

# Current practice pattern among anaesthesiologists for difficult airway management: A nationwide cross-sectional survey

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## ABSTRACT

**Background and Aims:** The practice patterns for airway management vary among anaesthesiologists, depending on various setups and geographical divides. This survey assessed practice patterns in unanticipated difficult intubation and cannot intubate or cannot ventilate (CICV) situations/complete ventilation failure among Indian anaesthesiologists'.

**Methods:** A validated questionnaire of 22 items related to practice preferences for airway management among anaesthesiologists was sent to Indian Society of Anaesthesiologists members online through Google Forms and distributed manually to delegates in continuing medical education programme. **Results:** A total of 535 responses were obtained and analysed. In unanticipated difficult laryngoscopy and intubation, the order of preference for alternative airway devices was video laryngoscope (VL, 60.1%), intubating laryngeal mask airway/laryngeal mask airway (23.5%), fiberoptic bronchoscope (13.5%) and optical stylets (1.2%). Advanced difficult airway devices were unavailable in most nursing homes and government non-teaching hospitals. Seventy per cent of respondents experienced CICV situations at least once, most during head and neck surgeries. In CICV situations, the order of choice for the front-of-neck airway access was cricothyroidotomy (CT) by narrow bore cannula (48.9%), tracheostomy by the surgeon (30%), Seldinger CT (12.5%), open surgical CT (5.4%) and scalpel bougie CT (3.2%). **Conclusion:** The VL was the most preferred airway rescue device in unanticipated difficult intubation, and intravenous catheter cricothyroidotomy was the most selected technique in CICV situations.

**Key words:** Airway management, anaesthesiologists, cannot intubate or ventilate, complete ventilation failure, intubation, practice, questionnaire survey

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## INTRODUCTION

Managing a difficult airway can be a challenge even for an experienced anaesthesiologist as 'Cannot Intubate, Cannot Ventilate (CICV)' or 'Complete Ventilation Failure (CVF)' situations are rare but present as life-threatening emergencies.<sup>[1,2]</sup> In such difficult airway situations, following the steps from the All India Difficult Airway Association (AIDAA), American Society of Anesthesiologists (ASA) and Difficult Airway Society (DAS) guidelines may help prevent adverse events like hypoxic brain damage and death.<sup>[1-3]</sup> In difficult airway (DA) and CICV/ CVF, success depends upon detailed pre-operative airway assessment and planning, proper training of

practitioners for the execution of the plans, availability of essential airway rescue devices and experienced individuals to tackle the situation.<sup>[4,5]</sup>

The practice patterns among Indian anaesthesiologists vary considerably depending on various setups

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and geographical divides. The primary objective of this survey was to report practice patterns among anaesthesiologists in the unanticipated DA and CICV/CVF conditions. The secondary objectives were to find comfort in using different airway devices and the availability of DA devices across various setups.

## METHODS

The survey was approved by the Institutional Ethics Committee for biomedical health research (vide approval number DYP/IECBH/2021/121, dated 7 June 2021) and was registered with the Clinical Trial Registry - India (vide registration number CTRI/2021/06/034283; <http://ctri.nic.in>). The study was carried out by the principles of the Declaration of Helsinki, 2013.

A literature search on web-based electronic databases, including PubMed, Google Scholar, Scopus, Cochrane and Embase was done to frame the questionnaire using the keywords 'difficult intubation, airway management, CICV, CVF, emergency cricothyroidotomy, and survey' in various combinations. In addition, AIDAA, ASA and DAS guidelines were referred to for designing the questionnaire. Initially, 19 questions were prepared based on searched literature. The questionnaire was later expanded to 22 questions after an expert suggested reframing a few questions. The questionnaire was then sent to 20 anaesthesiologists with more than 10 years of experience in anaesthesiology. These experts were asked to evaluate each question for relevance, simplicity, clarity and ambiguity and rate it on a 4-point scale (1 = not relevant, 2 = somewhat relevant, 3 = relevant and 4 = highly relevant). Sixteen out of 20 experts responded to the questionnaire. The item-wise content validity index (I-CVI) was calculated for each question (I-CVI = the number of experts rating questions as 3-4 divided by the total number of experts), and scale level content validity index (S-CVI)/average or average congruency percentage was also calculated based on the methods described by Polit *et al.*<sup>[6]</sup> Modified Kappa Statistics (MKS) was calculated using the probability of chance agreement on relevance. The questions with I-CVI >0.78 and MKS ≥0.75 were retained in the final version. The final version of the questionnaire was piloted among ten anaesthesiologists (who were not involved in validating the questionnaire) in the authors' department for feasibility.<sup>[7,8]</sup>

The final questionnaire included three sections. Section A included collecting general demographic data like age,

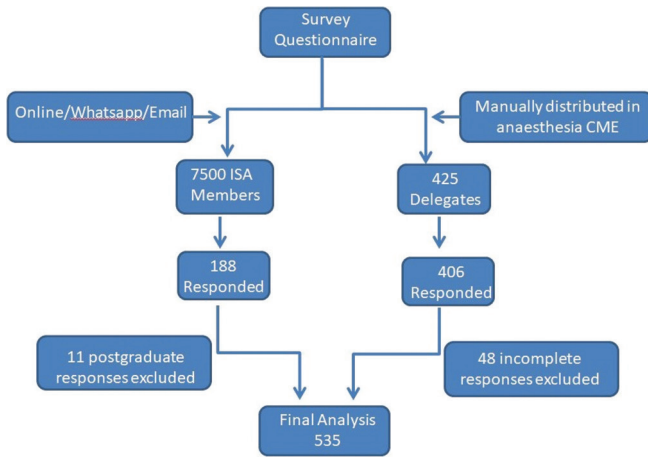
gender, years of experience, position in the institute, type of institute and area of practice. Section B aimed to assess the preferences among practitioners while tackling unanticipated difficult intubation, which included routine pre-operative airway assessment practices, availability of DA gadgets, comfort levels with these alternate devices and apnoeic oxygenation practices. Section C focused on eliciting data on the number of times the participants had faced CICV/CVF scenarios in their practice, including conversion rate to tracheostomy, first and second choices for airway management in the CICV/CVF scenario, comfort levels in using those devices, their familiarity with DA guidelines and attendance in airway workshops in the last 5 years. The level of comfort with the airway technique was asked on a 4-point scale (1 = not consider using, 2 = somewhat uncomfortable, 3 = somewhat comfortable, 4 = very comfortable).

The questionnaire form was manually distributed to 425 anaesthesiologists who attended continuing medical education programmes. The Google Forms questionnaire link was distributed between 16 July 2021 and 31 August 2022 through email and WhatsApp messenger to 7500 members from the Indian Society of Anaesthesiologists pool. The online link was not sent to those who had responded manually to prevent duplicate responses. This link was recirculated multiple times. The answer to the questionnaire manually and online was voluntary, and confidentiality was maintained throughout the survey.

The sample size of 519 was calculated by considering a confidence level of 95%, a margin of error of 4.5% and a proportion of people choosing VL obtained from the previous study as 51.8%.<sup>[4]</sup> The Chi-square test tested all categorical variables statistically, and  $P < 0.05$  was considered significant. The 4-point comfort score for devices used in difficult intubation airway and front-of-neck access was converted into a binary variable. The uncomfortable level included scores 1 and 2, whereas the comfortable level included scores 3 and 4. All data analysis was done using Microsoft Excel 2013 (USA) and Statistical Package for the Social Sciences (SPSS Inc. Chicago, IL, USA) software.

## RESULTS

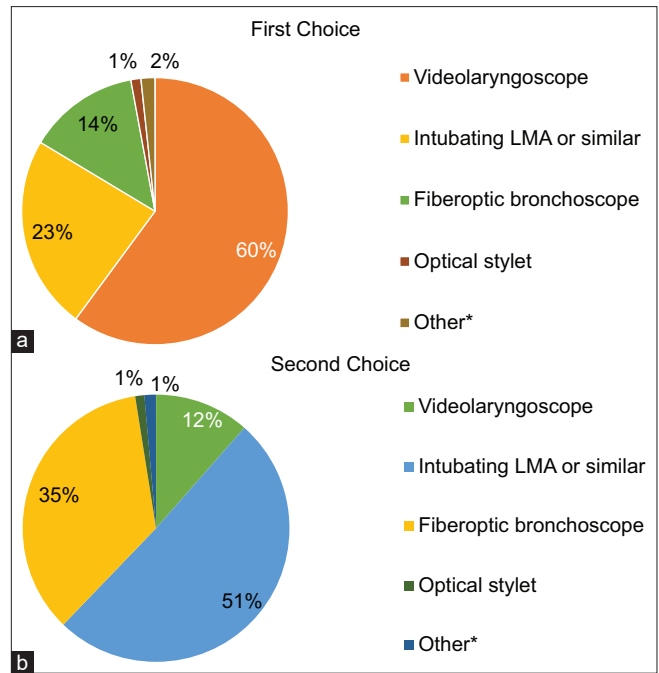
Five hundred and thirty-five responses were analysed after excluding 11 postgraduate residents online and 48 incomplete manual responses [Figure 1]. The demographic data are summarised in Table 1. Alternative device preferences varied in unanticipated difficult



**Figure 1:** Study flow diagram. CME=Continuing Medical Education

laryngoscopic intubation [Figure 2a and b]. While using advanced airway rescue devices, 69.5% were comfortable with an awake fiberoptic bronchoscope (FOB), 59% with an asleep FOB, 74.6% with intubating laryngeal mask airway (ILMA) and 89.9% with a video laryngoscope (VL), while the majority (80.1%) were uncomfortable with retrograde wire set and the optical stylet. Almost all respondents performed pre-operative airway assessments. Apnoeic oxygenation is practised by 29.5% of respondents in all their intubations, and 85% used oxygenation via nasal cannula in anticipated difficult intubation. Trans-nasal humidified rapid insufflation ventilatory exchange was used by 25% of respondents in anticipated DA. In the CICV situation, the choice of rescue technique preference varied [Figures 3a and b]. Most respondents were not comfortable with cricothyroidotomy (CT) by any method. Thirty percent of the anaesthesiologists were satisfied with CT by intravenous (IV) catheter, and 15% were comfortable with a tracheostomy. In our survey, 60% of respondents were aware of the DAS algorithm, 56% of AIDAA 2016 guidelines and 32% of the ASA DA algorithm. Sixty-two percent of respondents had attended DA workshops in the last five years. Experience gained from hands-on DA workshops resulted in increased comfort with FOB intubation, ILMA and VL gadgets. However, it was not statistically significant with optical stylet and retrograde wire set [Table 2]. With the front-of-neck airway, a higher level of comfort with the technique was noted amongst those who had attended DA hands-on workshop, but it was not statistically significant [Table 2].

We found a statistically significant correlation ( $P = 0.004$ ) between years of clinical experience and comfort levels by using ILMA. Still, it could not be



**Figure 2:** (a) First choice of alternative airway device in an unanticipated Difficult Airway. (b) Second choice of alternative airway device in an unanticipated Difficult Airway. LMA-laryngeal mask airway

Table 1: Demographic data		
	Number	Percentage
Age		
25–34 years	118	22.1
35–44 years	199	37.2
45–54 years	106	19.8
55–64 years	91	17.0
Years in practice		
0–4 years	66	12.3
5–9 years	78	14.6
10–19 years	201	37.5
20+ years	190	35.6
Position in Institute		
Consultant/Professor	331	61.9
Junior Consultant/Associate Professor	128	23.9
Senior Resident	76	14.2
Type of Institute		
Autonomous Institute	60	11.2
Corporate Hospital	134	25.0
Government Non-teaching	7	1.3
Medical College	214	40.0
Other	120	22.4
Area of practice		
Rural	9	1.7
Semi-urban	66	12.3
Urban	460	86.0

replicated with other devices like FOB ( $P = 0.183$ ) and VL ( $P = 0.828$ ). With the optical stylet and the retrograde wire set, there appeared to be no correlation between years of experience and confidence in handling them. In the CICV/CVF situation, years of experience

**Table 2: Correlation between comfortability and difficult airway workshop attendance in unanticipated difficult intubation devices and FONA**

	Have you attended a difficult airway workshop in the last five years?		Chi-square ( $\chi^2$ )	df	P
	No n (%)	Yes n (%)			
Awake FOB intubation					
Not comfortable	60 (36.8%)	103 (63.2%)	0.13	1	0.720
Comfortable	143 (38.4%)	229 (61.6%)			
Asleep FOB intubation					
Not comfortable	94 (42.9%)	125 (57.1%)	3.90	1	0.048
Comfortable	109 (34.5%)	207 (65.5%)			
Intubating LMA					
Not comfortable	63 (46.3%)	73 (53.7%)	5.44	1	0.020
Comfortable	140 (35.1%)	259 (64.9%)			
Video laryngoscope					
Not comfortable	33 (61.1%)	21 (38.9%)	13.69	1	<0.001
Comfortable	170 (35.3%)	311 (64.7%)			
Stylet					
Not comfortable	196 (37.9%)	321 (62.1%)	0.01	1	0.933
Comfortable	7 (38.9%)	11 (61.1%)			
Retrograde wire set					
Not comfortable	171 (38.3%)	275 (61.7%)	0.18	1	0.67
Comfortable	32 (36.0%)	57 (64.0%)			
CT by intravenous catheter method					
Not comfortable	148 (39.3%)	229 (60.7%)	0.94	1	0.334
Comfortable	55 (34.8%)	103 (65.2%)			
CT by wire guide method (Seldinger)					
Not comfortable	143 (38.4%)	229 (61.6%)	0.13	1	0.72
Comfortable	60 (36.8%)	103 (63.2%)			
CT by Scalpel open surgical method					
Not comfortable	158 (38.7%)	250 (61.3%)	0.45	1	0.504
Comfortable	45 (35.4%)	82 (64.6%)			
CT by Scalpel Bougie method					
Not comfortable	161 (39.8%)	244 (60.2%)	2.32	1	0.128
Comfortable	42 (32.3%)	88 (67.7%)			
Tracheostomy					
Not comfortable	127 (36.5%)	221 (63.5%)	0.01	1	0.933
Comfortable	76 (40.6%)	111 (59.4%)			

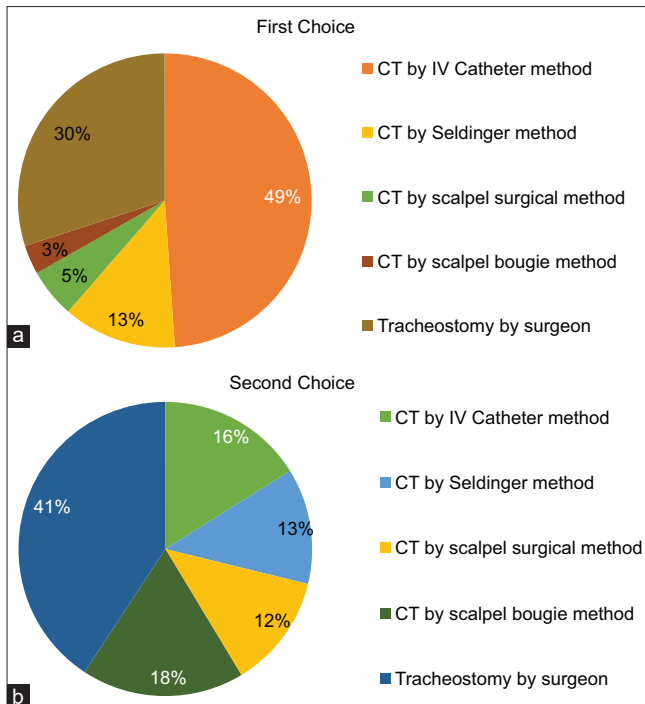
Data represented as Number (Percentages). FOB=Fibreoptic bronchoscope, LMA=Larngal Mask Airway, CT=Cricothyroidotomy

showed a significant positive statistical correlation with CT by cannula ( $P < 0.001$ ) and the Seldinger method ( $P = 0.049$ ). In contrast, open surgical CT and tracheostomy also had a favourable clinical correlation with experience, but it was not statistically significant.

Across all operation theatre setups, basic DA devices like McCoy blade, bougie, supraglottic airways and tracheostomy trays were mainly available. The rural and semi-urban centres were deficient in advanced DA devices like VL, FOB, jet ventilation or cricothyroidotomy set. The lack of availability of advanced airway devices was also noted in nursing homes and government non-teaching hospitals. Most medical colleges, corporate hospitals and autonomous institutes showed the availability of at least one or more advanced airway devices [Figure 4].

## DISCUSSION

This survey was conducted to document the practice preferences in unanticipated difficult intubation and CICV/CVF situations among Indian anaesthesiologists. The clinical pre-operative airway assessment was done regularly. Similar findings were noted in previous studies.<sup>[5,9]</sup> High awareness of apnoeic nasal oxygen insufflation and non-adherence to following it in clinical practice was reported, similar to Kaniyil *et al.*<sup>[10]</sup> The use of advanced airway management reported in this study was similar to other reports.<sup>[4,5,11,12]</sup> Our survey showed that most anaesthesiologists are comfortable with VL, ILMA and awake FOB, with a declining trend towards using asleep FOB, retrograde wire set and optical stylet.<sup>[13]</sup> However, the steep learning curve involved in the use of asleep FOB, retrograde



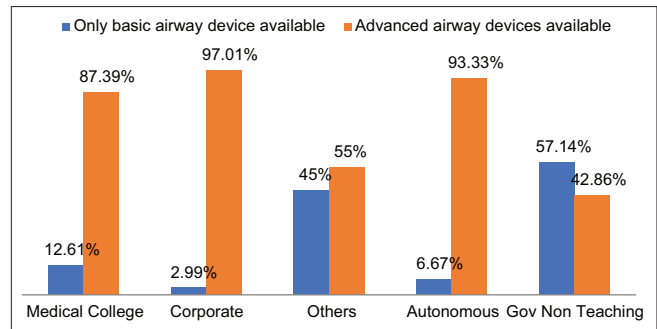
**Figure 3:** (a) First choice of rescue procedure in a CICV situation. (b) Second choice of rescue procedure in a CICV situation. CICV = Cannot Intubate, Cannot Ventilate, CT-cricothyroidotomy, IV-intravenous

wire set and optical stylet proved detrimental to their widespread use. Attending DA workshops also resulted in higher comfort levels among anaesthesiologists. The increased use of simulators and manikins in the DA and repeated surgical airway training workshops improve the anaesthesiologist's confidence, skills retention, and timely decision-making and increase the success rate.<sup>[14]</sup>

In our survey, most respondents chose a narrow bore cannula or IV catheter method for cricothyroidotomy, followed by tracheostomy, as the first choice in CICV/CVF. This high preference for emergency tracheostomy in CICV might be due to the majority of respondents facing it in head and neck surgeries, the availability of surgeons, and the non-availability of other airway experts or gadgets.<sup>[15]</sup>

In our survey, rural and semi-urban centres were found deficient in the availability of advanced DA devices, mostly nursing homes and government non-teaching hospitals. High purchase costs are the key reason behind the non-availability of these instruments in smaller setups.<sup>[5]</sup>

This survey has a few limitations, such as the inability to reach all anaesthesiologists in India, leading to non-respondent bias. India is a vast country



**Figure 4:** Percentage availability of advanced airway devices among setups. Gov = Government

geographically with varying resource availability and financial strata divide leading to different standards of anaesthesia care and varying practices between rural and urban centres, between the nursing home and tertiary institutes. Most (98.5%) of the responses were from urban and semi-urban areas. Manual form respondents were majorly from one specific geographical area, so this cannot be extrapolated to the practice preference across the country.

## CONCLUSION

Most participants' preferred choice when encountering unanticipated difficult intubation was a VL, and their first choice for CICV situations was CT using the IV cannula method.

### Study data availability

De-identified data may be requested with reasonable justification from the authors (email to the corresponding author) and shall be shared.

### Financial support and sponsorship

Nil.

### Conflicts of interest

There are no conflicts of interest.

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## **APPENDIX 1: Survey Questionnaire**

### **“Current practice preferences of Indian Anaesthesiologists in difficult intubation and “Cannot intubate, cannot ventilate” situations: A nationwide survey**

**Dear Anaesthesiologist,**

We are Anaesthesiologists working in Dr.D.Y.Patil Medical College,Navimumbai.We invite you to participate in this nationwide survey.Your valuable feedback is very important to us as this data will serve as the the platform for comprehensive study of practical preferences amongst Anaesthesiologists in difficult intubation and cannot intubate cannot ventilate situations. We fully understand that whatever is ideal may not be practical for various reasons.We endeavour to make a sincere attempt to identify practice pattern amongst Anaesthesiologists across India.Please note that your participation in this survey is completely optional and the data collected will be used for medical publication.We assure you that confidentiality will be maintained at every step of the way.

#### **SECTION A: DEMOGRAPHICS**

1. Age
  - 25-34 Years
  - 35-44 years
  - 45-54 years
  - 55-64 years
  - 65 years
  
2. Gender
  - Male
  - Female
  
3. Years in practice
  - Resident
  - 0-4 years
  - 5-9 years
  - 20+ years
  
4. Position in Institute
  - Consultant / Professor
  - Faculty
  - Senior resident
  - Postgraduate Student
  
5. Type of Institute
  - Medical College
  - Corporate Hospital
  - Government Non Teaching
  - Autonomous Institute
  - Other -----
  
6. Area of practice
  - Urban
  - Semi urban
  - Rural

**SECTION B: DIFFICULT INTUBATION SCENARIO**

7. You have a 65 year old man for elective colonic resection. After induction, you failed intubation twice with direct laryngoscopy and with a bougie due to anterior larynx. Can mask ventilate. SpO2 98%. You have decided to move to alternative device. What would be your first and second choice of device.

Device	First	Second
Flexible Fiberoptic bronchoscope		
Intubating laryngeal mask airway (LMA) or similar		
Videolaryngoscope		
Optical Stylet		
Others (please specify)		

8. Have you personally used the following intubation devices/ techniques?

Devices/Technique	On Mannequin	On Patient	Haven't Used
Awake fibreoptic bronchoscope (FOB) intubation			
Asleep FOB intubation			
Intubating LMA or similar			
Videolaryngoscope			
Optical Stylet			
Retrograde wire set			

9. What is your level of comfort using these devices/ techniques? (check one)

Devices/Technique	Not consider using	Somewhat uncomfortable	Somewhat comfortable	Very comfortable
Awake FOB intubation				
Asleep FOB intubation				
Intubating LMA or similar				
Videolaryngoscope				
Optical Stylet				
Retrograde wire set				

10. Do you practice apnoeic oxygenation using nasal cannula during all intubation

- Yes
- No

11. Do you practice apnoeic oxygenation during anticipated difficult airway ?

- Yes
- No

12. Have you used THRIVE (transnasal humidified rapid Insufflation ventilatory exchange) in anticipated difficult airway

- Yes
- No

13. Which Difficult Airway Rescue Device do you have in your OT setup?

- McCoy blade
- Stubby handle
- Bougie
- Supraglottic Airway Device
- Intubating LMA
- Videolaryngoscope
- Fibreoptic scope



- Seldinger's cricothyroidectomy (CT) set
- Tracheostomy tray
- Transtracheal jet ventilation

14. Airway examinations routinely carried out by you before intubation

- Mallampati scoring
- Mouth opening
- Thyromental distance
- Upper lip bite test
- Other \_\_\_\_\_

**SECTION C: CANNOT INTUBATE, CANNOT VENTILATE (CICV) SITUATIONS-**

15. How many times did you come across CICV?

\_\_\_\_\_

16. Please indicate in which of the following clinical situations did you come across CICV?

- Elective surgery
- Emergency surgery
- Obstetrics
- Trauma
- Burn
- Bariatric surgery
- Head and neck surgery
- Intensive care unit
- Emergency department

17. In a CICV situation if the patient's SpO<sub>2</sub> is 50% and you have decided to go for a surgical airway, what would be your first and second choice device?

Devices/technique	First	Second
Cricothyroidectomy by wire guide method (Seldinger)		
Cricothyroidectomy by IV catheter method		
Cricothyroidectomy by scalpel open surgical method		
Cricothyroidectomy by scalpel bougie method		
Tracheostomy by Surgeon		

18. Have you personally used the following CICV device/ technique?

Devices/Technique	On Mannequin	On Patient
Cricothyroidectomy by IV catheter method		
Cricothyroidectomy by wire guide method (Seldinger)		
Cricothyroidectomy by scalpel open surgical method		
Cricothyroidectomy by scalpel bougie method		
Tracheostomy		

19. What is your level of comfort using these devices/ techniques? (check one)

<b>Devices/Technique</b>	<b>Not consider using</b>	<b>Somewhat uncomfortable</b>	<b>Somewhat comfortable</b>	<b>Very comfortable</b>
Cricothyroidectomy by IV catheter method				
Cricothyroidectomy by wire guide method (Seldinger)				
Cricothyroidectomy by scalpel open surgical method				
Cricothyroidectomy by scalpel bougie method				
Tracheostomy				

20. Are you familiar with the exact steps of CICV protocol in the following

- American Society of Anesthesiologists Difficult Airway Algorithm 2013
- Difficult Airway Society Algorithm 2015
- All India Difficult Airway Association 2016

21. Have you attended a difficult airway workshop in last 5 years?

- Yes
- No

22. Out of the total number of difficult intubation cases, how many patients could not be intubated and required emergency tracheostomy? \_\_\_\_\_