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ISSN 2470-9956

Journal of Clinical Anesthesia and Management

Research Article | Volume: 1.5 | Open Access

Current Status of Advanced Airway Training in the UK: A Survey of Advanced Airway Trainees

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Received date: 08 May 2016; **Accepted date:** 22 Nov 2016; **Published date:** 26 Nov 2016.

Citation: Sharma MP, Athanassoglou V, Badiger S, Ahmad I (2016) Current Status of Advanced Airway Training in the UK: A Survey of Advanced Airway Trainees. J Clin Anesth Manag 1(5): doi http://dx.doi.org/10.16966/2470-9956.121

Abstract

Background: "Choosing the safest technique for airway management may not necessarily be the anaesthetist's most familiar. It may be necessary to seek the assistance of colleagues with specific skills". Executive Summary, 4th National Audit Project (NAP4), 2011. The 4th National Audit Project (NAP4) is the largest study of major complications in airway management ever conducted in the United Kingdom (UK). It collected data between September 2008 and August 2009 and the findings were published in March 2011. The commonest cause of adverse events reported to NAP4, identified by both reporters and reviewers, was poor judgement, followed by lack of education and training.

In the 2010 training curriculum the Royal College of Anaesthetists (RCOA) updated the competencies required for the mandatory higher, and optional advanced training modules in airway management, to be offered by all schools of anaesthesia (SOA).

The aim of subspecialty training is to train and educate the experts of the future, to enable the management of a range of complex major head and neck surgeries and gain mastery of a variety of advanced airway techniques and devices. In the UK, despite the RcoA competency framework, there is no national accreditation system to provide quality control for the head and neck anaesthesia/advanced airway management fellowships that are delivered by individual schools. This lack of standardisation potentially could lead to inconsistencies in the quality of training. We undertook a survey to assess the current status of head and neck anaesthesia/advanced airway management subspecialty advanced training in the UK.

Methods: We contacted all the Schools of Anaesthesia in the UK. The "Airway Fellows" and advanced airway trainees, current and of the previous 18 months, were identified. A questionnaire addressed to the airway fellow was electronically distributed and kept active for 90 days.

Results: Of the 28 Schools of Anaesthesia in the UK, 23 offer advanced airway training. On average, each fellow performed approximately 14 (2-21) awake and 16 (6-31) asleep fibreoptic intubations, 3 (0-11) cases of jet ventilation and 1 (0-4) needle cricothyroidotomy per 6-month period. The number of supervised uses of video laryngoscopes, cricothyroidotomy, jet ventilation, and flexible fibreoptic scopes were lower than that believed to be required to attain proficiency in these techniques (Johnstone and Roberts 1989; Bulletin RCOA March 2009, Issue 54).

Conclusion: Our findings show a wide variation in clinical, teaching and research activity amongst the airway fellows who responded. However, as shown by the wide discrepancy in the number of procedures performed; the experience of videolaryngoscopy, jet ventilation and cricothyroidotomy was not the same and airway fellowships appeared to offer different levels of experience and opportunities. We hope to standardise and improve advanced airway training across the UK by creating a Difficult Airway Society endorsed syllabus and guidance for all the Schools of Anaesthesia.

Keywords: Airway training; Anaesthesia training programme; Education; Tracheal intubation

Introduction

The 4th National Audit Project (NAP4) is the largest study of major complications in airway management ever conducted in the United Kingdom (UK). It collected data between September 2008 and August 2009. The commonest cause of adverse events reported to NAP4, identified by both reporters and reviewers, was poor judgement.In the executive summary it is stated that "choosing the safest technique for airway managementmay not necessarily be the anaesthetist's most familiar" and that "It may be necessary to seek the assistance of colleagues with specific skills". The second commonest contributory factor for the cause of the events reported to NAP4 was lack of education and training.

In 2010 the Royal College of Anaesthetists (RCOA) introduced a higher training module in airway management, expected to be delivered by all schools of anaesthesia (SoA) [1]. They set their learning outcomes: the anaesthetic trainee is to become skilled at managing the more complex airways by building upon intermediate knowledge, skills and experience, and their core clinical learning outcomes: trainees should be able to perform elective fibreoptic intubation in patients without serious intra-oral/laryngeal pathology, safely and proficiently, in awake or anaesthetised patients under distant supervision and manage patients with complex airway disorders, safely and proficiently, in all situations, under local supervision [2,3].

RCOA Curriculum. Annex D - Higher Level Training. 2010

For trainees who wish to further sub specialise, head and neck anaesthesia/advanced airway management fellowships are available. The aim is to train and educate the experts of the future, 'colleagues with specific skills', and to "able to manage a range of complex major head and neck surgeries" and gain the mastery of a variety of advanced airway techniques and devices [4,5]. Currently in the UK there are numerous head and neck anaesthesia/advanced airway management programmes or fellowships,, which are deanery and anaesthesia school approved however none are accredited by formally institutions such as the Royal College of Anaesthetists (RCOA) or the Difficult Airway Society (DAS). In the United Sates of America (USA) head and neck anaesthesia/advanced airway management fellowships have been available for subspecialty training since the for nearly 20 years. Stanford University "head and neck anaesthesia/advanced airway management fellowship" is formally recognised by the Society for Head and Neck Anaesthesia (SHANA). Lack of accreditation and regulation means that programmes may vary in quality and duration. There is no minimal standard and no official organisation for governance of these programmes.

We undertook a survey to assess the current status of head and neck anaesthesia/advanced airway management subspecialty advanced training in the UK.

Aims and Objectives

The primary aims of our survey were to: Identify which schools of anaesthesia (SoAs) offered head and neck anaesthesia/advanced airway management programmes (fellowships) in the UK.

Establish the level of experience fellowship trainees were receiving during their head and neck anaesthesia/advanced airway management programmes fellowships and assess trainee satisfaction with the training they were receiving during head and neck anaesthesia/advanced airway management programmes(fellowship). Compare the data from different SoAs in order to qualify the difference in standards and opportunities offered by different head and neck anaesthesia/advanced airway management programmes.

Methods

For this paper we will use the term advanced airway fellow and advanced airway fellowship to refer to all trainees, pre and post certificate of completion of training (CCT). For the purpose of this study we defined a fellowship according to the definition stated in the RCoA document "Curriculum for a CCT in Anaesthetics (2010)": a 6 or 12 month programme offered by the SoA, which together with the adequate clinical exposure to advanced airway procedures, the fellows were able to dedicate time towards research, teaching and training [1].

We contacted the Royal College of Anaesthesia (RCoA) in the UK to compile a list of all the Schools of Anaesthesia (SoA) in the UK. Each school was contacted to ascertain whether they offer an advanced airway fellowship.Those schools that offered an advanced airway fellowship were asked for a list of their current and previous (within 18 months) advanced airway fellows. Subsequently we distributed a questionnaire via email to identified all current and past advanced airway fellows. Questionnaires were sent to trainees and were kept active for 90 days.

Prior to distribution, the study questionnaire was piloted. The participants consisted of anaesthetists who were involved in advanced airway management training; with the specific question of whether the survey allowed appropriate data collection and provided a fairrepresentationof advanced airway training in the UK. Data was collected into an Microsoft Excel spreadsheet and analysed. All surveys in continuity. Trainees may be exposed to new technologies and practices in one hospital but completely miss opportunities in another [22-25].

There has not been extensive research on the minimum number of procedures necessary for trainees to become competent in advanced airway management techniques. However, Johnson and Roberts undertook a study to look specifically at competence in fibreoptic intubation. They demonstrated that to achieve a greater than a 95% success rate ten elective asleep fibreoptic intubations had to be performed by anaesthetic trainees with no prior experience with fibreoptic intubation [8]. In our survey 26% and 32% of ATM trainees had not attained this minimum number of awake and asleep fibreoptic intubations respectively.

Therefore, in response to the issues outlined above, subspecialty fellowships, such as head and neck anaesthesia/advanced airway management programmes will need to be institutionalised to ensure the trainees are exposed to and gain appropriate levels of expertise in managing the patients, techniques and procedurerelative to that subspecialty field.

There are advantages, and disadvantages, to formal accreditation of subspecialty, fellowships. The advantages of subspecialty training programmes include an increase in experience within a specialist field and associatedimproved patient outcomes. This is supported by the work of Varelas and colleagues regarding the management of neurocritical care patients [26,27]. Another advantage is that accreditation and institutionalisation would be a way to guarantee and maintain set and agreed high standards of practice. Formal accreditation of fellowships may also be used to secure funding for subspecialty fellowship training and attract highly qualified candidates to the subspecialty [7].

Disadvantages of formalised subspecialty training programs are few, but present. Formalised training with set criteria to be achieved may potentially increase the time required before independence practice can be granted and may inflict financial incursions on trainees, as expenses associated with extra training may not be recuperated by the training program [28].

Our study has limitations. Surveys are subject to several forms of bias. We achieved an overall 68% response rate, but also a 32% non-response rate; a bias which could affect our conclusions, as respondents

	no. (%)
Airway ATM trainees respondents	34 (68)
ST5	2 (6)
ST6	22 (65)
ST7	8(23)
Post-CCT	2 (6)
In training / Out-of-training	
Advanced training module	32 (94)
Post-CCT	2 (6)
Current / Past ATM trainees	
Current	7 (21)
Past	27 (79)
School of Anaesthesia (respondents)	
London	6 (18)
Oxford	3 (9)
Severn	1 (3)
East of England	1 (3)
Warwickshire	8 (23)
East Midlands	5 (15)
Mersey	3 (9)
North West	2 (6)
Wales	2 (6)
Scotland	2 (6)

Table 1: Characteristics of survey respondents

were included in the analysis. The results were analysed by simple descriptive statistics to illustrate the proportion of respondents that chose each option. Results have been represented as graphs or tables.

Results

23 out of the 28 SoAs in the UK (82%) offer advanced airway training, with only 45% of these having formalised training requirements for the fellows. The survey was completed by 34 of 50 (68%) airway fellows identified; 7 current fellows and 27 previous fellows. Three fellows without dated contact details were not included. The results to all survey questions are reported, but have been summarised in some cases for clarity and relevance.

Characteristics of the airway respondents are presented in Table 1 of the respondents 32 were doing an advanced airway management fellowship and two were post-CCT fellows when they underwent their advanced airway training. Eighty five percent of fellows had been involved in some teaching capacity either in local, regional, or national airway workshops, airway courses, local in-house teaching to other trainees or operating department practitioners, and national meetings.

Fifty eight percent reported having the opportunity to participate in research, and 91% were involved in airway related projects surveys through the Difficult Airway Society (DAS), audits in their departments or more substantive research projects. Twenty three percent reported they had published work during their fellowship and 68% had given presentations either locally (to their departments or medical students), regionally or nationally at conferences. The airway trainees on average had 2.1 training lists per week, which varied greatly depending on the SoA as shown in Table 2. A wide variety of airway management equipment was reportedly available for training [6,7].

The overall average number of cases per advanced trainee and the average number of each procedure per trainee are shown in Figure 1. The range of procedures were as follows: awake FOIs 2-29; asleep FOIs 0-42; ILMA 0-10; Airtraq 0-21; Video laryngoscope (VL) (e.g. C-MAC, Glidescope, McGrath, Venner A.P. Advance) 1-160; other VL (e.g. Bonfils) 0-22; needle cricothyroidotomy 0-6; surgical cricothyroidotomy 0-2 and jet ventilation 0-17. Table 3 shows the regional variation that exists with respect to the numbers of procedures performed by trainees in different SOAs. Thirty five percent of respondents of advanced airway fellowship trainees (12/34) performed fewer number of awake and asleep fibre-optic intubations (FOIs) than is thought to be required to attain proficiency [8]. The mean number of each procedure performed per trainee per month is shown in Figure 2. Regional variations between SoA with regards to procedures performed are shown in Table 3 and Figure 3. The average rating of the confidence of the respondents in managing anaesthesia for complex airway cases, performing awake and asleep fibreoptic intubations and performing an emergency cricothyroidotomy as well as the procedure of choice for emergency tracheal access are shown in Table 4 [9,10].

School of Anaesthesia by region	no.
London	2.2
Oxford	1.8
Severn	1.0
East of England	2.0
Warwickshire	2.9
East Midlands	2.1
Mersey	2.3
North West	2.0
Wales	2.0
Scotland	3.0

Table 2: Mean number of training lists per week

Advanced airway fellowship trainees on average taught on 2.4 airway workshops per 6 months (range from 0 to 6), 84% of trainees had the opportunity to teach in local, regional or national workshops. With regards to research opportunities, airway advanced airway fellowship trainees were on average involved in 1.8 projects (range 0 to 5), 29% produced a publication in a peer-reviewed journal and 1 fellow produced 2 publications during their 6-month ATM. We also asked the trainees to rate their training programme out of 10, the average score being 8. When asked if they agreed with the statement that they would recommend their fellowship to other trainees the mean score, in favour, was 8.5 (range 1-10).

Discussion

Even with a dedicated subspecialty head and neck anaesthesia/advanced airway management programme our survey has shown the wide variation in clinical experience, procedures performed, teaching and research activity and opportunities (Table 3).

The NAP4 project, the Royal College of Anaesthetists and the Difficult Airway Society, concluded that poor judgement (59%) and education and training (49%) were the major causal and contributory factors in major complications, leading to serious harm, in association with airway management in anaesthesia. In a review of litigation related to anaesthesia in the National Health Service (NHS) hospitals in the UK from 1995 to 2007, airway and respiratory related events accounted for 12% of all anaesthesia claims, 53% of deaths and 27% of cost, and were involved in 10 out of the 50 most expensive claims [11].

It is thought that airway management is inextricably intertwined with anaesthetics. Most anaesthetists would consider airway management their most important specialist skill. In the UK 82% of the Schools of Anaesthesia are able to offer an advanced airway fellowship, as we have demonstrated with our survey. In contrast, in North America few anaesthetic (training) programs provide the option of an advanced airway fellowship [12]. In the United States of America (USA)much of their airway management experience is limited to direct laryngoscopy and the use of supraglottic airways [13]. Multiple airway devices are currently available to assist in the management of a difficult airway and anaesthetists should be given the opportunity to learn and be trained how to and when to use these devices

School of Anaesthesia	Complex airway cases	Awake FOI	Asleep FOI	ILMA	VLs	Needle cricothyroidotomy	Jet ventilation
London	37.5	16.0	10.8	1.7	30.5	1.7	6.0
Oxford	37.0	12.3	31.0	3.3	11.0	2.7	8.3
East of England	2.0	2.0	8.0	0.0	6.0	0.0	3.0
Warwickshire	37.0	10.0	20.0	4.0	25.0	1.0	3.0
East Midlands	28.6	17.9	20.3	0.3	38.9	0.0	0.1
Mersey	14.0	9.6	6.8	0.5	21.5	0.6	0.8
North West	26.3	12.0	13.3	0.0	35.0	0.0	0.0
Scotland	11.5	3.5	9.5	0.0	12.5	1.5	2.0
Wales	43.0	21.3	21.3	8.3	94.7	4.0	11.3

Table 3: Regional variations in experience of advanced trainees

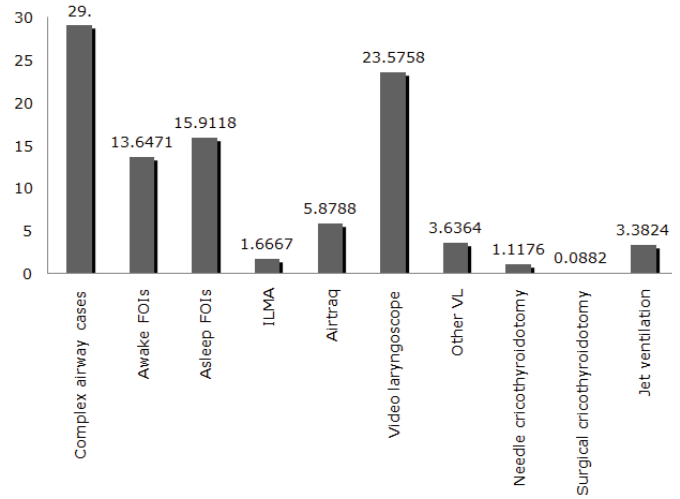

Figure 1: Average number of procedures performed per trainee during their fellowship.

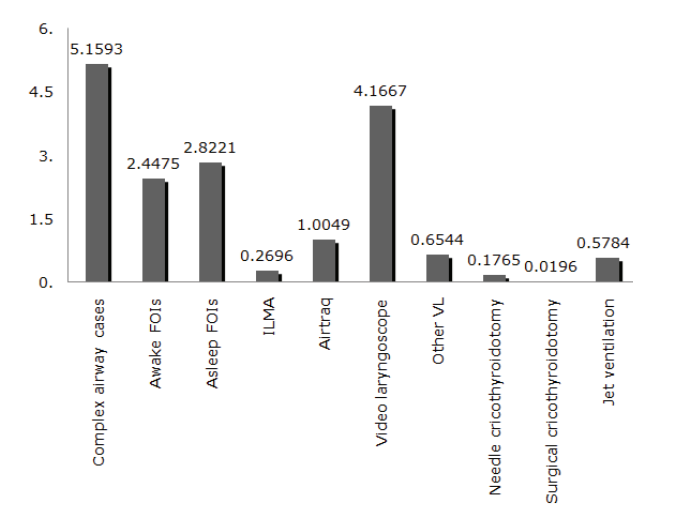

Figure 2: Average number of procedures per trainee per month of fellowship.

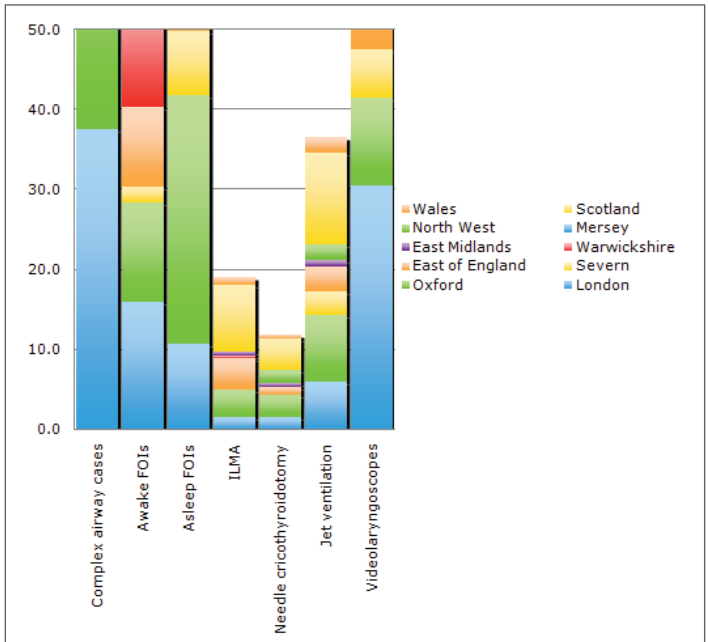

Figure 3: Regional variations in experience of advanced trainees

Situation / procedure	Confidence (0-10)
Complex airway cases	8.3
Awake fibreoptic intubation	8.5
Asleep fibreoptic intubation	8.9
Emergency cricothyroidotomy	6.7
Emergency tracheal access	No.(%)
Needle cricothyroidotomy	22(65)
Surgical cricothyroidotomy	12(35)

Table 4: Trainees' confidence in dealing with special situations and choice of emergency tracheal access

appropriately. Studies show that training is required before theses devices can be used properly and safely [5]. In the United Kingdom, despite the prevalence of advanced airway training opportunities, via head and neck anaesthesia/advanced airway management programmes (fellowships) quality and quantity of clinical exposure and training is variable (Tables 2 and 3).

In 1995 the Calman-Hine report on commissioning of cancer services identified the need for multi-disciplinary teams and centralised services, to improve the quality of care for people with cancer [14]. This report led to the development and publication of the UK National Health Service Cancer Plan in 2000 and an evidence-based "Improving Outcomes Guidance" report for head and neck cancer (IOG). As a result, services for head and neck cancer in the UK became centralized [15]. These centres were to be staffed by specialist surgeons and anaesthetists who are trained to a certain minimal standard to ensure safe management of these complex, technically difficult and high risk head and neck patients.

This disparity in head and neck anaesthesia/advanced airway management programmes in the UK may be explained by the current, multi faceted situation of training within the NHS. Changes to UK anaesthetic training due to the European Working Time Directive, which came into effect in 2009, have exposed the limitations of the traditional apprentice model used in medical training. In response there is a shift towards competency-based and simulation training [1]. The apprenticeship model however, is still viewed by many as the current standard for both surgical and anaesthesia training [4]. Similarly in the United States, the Institute of Medicine proposed further reductions to the trainee hours from those previously imposed in 2003 by the Accreditation Council for Graduate Medical Education [16]. Pott in 2008 assessed changes in the constitution of airway management training in North America and the integration of simulation-based teaching and newer airway devices, such as videolaryngoscopy, into established curricula. In 2011, 49% of the training programs in North America had a formalised airway rotation, compared to just 33 % in 2003 [17-21].

In addition to the reduction in the number of training hours, there has been an increase in training requirements. Trainees are not only expected to learn a large number of new procedures using new technologies, but they are also expected to accomplish an increased number of non-clinical roles e.g. management, teaching and audit [1]. Public expectation has also shifted and potential patient injury resulting from novice training errors is no longer acceptable. Efficiency initiatives in theatres have also played their part, as there are considerable pressures on hospitals to maximise operating theatre throughput. This has a direct impact on training [7]. Clinical teaching is often haphazard, unpredictable, variable and lacking

Objectives
The ATM trainees should display knowledge of • Airway anatomy • Airway physiology / reflexes • Airway innervations • Airway pharmacology – secretions, sedation, reflexes, reflux • Preoperative assessment including • Predicting difficult direct laryngoscopy • Predicting difficult mask ventilation • Predicting difficult front of neck access • Planning primary & back up procedures
• Procedures to execute plans Post operative care – extubation Publicity – communicate findings
• Management of airway scenarios Anticipated difficult airway, Unanticipated difficult intubation – elective Unanticipated difficult intubation – rapid sequence Can't intubate, can't oxygenate • Airway guidelines (DAS 2015) • Airway equipment – difficult airway trolley • Potential problems and hazards of the shared airway
• The ATM trainee should display detailed knowledge of the following techniques: • Anaesthesia for maxillo-facial surgery including free flaps • Management of maxillo-facial emergencies – fractured jaw, dental abscess • Day case dental anaesthesia • Anaesthesia for dental extractions (including sedation) • Optimisation of laryngoscopy • Peri-procedural oxygenation
Direct laryngoscopy techniques • Cricoid pressure - rapid sequence induction, difficulties • Fibreoptic intubation through SGA • Awake fibreoptic intubation (oral, nasal)* approximately 30 fibreoptic intubations • Extubation strategies – routine, predicted and unexpected • Emergency cricothyroidotomy – needle and scalpel, purpose built cannula, landmarks, confirmation of position, fixation, pressures for adequate flow, ventilation through catheter, complications • Immediate management • Management of acute & chronic obstruction • Flexible nasendoscopy & imaging • Have an understanding of the difference in management of supraglotic, transglottic and infraglottic lesions
The ATM trainee should obtain the following skills: • patient assessment for daycase surgery, including children • Pre and postoperative instructions to patients • Talking to patients and explaining the anaesthesia plan proposed • Recovery and patient assessment for discharge including regular audit of outcomes • Videolaryngoscopy – approximately 20 • Orotracheal fibreoptic intubation in anaesthetised patient* • Nasotracheal fibreoptic intubation in anaesthetised patient* • Awake fibreoptic intubation (oral or nasal)* • fibreoptic intubation through sga – approximately 5 • Blind nasal intubation • Elective cricothyroid / trans tracheal puncture – approximately 5 • familiarity with the scalpel cricothyroidotomy technique – aim to scrub for at least 1 surgical tracheostomy • high frequency jet ventilation – supraglottic, transglottic and subglottic techniques
The Atm trainee should display knowledge of the use of sedation techniques: • patient selection, assessment and suitability for treatment under sedation • the techniques and drugs available including non-pharmacological methods • administration methods – oral, inhalational, intravenous, transmucosal, patient-controlled • monitoring and management of the sedated patient
Education
The ATM trainee should: • familiarity with the 2015 das difficult intubation guidelines • Teach on an airway workshop, internally or externally run • Teach less experienced colleagues in advanced airway techniques • Teach regularly medical students • Attend an airway simulation course • training in simulation techniques and feedback

Audit
The ATM trainee should: • complete at least one airway related audit project
Research
The ATM trainee should aim to: • complete an airway related (research) project • submit an abstract to a national or international meeting • attend and present at a national or international meeting • submit a publication

Table 5: Proposed Airway ATM Syllabus

may be a self-selecting group of fellows, who have performed better than the average within their programs and are happy to reply about their fellowship. There may also be a data bias if trainees estimated procedural frequency rather than entering actual number of procedures performed. This may cause an over-estimation of experience and procedure exposure. The survey included current fellows and again this may cause a data bias, as they have not completed the programme and attained their full number of procedures. Some schools of anaesthesia may also offer more than one fellowship and this may effect the comparability between deaneries. Some fellowships may also be represented more than once in the data collection series, either because they offer more than one post, or questionnaires were completed by both current and previous fellows.

Ericsson argued that "while experience is part of being an expert, experience alone does not guarantee expertise" [29]. "Deliberate practice, immediate feedback, problem-solving and evaluation with the chance to repeat performance and modify behaviour are essential ingredients in the attainment of expert performance" [30]. The learning curve for most airway devices is biphasic: reasonable competence can be achieved within 30 cases, but performance continues to improve even after 100 cases. A patient with a difficult airway needs an anaesthetist who has the expertise to modify their technique as necessary.

It is important to note that advanced airway training should not deemed as a necessity exclusive to trainees. A recent review article by Baker et al.[31] discusses the necessity of advanced airway training for the established consultant and highlights the issues associated with the "constant stream of new airway techniques and devices for airway management", the "decline in psychomotor skills after the age of 45" and the poor self awareness" sometimes exhibited by senior practitioners. Baker et al. [31] go to describe the mandatory training models that they offer in their institution and a novel programme offered by John Hopkins Hospital, which include standardisation of practice and a mandatory education programme. This they report as a success with a decline in the number of can't intubate can't ventilate (CICV) scenarios, from 6 to 2. The editorial concludes that it is "an ethical obligation for all practitioners to keep up to date through life long learning". Therefore although this article focuses on the student we must not forget the teacher.

From the data we have collected we are now working with the Difficult Airway Society (DAS) to create a syllabus and guidelines to standardise advanced airway fellowships in the UK. This will ensure a set minimal standard in the quality of training provide by head and neck anaesthesia/advanced airway management programmes (fellowships) in the UK (Table 5). We will also list all the SoA who run advanced airway fellowships on the DAS website. To our knowledge, to date this is the first work published on the standard of advanced airway fellowships in the UK.

Details of author's contribution

M.S. revised the manuscript, V.A. conducted the literature search, data collection and prepared the initial manuscript, S.B. conducted the data collection and I.A. reviewed the manuscript at every point of preparation and oversaw the project.

Acknowledgement

The authors would like to thank all the Training Programme Directors for providing information about their programmes and the ATM trainees for taking the time to fill in and return the questionnaire.

Declaration of Interests

The authors have nothing to declare.

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