

# Emergency front of neck airway: What do trainers in the UK teach? A national survey

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## Abstract

**Background and Aims:** Front of neck airway (FONA) is the final step to deliver oxygen in the difficult airway management algorithms. The Difficult Airway Society 2015 guidelines have recommended a standardized scalpel cricothyroidotomy technique for an emergency FONA. There is a wide variability in the FONA techniques with disparate approaches and training. We conducted a national postal survey to evaluate current teaching, availability of equipment, experienced surgical help and prevalent attitudes in the face of a can't intubate, can't oxygenate situation.

**Material and Methods:** The postal survey was addressed to airway leads across National Health Service hospitals in the United Kingdom (UK). In the anesthetic departments with no designated airway leads, the survey was addressed to the respective college tutors. A total of 259 survey questionnaires were posted.

**Results:** We received 209 survey replies with an overall response rate of 81%. Although 75% of respondents preferred scalpel cricothyroidotomy, only 28% of the anesthetic departments considered in-house FONA training as mandatory for all grades of anesthetists. Scalpel-bougie-tube kits were available in 95% of the anesthetic departments, either solely or in combination with other FONA devices.

**Conclusion:** The survey has demonstrated that a majority of the airway trainers in the UK would prefer scalpel cricothyroidotomy as emergency FONA. There is a significant variation and deficiency in the current levels of FONA training. Hence, it is important that emergency FONA training is standardized and imparted at a multidisciplinary level.

**Keywords:** Airway management, intratracheal, intubation, surveys and questionnaires

## Introduction

A can't intubate, can't oxygenate (CICO) situation, although rare, can be catastrophic and result in hypoxic brain injury and death.<sup>[1]</sup> In such a situation, an emergency front of neck airway (FONA) is a lifesaving procedure. The Difficult Airway Society (DAS) 2015 guidelines recommend a standardized scalpel cricothyroidotomy technique as the final pathway to gain emergency FONA.<sup>[2]</sup>

Since the inception of CICO crisis algorithms, cannula cricothyroidotomy techniques have been taught alongside scalpel techniques as emergency FONA procedures.<sup>[3]</sup> There has been much debate regarding the best rescue technique for FONA in a CICO crisis.<sup>[4]</sup> Proponents of the cannula cricothyroidotomy technique cite familiarity of anesthetists with cannulae, their minimally invasive nature, simplicity, and reduced chances of bleeding as some of its advantages.<sup>[5]</sup> Scalpel cricothyroidotomy as the sole FONA technique is considered to be straightforward, minimizes "analysis–paralysis" dilemmas, involves a few steps which

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utilize simple and universally available equipment, has a higher success rate, and can be rapidly performed.<sup>[4]</sup>

The fourth national audit project (NAP4) of the Royal College of Anaesthetists (RCOA) and the DAS reported a comparatively higher success rate with emergency scalpel cricothyroidotomy techniques.<sup>[6]</sup> There is a risk of significant barotrauma, especially with upper airway obstruction, equipment failure, aspiration risk, and ventilation issues with cannula and needle cricothyroidotomies.<sup>[6,7]</sup>

The overall success of an emergency FONA may be reliant on provision of regular, multidisciplinary training sessions for CICO-simulated scenarios.<sup>[8]</sup> DAS 2015 guidelines recommend regular training of anaesthetists to strengthen and retain emergency FONA technical and psychomotor skills.<sup>[2]</sup> Assessment of the cricothyroid membrane (CTM) should be integral to a thorough airway evaluation particularly when anticipating difficulty.<sup>[9,10]</sup>

With a view to assessing the impact of national recommendations,<sup>[2,8]</sup> we conducted a national survey to evaluate the current training in emergency FONA, preferred CICO rescue technique, clinical approach to assessment of CTM, FONA equipment availability, and accessibility to surgical aid in a CICO situation.

## Material and Methods

A survey questionnaire consisting of total nine questions was designed in Microsoft Word®. This included respondent details, clinical approach to assessment of front of neck, details of FONA training, availability of FONA equipment, and an ENT surgeon to help with FONA in a CICO situation. The initial draft survey questionnaire was circulated to the anaesthetists in the authors' local departments. The comments and feedback received were incorporated into the final questionnaire [Appendix 1]. The survey questionnaire was reviewed by the local research and development department, who considered this as a service evaluation project and formal approval by the National Health Service (NHS) Ethics Committee was not required.

A preliminary list of NHS hospitals and trusts in the United Kingdom (UK) was obtained from the medical education department, University Hospital Coventry, UK. This list was further cross-checked for completeness with the list of hospitals obtained from the Health Services Research Centre, RCOA. Finally, we searched for the airway lead names for each trust or hospital on the RCOA database (<http://www.nationalauditprojects.org.uk/NAPAirwayLeads>), accessed in July 2016. Excluding the duplicates, we could find named airway leads for 193 NHS trusts or hospitals. In NHS trusts with more than one airway lead, we selected only one

lead on an alphabetical name order preference, to avoid duplication. The NHS hospitals in the UK with resources for anesthetizing adults were included in the survey. This methodology has been previously used in a national survey.<sup>[11]</sup>

The survey was done through postal correspondence addressed to the airway leads.<sup>[12]</sup> Each envelope consisted of a covering letter addressed to the respective airway lead, a survey questionnaire, and a prepaid return envelope. For the hospitals with no named airway lead at that time, the envelope was addressed to the college tutor. A total of 259 survey questionnaires were sent by post in November 2016, of which 193 were sent to the airway leads and 66 to the college. After 6 weeks, a second round of questionnaires was posted to the nonresponders. The nonresponders were further reminded through email and telephone calls wherever possible to improve the response rate. A final round of questionnaires was posted to the nonresponders of first and second round in February 2017. The survey was closed on March 31, 2017. The responses of returned questionnaires were entered in Microsoft Excel® spreadsheet and analyzed further.

## Results

We received a total of 209 completed survey questionnaires giving a response rate of 81%.

Of the total survey responses, 135 (65%) were from district general hospitals and 71 (34%) from teaching hospitals. Three responses were received from specialist hospitals. One hundred and fifty-two responses (73%) were from airway leads and 34 (16%) responses were from college tutors. Seventeen (8%) respondents had dual responsibilities as airway leads and college tutors. Of the others, one response was from a clinical director, one was sent by a consultant with an airway interest, and four respondents did not reveal their position.

Forty-two (20%) respondents palpate the CTM as a part of their routine airway assessment, whereas 163 respondents (78%) do not. Four respondents did not answer this question. Only 20 of the 42 respondents who palpate the CTM (10% of the total respondents) said they would use ultrasonography to identify and mark its position when it is clinically impalpable.

Scalpel cricothyroidotomy was chosen as the preferred technique by 157 (75%) respondents [Figure 1].

There was a wide variation in the responses regarding frequency of in-house FONA training [Figure 2]. In 58 (28%) departments, this training was mandatory for all grades of anaesthetists, whereas 144 (69%) respondents said it is not mandatory in their department. Seven respondents did not answer this question.

One hundred and eighty-nine (90%) respondents felt that the FONA training should be mandatory for all grades of anesthetists. Of those who felt it should be mandatory, the suggested frequency was annually (53%), once every 2 years (16%), once every 6 months (22%), and other responses varied from once in every 3 months to every 5 years.

Part task manikins such as Crico-Trainer “Frova”/Crico-Trainer “Adelaide” models (VBM Medizintechnik GmbH, Sulz am Neckar, Germany) and animal larynx are commonly used [Figure 3].

Ninety-six (46%) respondents stated that their departments provided formal FONA training for the theater team including nursing staff, surgeons, and operating department practitioners (ODPs). Among these departments that provided training for theater team, 38 (40%) made it available to only ODPs, 36 (38%) provided training to ODPs and theater nurses. Fourteen departments (15%) conducted multidisciplinary training days for ODPs, theater nurses, and surgeons. Three departments provided multidisciplinary training which included training provision to intensive care nurses and emergency department nurses. Five respondents did not elaborate on the constitution of the theater team for FONA training.

Scalpel-bougie-tube kits for emergency FONA were present in 198 (95%) difficult airway carts out of the 209 hospitals surveyed, either on their own or in combination with other FONA devices [Table 1]. Regarding the presence of 1 versus

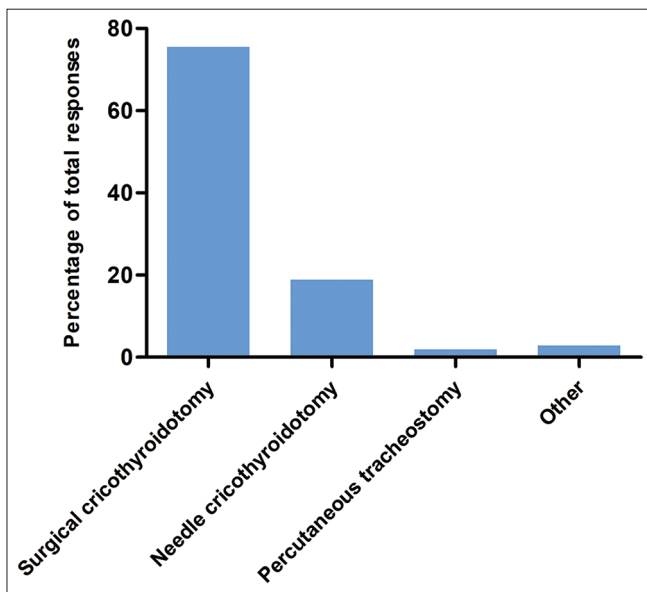
multiple FONA kits, 47 (22%) departments out of the 209 had only scalpel-bougie-tube kits and 2 (1%) departments possessed only Melker kits on their difficult airway carts.

One hundred and twenty-two (58%) respondents stated that the ENT surgeons were available in their hospitals to help with emergency FONA. Of these, 66 respondents (54%) stated that availability was during daytime hours only and 56 hospitals (46%) had a 24-h availability. Hence, overall 153 (73%) hospitals in the survey did not have a 24-h access to ENT services to help with emergency FONA.

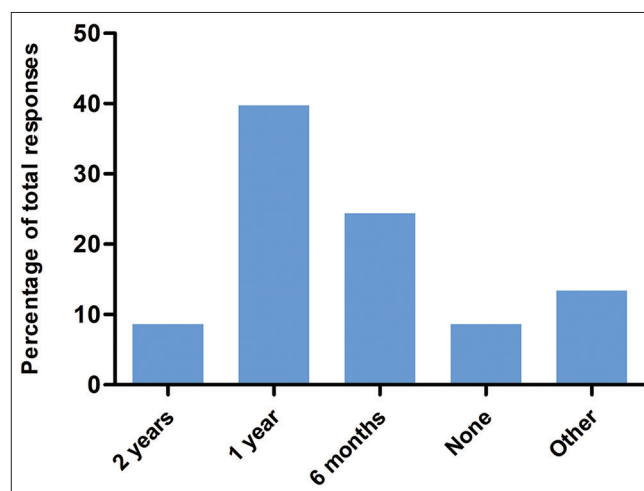
## Discussion

This national UK-wide survey has aimed to address the factors involved in a multidisciplinary team approach to a CICO situation and performance of an emergency FONA.

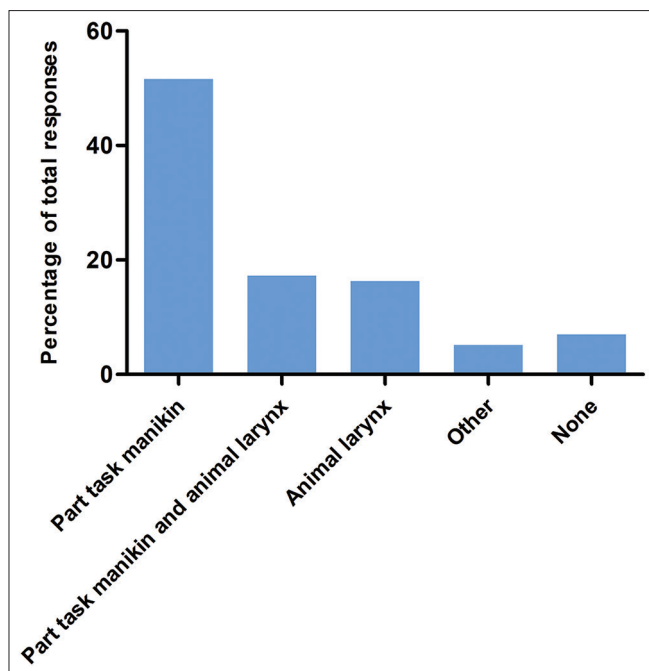
Three quarters of the respondents (75%) preferred scalpel cricothyroidotomy for emergency FONA. This suggests that majority of the departments have adopted the scalpel FONA technique described in the DAS 2015 guidelines.<sup>[2]</sup> The other techniques mentioned included all Wales airway group CICO guidelines<sup>[13]</sup> and A. Heard’s CICO algorithm.<sup>[3]</sup> Anesthetic specialty-specific evidence on FONA remains limited due to the rarity of a CICO crisis, and many anesthetists may only face this event once in their lifetime.<sup>[3,14,15]</sup> Valuable lessons have been learnt from NAP4<sup>[6]</sup> and observational studies on emergency airway management in other disciplines of military, prehospital, and emergency medicine.<sup>[16-18]</sup>



**Figure 1:** Preferred technique for an emergency front of neck access. The other techniques mentioned in the free text were the regional all Wales airway group CICO guideline (1), surgical help (1), A. Heard’s can’t intubate, can’t oxygenate algorithm (2)



**Figure 2:** Frequency of in-house front of neck access training. The other responses included on an ad hoc basis during clinical governance meeting (1), once a month (3), once in 2 months (4), once in 3 months (4), three to six monthly (2), thrice a year (1), once in 12–18 months (3), for trainees once a year and consultants once in 2 years (1), thrice a year for consultants and nine times a year for trainees (1), five times a year (1), in-theater tea-trolley front of neck access training on a regular basis (1), and front of neck access training during life support course only (1)



**Figure 3:** Front of neck access training models used. Other models that were selected include Trucorp® manikin (1), homemade model (1), a combined use of Simman® or AirSim® for can't intubate, can't oxygenate scenarios and part task manikins, and animal larynx for the hands-on component of the front of neck access training (2), did not specify the type of model used (16)

Ninety percent of the respondents agreed that acquisition of FONA technical skills should be made mandatory for all grades of anesthetists within their departments. There was varied opinion on the frequency of this mandatory training, with 53% reporting that it should be held on an annual basis. Skill retention period for scalpel-bougie-tube cricothyroidotomy has not yet been studied. However, in simulated studies, skill retention for cricothyroidotomy using Melker kit is at least 1 year.<sup>[19,20]</sup> Other studies using cannula cricothyroidotomy have shown a skill retention period between 3 and 6 months.<sup>[21,22]</sup>

A multidisciplinary approach to FONA training has been provided in only 46% of departments surveyed. Besides anesthetists, this included other theater staff members such as ODPs, theater nurses, and surgeons. There was, however, suboptimal staff representation from other acute areas such as the intensive care unit (ICU) and the emergency department. Clinical knowledge and skills tend to decline over a period of time in the absence of regular training.<sup>[23]</sup> This is seen more notably in airway management, where deliberate practice is necessary not only to maintain existing clinical expertise but also to continually enhance airway skills in keeping with the advancements in technology and equipment availability.<sup>[24]</sup> A previous survey on airway training in the UK has shown a wide variation in the content of airway workshops and failure to provide comprehensive training in several DAS guideline techniques.<sup>[25]</sup>

**Table 1: Availability of equipment in the difficult airway trolley for performing emergency front of neck airway**

FONA emergency airway equipment	Number of departments
SBT	47
SBT, Ravussin cannula and Manujet, Melker kit	42
SBT, Ravussin cannula and Manujet	34
SBT, Melker kit	29
SBT, Ravussin cannula and Manujet, Melker kit, rapid O <sub>2</sub> system	8
SBT, Quicktrach	7
SBT, Ravussin cannula and Manujet, Melker kit, Ventrain	5
Ravussin cannula and Manujet, Melker kit	5
SBT, Melker kit, rapid O <sub>2</sub> system	4
SBT, rapid O <sub>2</sub> system	3
SBT, Ravussin cannula and Manujet, Quicktrach	3
SBT, Melker kit, Ventrain	3
SBT, Ravussin cannula and Manujet, Ventrain	3
SBT, Ventrain	2
SBT, Ravussin cannula and Manujet, Melker Kit, Quicktrach	2
Melker kit	2
Ravussin cannula and Manujet	1
SBT, EasyTrach	1
SBT, Enk oxygen flow modulator set (Cook®)	1
SBT, Ventrain, Quicktrach	1
SBT, Ravussin cannula and Manujet, Enk oxygen flow modulator set (Cook®)	1
SBT, Melker Kit, rapid O <sub>2</sub> system, Ventrain	1
SBT, Ravussin Cannula and Manujet, Melker Kit, rapid O <sub>2</sub> system, Ventrain	1
Not answered	3

FONA: Front of neck airway, SBT: scalpel-bougie-tube

The routine palpation of CTM during airway assessment was done by 42 (20%) respondents in our survey. Among these, only 20 (10%) respondents used ultrasound to identify and mark the CTM in cases where it was found impalpable. Accuracy in the identification of CTM could be prone to clinical errors.<sup>[26]</sup> Achieving technical expertise in airway imaging could be pertinent in assessment of at-risk airways secondary to abnormal upper airway anatomy or where the CTM is found to be impalpable.<sup>[27,28]</sup> The adoption of regular targeted training in airway ultrasound during routine airway assessments could improve user confidence and may serve as a bailout measure in time-critical CICO situations where the front of neck anatomy is encountered to be difficult.<sup>[10]</sup>

A majority of the FONA training models used included part task manikins such as Crico-Trainer “Frova”/Crico-Trainer “Adelaide” models (VBM Medizintechnik GmbH, Sulz am Neckar, Germany) and animal larynx. A cadaver-based cricothyroidotomy skills study<sup>[29]</sup> demonstrated no difference in cricothyroidotomy skills attained using either low-fidelity or high-fidelity simulator models.

Regarding availability of equipment, scalpel-bougie-tube kit was available in 95% of the difficult airway carts. Some departments were in the process of phasing out cannula cricothyroidotomy kits and standardizing their difficult airway carts based on the DAS 2015 guidelines. Any ambiguity or concerns about lack of familiarity with multiple types of FONA-related equipment, including high-pressure oxygen delivery devices, could be overcome by standardizing difficult airway trolleys across theaters, ICU, and emergency departments. Delay in the decision-making process during CICO situations could be substantially reduced with the use of standardized and readily available FONA equipment.<sup>[4]</sup>

Only a quarter of respondents reported a 24-h availability of a specialist help from ENT or head and neck surgeons. In most hospitals, senior on-call surgical staff cover much wider geographical areas resulting in significant delay in attending an airway emergency. This further emphasizes the need for targeted training in FONA for all anesthetists. In a CICO crisis, it is important to use a technique which allows a quick and reliable access to the airway.

The technical approach to FONA by non-anesthetists can be variable depending on the clinical experience of the surgeon. For example, head and neck specialists are more likely to be experienced in surgical tracheostomy and intensivists in percutaneous tracheostomy; what is imperative is that the technique employed should be one that the individual is comfortable and confident with and that it is performed without delay.<sup>[8]</sup>

There were limitations to our survey. First, we had primarily directed this survey to airway leads who are responsible for airway training in their department. Hence, the most responses represent departmental practice; there may be possible variation in individual opinion. Second, we did not specifically evaluate for regional variation in FONA training. Finally, we did not include questions on respondents' experiences of real-life FONA situations encountered, but a national database to record CICO events would be vital in improving the management of airway crisis. A FONA database is currently being planned by the DAS and RCOA.

## Conclusion

The current teaching in UK favors scalpel cricothyroidotomy in managing a CICO situation. However, there is a significant variation in the frequency of FONA training and a deficiency of multidisciplinary training. Hence, it is important that national training standards which focus on continued skill acquisition and retention make recommendations on appropriate training intervals and the structured delivery of standardized, multidisciplinary FONA training.

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## Conflicts of interest

There are no conflicts of interest.

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## Appendix 1

### Questionnaire: (\*Please tick the boxes as appropriate)

1. Hospital Type: District general hospital  / Teaching hospital
2. Your position: Airway lead  / College tutor
3. Do you palpate for cricothyroid membrane as part of routine airway assessment? Yes  / No
4. If yes, in cases where it is impalpable, do you use ultrasound and mark the location of cricothyroid membrane? Yes  / No
5. What is your preferred technique for front of neck access in a CICO scenario?  
 Surgical cricothyroidotomy  / Needle cricothyroidotomy   
 Percutaneous tracheostomy  / Other  (please specify) \_\_\_\_\_
6. How often does your department provide regular in-house training in front of neck access?  
 Once in every 2 years  / 1 year  / 6 months  / None  / Other  .....  
 a. Is this training mandatory for all grades of anesthetists in your department? Yes  / No   
 b. Do you feel FONA training should be mandatory for all grades of anesthetists? Yes  / No   
 c. If you feel this should be mandatory, how often one should undergo training?  
 Once in every 2 years  / 1 year  / 6 months  / Other  .....  
 d. Which of the following training models do you use for training?  
 Part task neck manikin (Frova/Adelaide)  / Animal larynx  / Cadavers   
 None  / Other  (please specify) \_\_\_\_\_
7. Is there a formal FONA training for theater team in your department?  
 Yes  / No  If yes: does this involve ODPs  / theater nurses  / surgeons  (\*please tick all relevant)
8. Which of the following equipment is/are available in your difficult airway trolley to perform FONA? (\*please tick all relevant)  
 Scalpel-bougie-tube  / Ravusin cannula and Manujet  / Melker kit  / Rapid O2 system  / Ventrain  /  
 Other  (please specify) \_\_\_\_\_
9. Do you have immediate availability of ENT/maxillofacial or head and neck surgeon to help with FONA? Yes  / No   
 If yes: Daytime  / Night time  / Both