Effect Of The Provision Of An Airway Training Module On The Acquisition Of Complex Airway Skills

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Abstract

Questionnaires were sent to anaesthetists working in two regions in the United Kingdom: South Wales, without formal airway training module, and Oxford, with established airway training module. Replies were received from 68% and 64% of anaesthetists in the South Wales and in Oxford regions respectively. The results of experience with patients showed differences between the Oxford and South Wales regions in the use of the intubating laryngeal mask (64% and 26% respectively, p<0.001) and fibreoptic intubation via the intubating laryngeal mask (31% and 3% respectively, p< 0.001) and via the laryngeal mask (56% and 20% respectively, p<0.001). The results of experience with manikins show similar differences. Our findings suggest that the provision of an airway training module has important effect on the acquisition of complex airway management skills. The time has now arrived for airway management issues to take more a central place in the overall training of anaesthetists.

Work done at the University Hospital of Wales, Cardiff, Royal Gwent Hospital, Newport, Princess of Wales Hospital, Bridgend and John Radcliff Hospital, Oxford.

INTRODUCTION

The skill of managing the difficult airway is essential to the practice of anaesthesia. Traditionally, anaesthetists acquired these skills through ‘on-the-job' learning. However, with the introduction of shorter and more structured training [1, 2] anaesthetists may now find it even more difficult to obtain adequate exposure to all areas of airway management. The Royal College of Anaesthetists' document for specialist registrars [3] contains an extensive airway-training syllabus but there is no requirement for a designated airway module. Indeed, Kiyama et al found that only 20% of the anaesthetic departments in the UK have a formal training module for difficult airway management [4].

A deficiency in the necessary complex airway management skills was observed in three departments in South Wales in 2003 [5]. Similar deficiencies are likely to be present throughout the UK. Popat noted that at the moment ‘most anaesthetists continue to use high risk strategies as a consequence of a limited range of skills' [6]. In order to follow the Difficult Airway Society (DAS) guidelines [7] the anaesthetist must have the ability to perform the component techniques. This includes more complex techniques such as the use of Intubating Laryngeal Mask Airway (ILMA), fibreoptic intubation through both the ILMA and classical Laryngeal Mask Airway (cLMA) and cricothyroidotomy in the ‘can't intubate can't ventilate' scenario.

We therefore decided to investigate whether anaesthetists are able to perform the more complex techniques described in the DAS guidelines and compare the results from representative departments in South Wales without airway training module with the results from the departments in ten hospitals within the Oxford region. An airway training module is provided in the Oxford region.

METHODS

The first questionnaire was sent to anaesthetists working in the University Hospital of Wales and in two large district general hospitals in South Wales (representing around two thirds of anaesthetists working in Wales). The anaesthetic departments in these hospitals did not have formal airway training modules. This survey was completed in 2004. The same questionnaire (with one added question) was sent in March 2005 to anaesthetists working in ten hospitals in the Oxford region. The questionnaire consisted of six sections, covering both manikin and patient experience. The first three sections were concerned with the experience in fibreoptic intubation through the cLMA or the ILMA. The remaining three sections related to experience in establishing invasive emergency airway and cannula transtracheal oxygenation in the ‘can't intubate, can't ventilate' situation.

RESULTS

Replies were received from 155 of the 229 anaesthetists (68%) in the South Wales region and 210 of the 330 anaesthetists (64%) in the Oxford region. One hundred and eight of the 155 (70%) surveyed anaesthetists in the South Wales region and 173 of the 210 (82%) in the Oxford region had more than six years of anaesthetic experience and would therefore be expected to have received adequate airway training. Forty nine of the 210 (23%) surveyed anaesthetists in the Oxford region had completed a dedicated airway module and 145 of the 210 (69%) had attended an airway workshop in the past 5 years. The results of experience in training on manikins are shown in Table 1. The results of experience with patients show similar differences (Table 2).

Figure 1

Table 1: Experience with advanced airway techniques on manikins. Values are number of anaesthetists (proportion). * denotes significant difference (P < 0.002) between South Wales and Oxford. Chi-square test with continuity correction.

		Fibreoptic intubation		Cricothyrotomy	
	ILMA	via ILMA	via cLMA	cannula	surgical
Yes					
South Wales	36/155 (23%)*	36/155 (23%)	47/155 (30%)*	109/155 (70%)	73/155 (47%)
Oxford	100/210 (48%)*	74/210 (35%)	116/210 (55%)*	170/210 (81%)	108/210 (51%)
p-value	<0.001	0.018	<0.001	0.025	0.48
> 5 times					
South Wales	6/155 (4%)	6/155 (4%)	12/155 (8%)	34/155 (22%)	10/155 (6%)
Oxford	22/210 (10%)	20/210 (10%)	30/210 (14%)	52/210 (25%)	23/210 (11%)
p-value	0.032	0.062	0.077	0.61	0.19

Figure 2

Table 2: Experience with advanced airway techniques on patients. Values are number (proportion). * denotes significant difference (P < 0.002) between South Wales and Oxford (Chi-square test with continuity correction).

		Fibreoptic intubation		Cricothyrotomy	
	ILMA	via ILMA	via cLMA	cannula	surgical
Yes					
South Wales	41/155 (26%)*	4/155 (3%)*	31/155 (20%)*	30/155 (19%)	12/155 (8%)
Oxford	134/210 (64%)*	66/210 (31%)*	118/210 (56%)*	45/210 (21%)	24/210 (11%)
p-value	<0.001	<0.001	<0.001	0.72	0.32
> 5 times					
South Wales	5/155 (3%)*	0/155 (0%)*	4/155 (3%)*	1/155 (1%)	0/155 (0%)
Oxford	59/210 (28%)*	16/210 (8%)*	31/210 (15%)*	0/210 (0%)	1/210 (0%)
p-value	<0.001	0.001	<0.001	0.42†	1.0†

The claimed choices of intubation technique by the surveyed anaesthetists when faced with a failed intubation (after using a bougie and/or different blade) and easy ventilation on a patient is shown in Table 3.

Figure 3

Table 3: Anaesthetist's claimed choice of intubation technique after a failed intubation using a bougie and/or different blade. Values are number (proportion). * denotes significant difference (P < 0.002) between South Wales and Oxford (Chi-square test with continuity correction).

		Fibreoptic intubation			Intubation via
	Call for help	Fibrescope only	via ILMA	via cLMA	ILMA (no fibrescope)
South Wales	53/155* (34%)	71/155 (46%)	14/155 (9%)	17/155 (11%)	Not asked
Oxford	12/210* (6%)	90/210 (43%)	16/210 (8%)	43/210 (20%)	49/210 (23%)
p-value	<0.001	0.65	0.63	0.023	
Difference [95% CI]	0.28 [0.20 to 0.37]	0.03 [-0.07 to 0.13]	0.01 [-0.04 to 0.08]	-0.10 [-0.17 to -0.02]	

Seventeen of the 155 surveyed anaesthetists (11%) in South Wales and 26 of the 210 surveyed anaesthetists (12%) in Oxford have performed transtracheal jet ventilation on patients in the 'can't intubate, can't ventilate' situation.

DISCUSSION

When faced with an unanticipated difficult intubation, anaesthetists in the UK might well adopt a strategy based on the Difficult Airway Society (DAS) guidelines [7]. Plan A of the DAS guidelines is the initial tracheal intubation plan involving the use of direct laryngoscopy and a tracheal introducer. The surveyed techniques form plan B (secondary tracheal intubation plan) and plan D (rescue techniques for 'can't intubate, can't ventilate' situation) of the DAS guidelines. Training in these procedures should benefit from a structured, locally based training module.

We considered it was important to find out if anaesthetists had used the advanced techniques in the guidelines more than five times. It would be appropriate for trainees to gain experience on the manikin before using these techniques on patients. Use of these techniques more than five times on a manikin may be indicative of exposure to these techniques in a training module and/or in workshops. Anaesthetists would use the techniques on manikins more than five times if the manikin training is provided at regular intervals or if these anaesthetists were trainers themselves. The use of these techniques more than five times on patients might illustrate that the anaesthetist would confidently use the technique on patients if indicated. It is worth noting that the fibreoptic intubation skills may be present in anaesthetist who have not performed intubation through the cLMA or ILMA on patients more than five times. We found that a larger number of anaesthetists in the Oxford region compared to the South Wales region had used these techniques on both the manikin and patients (Tables 1 and 2). Despite this the numbers of anaesthetists who had performed the techniques in either manikins or patients in both the Oxford and South Wales regions more than five times were low. Our findings suggest that even the establishment of an excellent airway training module in a region does not necessarily ensure that all anaesthetists are able to obtain adequate experience with the component techniques. The availability of experienced trainers, dedicated time for training, anaesthesia skills room and suitable equipment are some of the other factors that will have an important effect on locally organised airway training.

The findings from this survey indicate weaknesses in training in the components skills necessary to implement the DAS guidelines. The majority of the surveyed anaesthetists had little experience with the more complex components of the guidelines. This, despite the fact that the first description of fibreoptic intubation via the cLMA was in 1991 [8]. Furthermore, there is evidence to show that passage of a fibrescope is facilitated by the use of both the cLMA and the ILMA as conduits [9,10,11]. The anaesthetists in the South Wales region had very little experience with these techniques. It is evident that the current method of airway management training by apprenticeship ('see one, do one') is no longer acceptable. Repeatable, locally delivered airway training is likely to provide more uniform exposure of trainees to the component techniques. These complex techniques require a stepwise structured modular training programme. This is best achieved initially by imparting knowledge and practising skills on models and manikins in a classroom-based environment. This initial experience must then be followed by suitable training in the clinical environment.

Equipment availability is critical in implementing training in airway management. The ILMA was much more readily available in the Oxford than in the South Wales region when the surveys were undertaken. However, the cLMA was readily available in both the Oxford and the South Wales regions. The difference in results in fibreoptic intubation through the cLMA must therefore reflect improved training

in the Oxford region. The availability of airway equipment is often governed by local financial and other circumstances. Furthermore, the last decade has seen the introduction of a confusing plethora of airway devices often without adequate evaluation of efficacy or safety [12]. Concerns have been raised about the effect this may have on training in airway management [13]. There is clearly an urgent need to improve airway training in the UK both by establishing formal airway training modules and by ensuring that appropriate equipment is readily available.

Rescue techniques for the 'can't intubate, can't ventilate' situation are detailed in plan D of the DAS guidelines. A slightly greater number of anaesthetists in the Oxford region had performed these techniques on both manikins and patients (Tables 1 and 2). The number of anaesthetists performing these techniques on patients is predictably low. Training of these invasive techniques can not reliably be provided on patients. Such training must therefore be based primarily on manikins. The learning curve for gaining competency with these and other complex techniques has not been adequately worked out. There appears to be little information available on how well even the basic techniques (Plan A, Initial tracheal intubation plan) are taught and performed. There is however some evidence that the tracheal tube introducer is often not used in an optimum way [14]. Effective use of the basic airway techniques (laryngoscopy, optimum external laryngeal pressure and optimum use of the most effective introducer) should maximise initial intubation success and decrease the need for more complex and difficult airway manoeuvres.

We accept that there are shortcomings in this study. Firstly, the surveys were performed in two different regions at different times. Ideally the surveys should have been conducted simultaneously in both regions. The survey conducted in the South Wales region [5] revealed deficiencies in the provision of training in advanced techniques. The South Wales authors are however of the opinion that training in their region had not changed much between the two surveys. Similar views have been expressed by others [15]. Secondly, in order to compensate for multiple comparisons, we considered $p < 0.002$ to indicate statistical significance. Consequently, the differences between the two regions may be more pronounced than it appears from our analysis.

The information in this survey is important as it should help benchmark changes in training and practice as recommended by Chambers [16]. The results reveal a worrying deficiency in the level of training in the more complex skills needed to manage the difficult airway. The introduction of a shortened training system for junior doctors [2], the implementation of the European Working Time Directive and the lack of an airway module will further reduce the opportunity to practice airway management skills. Cook in a recent editorial stated that 'any anaesthetist considered competent to anaesthetise alone should be equipped to make a confident, effective attempt at detecting and managing airway emergencies'[13]. Only 3% and 15% of anaesthetists in the South Wales and Oxford regions respectively had used a fibreoptic scope through the cLMA more than five times. It is likely therefore that many trainees (and consultants with minimal fibreoptic experience) would not have enough confidence to perform the techniques described in the Plan B of the guidelines. We recommend that it should be mandatory for trainees to undertake 'an appropriate' number of fibreoptic intubations through the cLMA and/or ILMA at an early stage of their training. Indeed, Cook recommends that the skills for detecting and managing airway emergencies 'should be accomplished within the first year of a trainee's anaesthetic career' [13]. The conventional training system based on local practice and personal experience is not effective and is therefore no longer acceptable. It is now clearly 'time to tackle this task of managing the difficult airway in a more organised way' [17]. The need for structured and modular airway training has never been more urgent.

Plan B (secondary tracheal intubation plan) of the DAS guidelines includes placement of a cLMA or ILMA, placement of the fibreoptic scope through the device and railroading a tracheal tube into the trachea. Anaesthetists who are skilled in the use of the fibreoptic scope may not find it necessary to use the conduits. This group of anaesthetists may be confident to use the fibreoptic scope in isolation after conventional failed intubation. The need to practise fibreoptic intubation through the cLMA or ILMA for this group of anaesthetists is less urgent than for those with less advanced skills. This may be why more anaesthetists in the Oxford region had not performed fibreoptic intubation through either the cLMA or ILMA. However, experienced anaesthetists might be advised to acquire the skills described in the Plan B as the techniques have clear advantage over the use of the fibreoptic scope in isolation (cLMA and ILMA will allow for oxygenation and ventilation both during and between intubation attempts). Our survey shows a lack of the basic fibreoptic skills of many anaesthetists. Thirty-four percent of anaesthetists in

South Wales and 6% in the Oxford region would call for help after a failed intubation and would not attempt fibreoptic intubation in isolation (Table 3). The South Wales figure may well be more representative overall.

Why has the profession failed to impart the necessary skills? The Yentis group comprehensively reviewed 'the different modalities available for training and assessment in airway management' [18]. They strongly recommended establishment of departmental 'airway blocks' for all trainees. There is no evidence, however, that this excellent advice has been followed. There has never been enough emphasis on ensuring that advanced airway skills are acquired by the majority of anaesthetists. The time has now arrived for airway management issues to take more a central place in the overall training of anaesthetists. Suaris and Pearce stated that 'without RCA support and endorsement the time, physical resources and manpower will never be available' [15]. It is clearly going to need a vigorous and combined effort by the Royal College of Anaesthetists, DAS, the Association of Anaesthetists [19] and in addition individual anaesthetic departments if substantial changes are to be made. The findings of our surveys are not a hymn of praise to the acknowledged excellence of airway training in Oxford and the quality of its airway training module with clear positive knock on effect on clinical practice in the region. On the contrary it is a high volume, low frequency foghorn of warning on the lack of experience and training in the essential components of the DAS guidelines in both the Oxford and the South Wales regions. A solution to this worrying lack of experience and training should be a top priority for all those involved in the politics and teaching of airway management.

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