1.02	
Experience (years)		0.003
0 to 1	7.92±0.96	
2 to 3	8.27±1.07	
4 to 10	8.07±0.79	
11 or more	7.65±1.02	
Status of COVID training		0.29
Yes	7.85±1.01	
No	7.98±0.95	
PUI case experience		0.63
Yes	7.93±0.99	
No	7.86±0.98	
Participant's hospital has its own COVID-19 CPG		0.49
Yes	7.90±1.00	
No	8.18±0.41	

SD=standard deviation; PUI=patient under investigation

distribution of participants' answers to individual questions on COVID-19 anesthesia management according to their positions. Years of experience of the participants had a statistically significant effect only on the question "Who should perform intubation in COVID-19 suspected/confirmed cases?", with participants with 2 to 3 years of experience answering most correctly, followed by 0 to 1, 4 to 10, and more than 10 years, respectively.

When comparing between before and after the pandemic, there was a 58.96% increase in PPE usage during preoperative evaluation. When asked about which PPE they used when examining negative and confirmed cases, most of the PPE were used, more except for a surgical mask, which remained the same around 96%. For the location of preoperative evaluation, the operation room was preferred in suspected and confirmed cases, while bedside evaluation was preferred in negative cases.

To explore problems anesthesiology personnel faced during the pandemic, the authors asked each participant to state their opinion on two topics, "What are the reasons that prevent your hospital from following RCAT CPG?" and "In case your hospital has its own CPG, please illustrate why it might be different from RCAT CPG?". The scarcity of PPE, inability to timely screen for COVID-19 preoperatively, conflicts in the workplace, human errors, and unclear hospital policy were the main

Table 3. Percentage of participants answered correctly in each question according to their position (n=251)

CPG question	Position (%)			p-value
	A (126)	R (53)	N (72)	
Do you know that Royal College of Anesthesiologists of Thailand (RCAT) had published a clinical practice guideline named "current practice guidelines for anesthesia management in COVID-19 case (24 April 2020)"	88.1	66.0	77.8	0.002
There is a set of sequences that must be followed when donning and doffing PPE.	100	100	100	-
During intubation, a single-use plastic blade should be used, and the handle should be immediately cleaned by 70% alcohol after the procedure.	92.9	90.6	95.8	0.50
A Highly Efficient Hydrophobic (HEPA) filter should always be applied between the corrugation tube and the circuit breathing system.	98.4	98.1	100	0.54
Who should perform intubation in COVID-19 suspected/confirmed cases?	57.9	71.7	29.2	<0.001
What is the correct method for pre-oxygenation in COVID-19 suspected/confirmed cases?	96.0	96.2	95.8	0.10
What intubation technique should be performed in COVID-19 suspected/confirmed cases?	100	98.1	93.1	0.008
What is the optimal timing to start ventilation in COVID-19 suspected/confirmed cases?	99.2	98.1	97.2	0.55
What is the most appropriate mask holding technique and tidal volume setting for ventilation in COVID-19 suspected/confirmed cases?	85.7	84.9	61.1	<0.001
What is an example of an aerosol generating procedure?	73.0	79.2	77.8	0.60

PPE=personal protective equipment; A=anesthesiologist; R=resident; N=nurse

Table 4. Reasons for not following The Royal College of Anesthesiologists of Thailand clinical practice guideline (n=101)

Reasons	Number of subjects mentioning the reason
Inadequate resources or PPE	43
Human errors or conflict in the workplace	13
Health care personnel staffing shortage	12
Hospital's policy conflicting with RCAT CPG	9
No previous training regarding to recommended practice	8
Inappropriate facility setting	8
Emergency condition requiring rapid action	8

PPE=personal protective equipment; RCAT=The Royal College of Anesthesiologists of Thailand; CPG=clinical practice guideline

Table 5. Reasons causing differences between hospital's own clinical practice guideline and The Royal College of Anesthesiologists of Thailand clinical practice guideline (n=58)

Differences	Number of subjects mentioning the reason
Inadequate resources or PPE	30
Different hospital setting	16
Human errors or conflict in the workplace	8
Health care personnel staffing shortage	4

PPE=personal protective equipment

reasons for the former question. While different hospital settings and inadequate resources were attributed to the latter. All answers were summed up and are displayed in Table 4 and 5.

Discussion

The COVID-19 pandemic poses itself as a major public health burden with a significant impact on the healthcare system. Healthcare professionals, especially those who deal with patients in critical care units and those who perform aerosol-generating procedures such as intubation and airway management are more likely to contract the disease. Due to the heavy burden of COVID-19, practice of anesthesiology was affected around the world[9,13]. From the present study questionnaire, the authors selected interesting information and derived their own evidence-based interpretation tailor-made for Thailand's specific context and current situation. The authors will explore how participants' demographic profile correlate with the authors' COVID-19 test questions, how practice guidelines can be more applicable, how different settings affect the availability of PPE, and how participants actually practice in the real-world setting.

The present study is one of the first to conduct in Thailand regarding COVID-19 and anesthesiology practice. However, due to the nature of self-administered questionnaire, participation and response bias may be present. For instance, the target population who do not encounter problems regarding anesthesiology practice in COVID-19 era might feel less compelled to complete a questionnaire compared to their counterparts. To mitigate response bias, especially courtesy bias, the authors choose not to collect personal identifier data of the participants. Nevertheless, false data and duplication may arise.

While a paper questionnaire has its merits, in COVID-19 era, an online survey might be more practical due to contactless distribution, budget-

friendliness, and no transit loss. However, the authors cannot guarantee total coverage of the target population since convenience sampling was used and the exact percentage of social media platform usage in the target population could not be determined, despite an online platform being the RCAT recommended channels for news announcement.

Nine questions were used to evaluate the baseline knowledge of recommended GA practices in infected patients. The average score did not statistically differ across groups with and without training and groups with or without prior knowledge of RCAT CPG. This might be due to the fact that participants not receiving training and not knowing that CPG existed were outnumbered since 55.4% of all participants received training and 80.5% knew about RCAT CPG. However, the groups that exhibited a different average score were being stratified by position and year of experience ($p<0.01$ and 0.001, respectively). The authors hypothesize that anesthesiologists are more familiar with current practice than anesthesiology residents and anesthetist nurses because they frequently participate in academic activities such as annual academic conferences. Therefore, public relations of current best practice should target everyone in the field of anesthesiology, especially in non-anesthesiologist groups. When group the average score by years of experience, the authors found that the score was not correlated with years of experience (Pearson correlation coefficient of –0.204). Instead, participants with the highest average score have working experience of 2 to 3 years, followed by 4 to 10 years, and 0 to 1 year group, respectively, probably because they still do not have enough clinical exposure, and 11 years or more group because they might focus more on their service than keeping up with current practice. However, the overall score of participants is quite high and the difference between highest and lowest mean score is less than 1, which should not critically affect clinical decision of the participants.

Out of all CPG knowledge questions, there is one controversial question, "Who should perform intubation in COVID-19 suspected/confirmed cases?". Fifty-two-point-five-nine percent of all participants answered "most experienced personnel" while the other 47.41% answered "anesthesiologist". The correct response according to RCAT CPG is that the most experienced personnel should be the one who performs intubation in such cases to minimize errors and reduce contamination. However, the authors can assume that anesthesiologists would be the most experienced person in all settings, especially, if the number of previous intubated cases were considered. Nevertheless, there might be exceptions, such as in a setting without an anesthesiologist stationed where the best context-sensitive answer would be the most experienced personnel. The authors suggest tailor-making the guideline according to each hospital setting to improve its applicability and adherence.

Ninety-five-point-six-percent of participants' hospitals had its own CPG on COVID-19 patient intubation. This is probably due to the fact that RCAT CPG recommendation might not be fully compatible with participants' workplace environment as supported by their answers toward the open-ended questions when asked about the reasons that prevent their hospitals from following RCAT CPG. However, the distribution of participants' scores were the same across both groups, whether their hospital had its own CPG or not. It can be implied that hospitals' own guidelines are mostly in line with RCAT CPG.

PPE is one of the most important tools when combating infectious diseases[14]. Some PPE are more important now than ever due to their protective spectrum that covers aerosol transmission. From the authors' literature review, one study conducted in Thailand during the second trimester of 2020 about the usage of PPE in anesthesiology practice in the early COVID-19 pandemic revealed the shortage of PPE due to the lack of preparedness and response plan[15]. One year later, the present study was conducted to evaluate the preparedness and the availability of PPE in Thailand. According to the present study AIIR, PAPR, VL, single-use plastic Macintosh blades, and COVID-19 PCR diagnosis test were more accessible in specialty hospitals than non-specialty or private hospitals. This might be because specialty hospitals have more specialists, larger budgets, higher patient capacity, and the need to use more advanced equipment in more complex procedures. Non-specialty hospitals may not have as much budget but they can refer complicated patients beyond their capacity to more specialized hospitals.

A VL with a single-use plastic Macintosh blade is recommended to be used in COVID-19 case as stated in the guideline. However, there was a huge discrepancy between availability of a single-use plastic Macintosh blade and a VL with the latter being more accessible. Only 47% of the participants reported that their hospital provided a disposable plastic Macintosh blade, making it almost impossible to follow the guideline. The obvious solution would be for the associated organization to provide more

equipment as soon as possible. In the meantime, finding ways to reuse the equipment would be the second-best option in the resource-limited setting. Studies showed reusable laryngoscope blades could be the source of cross infection in the operating room[16]. A proper disinfection method and maintenance routine should be emphasized and added in the guideline for health care personnel to follow to reduce the risk of contamination of pathogenic microorganisms and prevent transmission of diseases, especially COVID-19.

To combat and contain COVID-19 spreading, CCSA assigned each province into four zones, according to infection control status ranking from most strict control as dark red zone to lowest control as yellow zone. Analyses results showed that the availability of single-use plastic Macintosh blade, COVID-19 PCR and rapid test, preoperative screening for COVID-19, and VL were different in each zone. Surprisingly, the red zone had the least PCR test available, while a rapid test was the most readily available. This might be because the majority of red zone provinces have a large population, requiring more tests to be done, which rapid antigen test was more suitable. Preoperative COVID-19 screening tests were sufficiently provided in only half of the hospitals in the yellow zone, in contrast with screening readily available in every hospital in other zones. Although yellow zone provinces had the least prevalence of COVID-19 patients, the spread can escalate at any time. Therefore, enough screening tests should be provided as a universal safety measure to lower the risk of undiagnosed patients infecting health care workers instead of investing only in protective gears, which required more resources.

In the last section of the questionnaire, participants were asked to choose which PPE they will use during a preoperative assessment session in each scenario, as infected, not infected, and unknown COVID status patient. According to the WHO list of aerosol-generating procedures, preoperative assessment is not considered as an aerosol-generating procedure[17]. Using WHO guideline for recommended PPE usage as a guidance[18], in case of a positive COVID infection patient, 87.25% of participants chose to use protection consisting of at least surgical mask, gown, gloves, and eye protection. While only 67.73% used PPE appropriately in case of unknown infection status, which in high prevalent areas should be treated as patients with COVID-19 infection. Meaning, despite having the knowledge of preventive measures, participants might not fully apply them in the real practice. This could be the effect of PPE shortages, forcing participants to perform substandard practice. Another crucial factor for infection prevention and control practice is adequate training for healthcare workers to be competent in using PPE in a correct manner when indicated and do not become a source of contamination to the wearer.

In conclusion, the majority of the participants have sufficient knowledge regarding RCAT CPG and are able to use PPE correctly in confirmed COVID-19 cases according to guidelines by WHO. However, from participants' point of view, the scarcity of PPE, inability to timely screen for COVID-19 preoperatively, conflicts in the workplace, human errors, and unclear hospital policy might be the reasons that prevent participants' hospital from following RCAT CPG. Hence, as a part of effective infection control in healthcare personnel, the authors believe three factors that play large roles are previous training, knowledge of COVID-19 transmission, and adequate supply of PPE.

What is already known on this topic?

COVID-19 is a newly emerging global pandemic with enormous impact on every aspect of medical care, especially anesthesiology practice. In April 2020, RCAT published CPGs about effective infection control protocol to limit transmission of COVID-19.

What this study adds?

While anesthesiology personnel have sufficient knowledge regarding RCAT CPG, inability to follow the guideline may be caused by inadequate resources.

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Conflicts of interest

The authors declare that there is no conflict of interests.

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