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Formal Instruction in Difficult Airway Management

A Survey of Anesthesiology Residency Programs

James N. Koppel, M.D.,* Allan P. Reed, M.D.†

Background: **Up to 30% of all deaths attributable to anesthesia are related to difficulties with airway management. The purpose of this study was to determine whether anesthesiology residents are receiving specialized instruction in the various techniques and mechanical devices currently recommended for airway management in patients with anticipated or unanticipated difficult airways.**

Methods: **A single anonymous questionnaire about resident instruction in the area of difficult airway management was mailed to the directors of 169 American anesthesiology programs.**

Results: **Twenty-seven percent of the 143 programs from which there were responses require residents to participate in a rotation dedicated to management of the difficult airway. As they currently exist, rotations tend to be of short duration. Many are limited to lectures only and infrequently employ state-of-the-art teaching systems. In some programs, recognized airway management techniques such as the Bullard laryngoscope and esophageal-tracheal combitube are not taught at all.**

Conclusions: **Based on the data obtained by the authors, formal instruction in difficult airway management is not offered by most residency programs. It is commonly taught as difficult clinical situations arise. Because these difficulties occur sporadically, opportunities for teaching are occasional. Learning based on sporadic and occasional occurrences risks incomplete and nonuniform training of residents. (Key words: Anesthesiology: education. Anesthetic techniques: tracheal intubation.)**

THE incidence of failed tracheal intubation approximates 1 in every 2,230 nonobstetric patients and 1 in every 238 obstetric patients.[1] Up to 30% of all deaths attributable to anesthesia are related to difficult airway management.[2,3] These figures establish failed intubation and difficult airway management as problems of low incidence and serious consequence. That they are so infrequent thwarts residents' exposure to their multiple and varied facets. Consequently, anesthesiology residents often lack familiarity and experience with difficult management options. We surveyed anesthesiology residency programs to determine whether current trainees are receiving specialized instruction in the various techniques and mechanical devices currently recommended for airway management.

Methods and Materials

A single anonymous questionnaire about resident instruction in the area of difficult airway management was mailed to 169 directors of American anesthesiology residency programs (fig. 1). A self-addressed, stamped envelope was included to facilitate survey return. Follow-up surveys were not sent to nonresponders. Questions included whether residents rotated through a mandatory, formalized instructional block devoted to the development of difficult airway skills and the duration of the block, if offered. Specific experiences with the various methods and techniques was also queried.

Results

Interpretable, completed questionnaires were received from 143 of 169 programs yielding an overall survey response rate of 85%. Thirty-eight programs (27%) require their residents to participate in a difficult airway rotation. Of the 35 training programs that specified the duration of their mandatory rotations, 9 (26%) lasted less than 1 week, 12 (34%) lasted between 1 and 1 1/2 weeks, 11 (31%) lasted 1 month, and 3 (9%) lasted longer than 1 month (table 1). Sixty per-

* Assistant Professor of Anesthesiology, Albert Einstein College of Medicine, Bronx, New York; Diplomate, American Board of Internal Medicine, Pulmonary Disease, Anesthesiology and Geriatric Medicine, Long Island Jewish Medical Center, New Hyde Park, New York.

† Associate Professor of Anesthesiology, The Mount Sinai School of Medicine, New York, New York; Diplomate, American Board of Anesthesiology, The Mount Sinai Medical Center, New York, New York.

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Address reprint requests to Dr. Reed: Box 1010, 1 Gustave Levy Place, New York, New York 10029-6574.

DIFFICULT AIRWAY QUESTIONNAIRE

How many residents will complete their anesthesiology residency at the end of this academic year? _____

Do you provide a MANDATORY formalized block of time devoted to the management of the difficult airway? YES NO

If YES, how long a period is the rotation?

____1 Week ____2 Weeks ____3 Weeks ____1 Month _____Other (Please specify)

If YES, how many faculty are presently involved? ____

Which of the following is taught at your institution?

DEVICE or TECHNIQUE	LECTURE or DISCUSSION	PRACTICE IN MODELS	PRACTICE IN PATIENTS
Bullard Laryngoscope			
Combitube			
Flexible Fiberscope			
Laryngeal Mask Airway			
Light Wand			
Retrograde Intubation			
Transtracheal Jet Ventilation			

Are residents evaluated specifically in the area of difficult airway management? YES NO

For instruction either with the flexible fiberscope of Bullard laryngoscope, do you employ

____No teaching aids
____Video chip camera and monitor
____Beam splitter adapter (for dual viewing)

Fig. 1. Questionnaire.

cent of mandatory rotations for which information was received lasted 1 1/2 weeks or less.

Overall, 28% of 140 programs responding to the survey evaluated resident performance in the area of difficult airway management (three programs did not answer this question). Thirty-seven respondents with mandatory rotations indicated residency size. Larger programs were not more likely than smaller programs to teach methods of managing difficult airways as a formalized rotation ($P = 0.076$ chi-squared test by coding; table 2). Instruction in some techniques was infrequent

Table 1. Duration of Mandatory Block Rotation (n = 35)

Duration	n	%
<1 wk	9	26
1–1.5 wk	12	34
1 mo	11	31
>1 mo	3	9

Table 2. Mandatory Airway Management Rotation by Residency Size (n = 37)

No. of Graduating Residents	n	%
1–5	4	11
6–10	11	30
11–15	10	27
>15	12	32

in all programs regardless of size (table 3). Two surveys returned did not indicate types of devices and techniques taught. Only 54, 45, and 70% of programs taught the use of the Bullard laryngoscope, Combitube, and light wand, respectively. A number of airway management methods was taught in lecture format only, with neither practice in anatomic models nor human subjects available to resident trainees (table 4). Of the institutions that taught the technique of cricothyrotomy, 60% used a lecture format only. Similarly, use of the Combitube, retrograde intubation, and transtracheal jet ventilation were taught by lecture alone in 57, 53, and 46%, respectively. Twenty-nine percent of institutions did not employ either a video system or a beam splitter during teaching sessions with the Bullard laryngoscope or flexible fiberscope.

Discussion

Almost one third of all adverse anesthetic outcomes are related to respiratory problems,[4] and of all anesthetic deaths, 30% are related to difficulties with intubation and aspiration pneumonitis.[5] These figures confirm difficult airway management as a critical aspect of anesthesia practice. The importance of difficult airway management has been recognized by the Accreditation Council for Graduate Medical Education

Table 3. Types of Airway Devices and Techniques Taught to Residents in All Programs (n = 141)

Technique	n	%
Bullard laryngoscope	76	54
Combitube	63	45
Cricothyrotomy	115	82
Flexible fiberscope	140	99
Laryngeal mask airway	123	87
Light wand	99	70
Retrograde intubation	120	85
Trans Trach Jet Vent	128	91

Table 4. Modalities of Teaching Difficult Airway Techniques in All Programs

Modality	Total n	Lecture Only		Practice in Models		Practice in Patients	
		n	%	n	%	n	%
Bullard	76	22	29	29	38	50	66
Combitube	63	36	57	21	33	17	27
Cricothyrotomy	115	69	60	38	33	14	12
Flexible fiberscope	140	2	1	99	71	135	96
Laryngeal mask	123	12	10	56	46	106	86
Light wand	99	22	22	27	27	77	78
Retrograde intubation	120	63	53	24	20	42	35
Transtracheal ventilation	128	59	46	38	30	49	38

(ACGME), which will require "significant experience with certain specialized techniques," which include but are not limited to flexible fiberoptic laryngoscopes and laryngeal mask airways.‡ This requirement goes into effect on July 1, 1996. The implications for teaching programs are considerable. There will be start-up costs to buy equipment. Depending on the types and amounts of equipment purchased, this can be an expensive endeavor. Fiberoptic devices such as flexible fiberoptic laryngoscopes and Bullard laryngoscopes tend to be costly. Low technology instruments tend to be less expensive initially, but repeated use necessitates replacement costs. Nevertheless, acquiring equipment is relatively easy. Acquiring expert instructors to teach residents will be much more difficult. Many of these methods are relatively new and there exists only a small cadré of competent practitioners who could serve as instructors. Additionally, one can anticipate slightly greater administrative costs to document teaching. Programs that do not satisfy this new obligation could be cited for not doing so.

Currently, few anesthesia residency training programs provide formal difficult airway management training. Seventy-three percent of programs do not offer formal organized instruction. Of those programs that do offer formalized instruction, it lasts only 1 1/2 weeks or less in most cases (60%). Much of this experience is limited to lecture material with little practical exposure. Brief workshops offering lectures and manikin practice function to introduce didactic and practical information, but provide insufficient learning experiences to foster mastery.[6]

‡ Accreditation Council for Graduate Medical Education-Residency Review Committee for Anesthesiology-Revisions to Program Requirements for Anesthesiology-Memorandum dated June 20, 1995. ACGME, 515 N. State Street—Suite 2000, Chicago, IL 60610

Difficult airway management is a burgeoning discipline that encompasses specialized information, clinical skills, and research programs. Trainees have mastered specialized knowledge and skills after brief block rotations in the fields of anesthesiology, medicine, emergency medicine, and surgery.[7–12] Current anesthesia residency education methods compartmentalize teaching of cardiac, pediatric, obstetric, pain, and other areas of interest into formal block rotations. We, as well as Cooper and Benumof,[13] incorporate difficult airway management into residency training as a formal block of instruction. Blocks are devoted to hands-on experience with a number of different methods. Didactic materials include lectures and/or background reading to highlight airway management theory. Additional methods of presenting didactic information include videotape and computer-assisted instructional programs. Practical instruction follows. Manikin practice complimented by patient care experiences are traditional routes to achieving technical mastery.[14] Additional practical aids include workshops that generally offer opportunities to practice with the equipment on manikins. Use of animal models provides experience on actual living tissue as opposed to plastic models. Patient care opportunities need not be limited solely to those with difficult airways. Many of these techniques are applicable to the majority of patients receiving general anesthesia. Examples include Bullard laryngoscopes, esophageal-tracheal Combitubes, flexible fiberoptic laryngoscopes, laryngeal mask airways, and light wands. By extending their application to the general population (absent contraindications to their use), teaching opportunities are increased. Residents can be provided with frequent occasions for practice with these devices.

Alternative learning options are fraught with problems. Cadaver practice raises an ethical question.[15] Although From *et al.* found that expensive "sensorized" manikin practice did not prove superior to traditional methods of airway management,[16] Smith *et al.* documented the advantages of closed-circuit television systems.[17] However, almost 30% of the residency programs responding do not employ readily available but state-of-the-art teaching systems such as beam splitters and video cameras.

Johnson and Roberts demonstrated that a rotation devoted to flexible fiberoptic intubation leads to proficiency within a relatively short period of time.[7] Participating residents under the guidance of the same staff anesthesiologist performed oral flexible fiberoptic intubations under general anesthesia during a 1-month period. Residents achieved an acceptable level of expertise after completing ten intubations. Experience at The Mount Sinai Medical Center has yielded similar results (unpublished data). Dyson *et al.* have published analogous findings using Bullard laryngoscopes with manikins.[8]

Based on these data, formal difficult airway management instruction is offered by few residency training programs. It appears to be taught most commonly as difficult clinical situations arise. Because of their infrequent occurrence, practical teaching, by necessity, must be occasional and sporadic. In the interest of patient care, more experienced staff may handle difficult airways themselves, rather than allow those with insufficient skills to compromise patient safety. This further limits resident learning. Consequently, there is no way of ensuring that each resident will receive adequate training in difficult airway management under the prevalent teaching system.

Block rotations in difficult airway management are one remedy for this problem. Mastery of various methods has been successfully attained under elective, controlled situations.[13] Evidence exists for teaching specialized knowledge and skills in block rotations.[7–12] Mandatory block rotations ensure that each trainee is exposed to the necessary body of knowledge and has an opportunity for practical experiences with the devices. Furthermore, block rotations facilitate documentation of fulfilling this new ACGME requirement.

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