# Management choices for the difficult airway by anesthesiologists in Canada

## *[Les choix des anesthésiologistes canadiens pour gérer l'intubation difficile]*

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**Purpose:** This study assessed difficult airway management, training and equipment availability among Canadian anesthesiologists.

**Methods:** A postal survey of active members of the Canadian Anesthesiologists' Society was conducted in 2000. Respondents chose an induction condition and intubation technique for each of ten difficult airway scenarios. Availability of airway devices in their workplaces was assessed. Chi square analyses were used to compare groups. A $P$ value of $< 0.05$ was considered statistically significant.

**Results:** Eight hundred and thirty-three of 1702 (49%) surveys were returned. Staff comprised 88%, and residents 12%. Fifty-five percent had attended a difficult airway workshop within five years and 30% received mannequin airway training during residency. Direct laryngoscopy (48%) or fibreoptic bronchoscopy (34%) were the preferred techniques for intubation. For laryngeal, subglottic and unstable cervical spine scenarios, awake intubation with fibreoptic bronchoscope was most widely chosen. Asleep intubation with direct laryngoscopy was most commonly selected for trauma scenarios. Availability of difficult airway equipment varied between regions and types of hospital. Cricothyroidotomy equipment and difficult airway carts were not universally available.

**Conclusions:** Our survey assessed current preferences, training and equipment availability for the difficult airway amongst Canadian anesthesiologists. Direct laryngoscopy and fibreoptic bronchoscopy were the preferred technique for intubation despite widespread availability of newer airway equipment. Lack of certain essential airway equipment and difficult airway training should be addressed.

***Objectif :*** *Évaluer la gestion de l'intubation difficile, la formation et la disponibilité du matériel auprès des anesthésiologistes canadiens.*

***Méthode :*** *Une enquête postale a été réalisée en 2000 auprès des membres actifs de la Société canadienne des anesthésiologistes. Les répondants ont choisi une condition d'induction et une technique d'intubation pour chacun des dix scénarios d'intubation difficile présentés. La disponibilité des instruments d'intubation dans leur milieu de travail a été évaluée. Des analyses du khi carré ont été utilisées pour comparer les groupes. Une valeur de $P < 0,05$ a été considérée comme significative.*

***Résultats :*** *Huit cent trente-trois des 1702 formulaires ont été renvoyés. On comptait 88 % de spécialistes et 12 % de résidents. Cinquante-cinq pour cent avaient assisté à un atelier sur l'intubation difficile pendant les cinq dernières années et 30 % avaient reçu une formation avec un mannequin pendant la résidence. La laryngoscopie directe (48) ou la fibroscopie bronchique (34 %) ont été préférées. L'intubation vigile avec un fibroscope bronchique a été largement choisie pour des scénarios laryngés, sous-glottique et d'instabilité de la colonne cervicale. L'intubation sous anesthésie générale avec une laryngoscopie directe a été couramment sélectionnée pour les traumatismes. La disponibilité du matériel pour l'intubation difficile variait selon les régions et les types d'hôpitaux. Le matériel de cricothyroïdotomie et les chariots pour intubation difficile n'étaient pas disponibles partout.*

***Conclusion :*** *Notre enquête a évalué les préférences des anesthésiologistes canadiens, la formation et la disponibilité du matériel concernant l'intubation difficile. La laryngoscopie directe et la fibroscopie bronchique ont été les techniques préférées malgré la disponibilité répandue de nouveau matériel d'intubation. Il faudrait pallier les lacunes d'un certain matériel essentiel et de la formation à l'intubation difficile.*

THERE is no universal consensus for optimal management and equipment use for the difficult airway, despite continuing reports of airway-related morbidity and mortality.[A] Since publication of the ASA guidelines for management of the difficult airway in 1993,[1] and their modification in 1996 following introduction of the laryngeal mask airway (LMA) in the United States,[2] difficult airway equipment usage, training and man-

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This study was supported in part by the Department of Anesthesia, Toronto Western Hospital, University of Toronto and Vitaid Inc., Toronto, Ontario, Canada.

*Accepted for publication October 31, 2001.*

*Revision accepted March 15, 2002.*

agement issues have become increasingly important. In 1998 Rosenblatt *et al.* surveyed 472 ASA members to determine current practice patterns in the United States.[3] Following publication of a review with recommendations on management of the unanticipated difficult airway by the Canadian Airway Focus Group (CAFG) in 1998,[4] we wished to assess current anesthesia practice, training and equipment availability for the difficult airway among Canadian anesthesiologists.

## Methods

Following approval from the Research Ethics Board, University Health Network and Canadian Anesthesiologists Society, a survey of airway management was sent to 1702 members of the Canadian Anesthesiologists Society. All active and resident members were included while associate, retired, foreign and honorary members were excluded. Confidentiality and anonymity were maintained but questionnaires were number coded to identify non-respondents. A stamped, addressed envelope was included with each survey.

The questionnaire consisted of three sections. In the first, each subject was presented with ten brief difficult airway scenarios involving cooperative adult patients for elective surgery (unless specified otherwise) who required endotracheal intubation. The cases included:

1. Post-tonsillectomy bleeding for exploration.
2. Cervical cord compression with leg weakness for discectomy.
3. Laryngeal tumour with stridor for laryngectomy.
4. Mediastinal mass with supine stridor.
5. Motor vehicle accident (MVA); cervical spine not cleared; uncooperative patient; neurologically intact.
6. Laparoscopic cholecystectomy; Mallampati IV.
7. Retropharyngeal abscess for incision and drainage; patient cannot swallow.
8. Stat Cesarean section for fetal distress, "airway looks difficult".
9. Closed head injury, Glasgow coma score (GCS) 5; cervical spine *x rays* normal.
10. Previous anesthetic, arytenoids seen on laryngoscopy; three attempts before successful intubation

Respondents were required to choose one induction condition and one intubation technique they would use in each case. Choices of induction condition included: asleep, *iv*; asleep, inhalational; or awake/local. Choices of airway equipment included: direct laryngoscope, fibreoptic bronchoscope (FOB), lighted stylet, intubating LMA, rigid fibreoptic scope e.g., "Bullard", and surgical airway. Other techniques (to be specified) included nasal intubation, rigid bronchoscopy and retrograde wire.

The second section was designed to assess the availability of these and other airway devices and a difficult intubation cart in the respondent's workplace. In the third section demographic variables including age, gender, years in practice, region of practice and type of hospital practice were assessed. Respondents were asked whether they had attended a difficult airway course within the preceding five years and if they had opportunity to practice airway skills on a mannequin during residency.

Surveys were mailed in March 2000. Data were entered into Microsoft Excel 97 (Redmond, WA, USA) and analyzed using Statistical Package for Social Sciences (SPSS, version 10.0.7 for Windows, Chicago, IL, USA). Demographic data were categorized as follows: age: less than 45 yr and 45 yr or greater; years in practice: less than 20 yr and 20 yr or greater experience; community or teaching hospitals; four geographical regions: Western provinces (British Columbia, Northwest Territories, Alberta, Saskatchewan, Manitoba), Ontario, Quebec and Atlantic Provinces (New Brunswick, Nova Scotia, Newfoundland and Prince Edward Island). The age and years in practice cutpoints were either derived arbitrarily or based on results from the ASA survey of difficult airway management.[3] Surveys with more than one response in induction and intubating choices were eliminated from analysis. Comparison of categorical variables among and between groups and subgroups were performed using Chi squared or Fisher's exact analyses. A $P$ value of $< 0.05$ was considered statistically significant.

## Results

Out of 1702 surveys sent, 833 were returned (49% response rate). Demographic data are summarized in Table I. The commonest age group of anesthesiologists was 35–44 yr old (32%). Seventy-six percent of respondents were male and 23% female. Staff physicians comprised 88% of the sample and residents the remaining 12%. The majority of respondents worked in teaching hospitals (60%) with the rest based in the community. Respondents from Western, Ontario, Quebec and Atlantic provinces accounted for 30, 41, 16 and 9% respectively. Fifty-five percent had attended a difficult airway workshop within the last five years, and 30% had received difficult airway training

[A] *Caplan RA.* The ASA closed claims project: leassons learned. ASA Annual Meeting Refresher Course Lecture 2000.

TABLE I Demographic data

| *Data* | *Number of respondents (n)* | *Percentage (%)* |
|---|---|---|
| *Age (yr)* | | |
| 25–34 | 178 | 21.4 |
| 35–44 | 265 | 32 |
| 45–54 | 252 | 30 |
| 55–64 | 103 | 12.4 |
| 65 or more | 20 | 2.4 |
| Not specified | 15 | 1.8 |
| *Gender* | | |
| Male | 630 | 76 |
| Female | 190 | 23 |
| Not specified | 13 | 1 |
| *Geographical region of practice* | | |
| Western | 249 | 30 |
| Ontario | 337 | 41 |
| Quebec | 136 | 16 |
| Atlantic | 75 | 9 |
| Not specified | 36 | 4 |
| *Experience in anesthesia (years)* | | |
| Resident | 100 | 12 |
| 0–4 | 105 | 12.6 |
| 5–9 | 138 | 16.6 |
| 10–19 | 285 | 34.2 |
| 20 or more | 189 | 22.7 |
| Not specified | 16 | 1.9 |
| *Type of hospital practice* | | |
| Teaching | 501 | 60 |
| Community | 318 | 38 |
| Not specified | 14 | 2 |

on mannequins during residency. However, respondents with less than ten years experience were more likely to have completed mannequin training in residency than their colleagues (residents: 48%; 0–4 yr experience: 62%; 5–9 yr: 41%; 10–19 yr: 22% and > 20 yr experience: 9%).

The responses to each of the ten clinical scenarios are summarized in Table II. For each scenario, devices that were selected 5% of the time were reported individually, with the remainder grouped as "other devices". In addition, "awake" and "asleep" (combining *iv* and inhalation) induction conditions were compared. Statistically significant findings ($P < 0.05$) were as follows: asleep induction was the most commonly chosen technique in cases 1, 5, 9 and 10. Of these, the laryngoscope was the most commonly chosen airway instrument with the exception of case 10, where a FOB was preferred.

Awake intubating conditions were most commonly chosen in cases 2, 3, 4, 6 and 7. Of these, the FOB was the preferred intubating device. For case 8, awake and asleep inductions were chosen equally. Laryngoscopy (47%) was preferred to the FOB (19%) for this case. A spinal anesthetic was chosen by 16% of respondents despite specification in the survey that the patient required to be intubated under general anesthesia. Asleep induction was chosen more often in cases 3 (laryngeal tumour) and 8 (Cesarean section) by male physicians, those aged 45 or greater, and by those with 20 or more years clinical experience than their counterparts.

Residency airway training on mannequins and/or attendance at a recent difficult airway workshop did not have any significant effect on intended practice. There were no significant differences between induction or intubation preferences in respondents from community or teaching hospitals.

Scenarios were grouped into the following categories for further analysis: history or examination evidence of difficult airway (cases 6, 8, 10); airway pathology above the vocal cords (cases 1, 7); airway pathology of larynx or below (cases 3, 4); trauma scenarios (cases 5, 9) and unstable spine (case 2). Results are shown in Table III.

There was no difference overall in preferences for asleep (50%) or awake (50%) intubating conditions in those patients with preoperative evidence of a difficult airway (cases 6, 8, 10). There was consensus among the groups in management of the other categories. Respondents preferred awake techniques in known pathology above or below the larynx, using the FOB, with the exception of the bleeding tonsil when direct laryngoscopy in the asleep patient was the technique of choice. Asleep induction and direct laryngoscopy was the preferred management for trauma scenarios, whereas the majority of respondents chose awake intubation of the patient with the unstable spine, using a FOB.

The availability of airway devices among respondents is shown in Table IV. FOB, LMA™ (LMA International Services Ltd, Henley, UK), lighted stylets and formal difficult intubation carts were widely available nationwide. Eighty-six percent and 91% of the institutions had cricothyroidotomy dilatational kit or needle available respectively. There were significant differences in availability of many airway adjuncts among regions (Table IV). The Atlantic provinces had the highest availability of rigid fibreoptic laryngoscopes (51.4%), McCoy laryngoscopes (42.6%) and gum elastic bougies (93.2%), whereas these adjuncts were significantly less available in Quebec. However Quebec had the highest percentage of Combitubes™ [Tyco-Healthcare-Kendall Company, Mansfield, MA, USA] (85.6%) and retrograde wire sets, (77.4%) available out of all the regions. Most airway equipment was less available in community compared to teaching hospitals, with the exception of LMAs, intubating LMAs and dilatational cricothyroidotomy kits.

TABLE II Preferred induction and intubation methods among Canadian Anesthesiologists

| *Clinical scenario* | *Anesthesia technique* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | *Induction (% respondents)* | | | *Intubation (% respondents)* | | | | | |
| | *Asleep iv* | *Asleep inhal.* | *Awake* | *Direct Laryngoscope* | *FOB* | *Lighted Stylet* | *Intubating LMA* | *Surgical airway* | *Other Spinal* |
| 1. Tonsillectomy bleeding postop for exploration | 88 | 3 | 9 | 97 | 3 | | | | |
| 2. Cervical cord compression for discectomy | 31 | 2 | 67 | 21 | 63 | 13 | 3 | | |
| 3. Laryngeal tumour with stridor for laryngectomy | 1 | 9 | 90 | 16 | 45 | 38 | 1 | | |
| 4. Mediastinal mass with supine stridor | 3 | 34 | 63 | 39 | 57 | 4 | | | |
| 5. MVA, cervical spine not cleared, uncooperative | 90 | 4 | 6 | 67 | 8 | 15 | 10 | | |
| 6. Laparoscopic cholecystectomy Mallampati IV | 24 | 11 | 65 | 14 | 61 | 14 | 7 | 4 | |
| 7. Retropharyngeal abscess, can't swallow, for drainage | 7 | 23 | 70 | 37 | 50 | 8 | 5 | | |
| 8. Stat Cesarean section for fetal distress, "airway difficult" | 50 | 3 | 47 | 47 | 19 | 6 | 7 | 5 | 16 |
| 9. Closed head injury, GCS 5, cervical spine *x-rays* normal | 96 | 1 | 3 | 93 | 7 | | | | |
| 10. Previous anesthetic showed arytenoids only on laryngoscopy | 49 | 14 | 37 | 24 | 40 | 23 | 8 | 5 | |

Inhal. = inhalational; FOB = fibreoptic bronchoscope; LMA = laryngeal mask airway; MVA = motor vehicle accident; GCS = Glasgow coma scale.

## Discussion

We conducted a nationwide survey of management choices and equipment availability for the difficult airway by Canadian anesthesiologists in the wake of the CAFG management recommendations published in 1998.[4] Despite the wide expansion and greater availability of new alternative airway devices over the last 20 years, respondents in this survey still preferred the laryngoscope (48%) or FOB (34%) as first choice overall in these difficult airway scenarios, which may reflect most familiar practices. Similarly in 1994, Rose *et al.*, at their institution, noted that alternative techniques to direct laryngoscopy were used only in 1.9% of 18,558 tracheal intubations, the majority of these being awake fibreoptic laryngoscopy.[5]

Although overall, asleep and awake induction techniques were chosen equally (54% *vs* 46%), patterns of airway management did emerge. For laryngeal, subglottic and unstable cervical spine scenarios, awake intubation with FOB was most widely chosen. Asleep intubation with direct laryngoscopy was most commonly used for trauma scenarios. Of note, more experienced, male gender and older practitioners in this survey were significantly more likely to choose asleep induction for high-risk scenarios, either reflecting greater familiarity with these problem patients or less experience with awake techniques (cases 3, 8).

With regard to training issues, overall only 30% of respondents had had the opportunity to use mannequins for difficult airway training in residency despite recommendations that learning and practicing strategies for difficult airway management be an integral part of all residency programs.[4,6] This echoes the findings of Koppel *et al.* who found 27% of anesthesia programs in the US provided a rotation dedicated to management of the difficult airway, mostly limited to lectures only.[7] Reassuringly, more recently trained respondents reported a higher percentage of mannequin training in residency. In addition, in this survey just over half of respondents had attended a recent

TABLE III Case summaries

| *Clinical scenario* | *Anesthesia technique* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | *Induction (% respondents)* | | | *Intubation (% respondents)* | | | | | |
| | *Asleep iv* | *Asleep inhal.* | *Awake* | *Direct Laryngoscope* | *FOB* | *Lighted Stylet* | *Intubating LMA* | *Surgical airway* | *Other* |
| 1. Summary of all scenarios | 44 | 10 | 46 | 48 | 34 | 7 | | 5 | 6 |
| 2. Evidence of difficult airway (cases 6, 8, 10) | 41 | 9 | 50 | 28 | 40 | 14 | 7 | | 11 |
| 3. Pathology above larynx (cases 1, 7) | 47 | 13 | 40 | 67 | 26 | | | | 7 |
| 4. Pathology of larynx or below (cases 3, 4) | 2 | 21.5 | 76.5 | 28 | 51 | | | 19 | 2 |
| 5. Trauma scenarios (cases 5, 9) | 93 | 2.5 | 4.5 | 80 | | 8 | | | 12 |
| 6. Unstable spine (case 2) | 31 | 2 | 67 | 21 | 63 | 13 | | | 3 |

Inhal. = inhalational; FOB = fibreoptic bronchoscope; LMA = laryngeal mask airway.

difficult airway workshop as part of continuing medical development, an important part of any anesthesiologist's practice to update and consolidate skills.[4]

It was surprising that mannequin training and attendance at airway workshop did not change the induction or intubation technique in our scenarios. However, incorporating a new technique into practice involves a series of steps: acquisition of information on a new technique, validation of information, clinically testing the technique, satisfaction with technique and finally incorporation into practice.[8] Therefore, the introduction of a technique early in residency training or testing a new technique at an airway workshop on a single occasion may have limited impact on clinical practice. To change practice successfully, incorporation of a new difficult airway technique by mannequin training or an airway workshop needs to be reinforced by sequential interactive educational sessions and multiple clinical usages.[9]

Availability of equipment for management of the difficult airway varied between regions and types of hospital practice. Use of the FOB has become common practice over the last 20 years with our survey showing 99% availability in all hospitals, comparable with US practice.[3] The availability of the LMA, gum elastic bougie and lighted stylet as airway adjuncts were 99, 81 and 95% compared with 83, 30 and 46% respectively in the 1998 US survey.[3] Despite ready availability, the lighted stylet was chosen only in 7% and the intubating LMA in < 3% of the scenarios. There are still substantial gaps in knowledge, availability and application of these newer intubating equipment highlighting the need to be thoroughly comfortable with alternative airway equipment in normal intubating circumstances before they can be used in difficult airway situations.

Looking at transcricothyroid membrane airway equipment availability across the country, 91% of hospitals had a cricothyroidotomy needle and 86% had a dilatational kit available. Transtracheal techniques for oxygenation and ventilation in the "can't intubate, can't ventilate" scenario are essential skills for all anesthesiologists, and the necessary equipment should be included in every difficult airway cart.[4,10] These carts, containing an appropriate selection of airway devices, should be immediately available in the operating room area in preparation for recognized or unanticipated airway problems.[1,4,10] Although overall 96.5% of respondents had carts available, significantly less community hospitals had this facility compared with teaching institutions (91.5% *vs* 99.6%). Smaller hospitals may have this equipment stored in one location anyway obviating the need for a separate cart. Nevertheless, lack of essential equipment needs to be addressed.

Several limitations of the survey are recognized. As in Rosenblatt's 1998 survey of airway management in the US,[3] this study may be criticized as most scenarios considered airway management in cooperative adult patients, not covering problems seen in children, the emergency situation or in uncooperative, difficult patients. Despite specifying that all the patients required intubation and general anesthesia, some respondents still chose a regional technique for case 8 (Cesarean section). Similarly, respondents were restricted to a single response for induction and intubating conditions in each scenario, and those indicating more than one technique were excluded from the analysis. We recognize that more than one response for each scenario may have represented

TABLE IV Availability of airway devices

| *Equipment availability (%)* | *Total* | *Western* | *Ontario* | *Quebec* | *Atlantic* | *Community* | *Teaching* |
|---|---|---|---|---|---|---|---|
| Laryngeal mask airway (LMA) | 99.9 | 100 | 100 | 100 | 98.7 | 99.7 | 100 |
| Fibreoptic bronchoscope | 99 | 98.8 | 99.4 | 100 | 96 | 97.8† | 99.8† |
| Difficult intubation cart | 96.5 | 96.4 | 96.7 | 95.6 | 97.3 | 91.5† | 99.6† |
| Lighted stylet | 95 | 94 | 94.7 | 97.8 | 94.7 | 90.3† | 97.8† |
| Cricothyroidotomy needle | 91 | 93.9 | 89.6 | 90.2 | 89.2 | 88.1† | 92.4† |
| Dilatational cricothyroidotomy | 85.7 | 85.7 | 84.2 | 88.2 | 87.8 | 86.1 | 85.2 |
| Intubating LMA | 81.1 | 82.7 | 78.8 | 83.8 | 81.3 | 79 | 82.1 |
| Gum elastic bougie | 80.6 | 78.7 | 81.6 | 74.8* | 93.2* | 71.1† | 86.2† |
| Retrograde wire set | 59 | 54.4 | 56.3 | 77.4* | 52.8* | 44.5† | 67.6† |
| Combitube | 54.8 | 41* | 52.1 | 85.6* | 56.3 | 47.9† | 59.8† |
| Rigid fibreoptic scope | 43.3 | 46.5 | 48 | 21.2* | 51.4* | 31.3† | 51.3† |
| McCoy laryngoscope | 31.7 | 26.7 | 40.5 | 13* | 42.6* | 21.7† | 37.9† |

Significant differences * between highest and lowest regions; † between community and teaching hospitals ($P < 0.05$).

acceptable and safe practice. However, our aim was to ascertain common patterns of airway management among Canadian anesthesiologists, using a larger sample size than in previous studies. The initial response rate of 833/1702 (49%) was considered acceptable by the authors; therefore we did not contact the non-responders. The survey was sent to active and resident members of the Canadian Anesthesiologists' Society. We do not know if the respondents are representative of all anesthesiologists across the country. However, recent data from the Canadian Anesthesiologists' Society reveal 23% of their members are residents and 77% staff. Those from Western, Ontario, Quebec and Atlantic provinces account for 17%, 46.5%, 24.5% and 12% of active members respectively.

In conclusion, our survey assessed Canadian anesthesiologists' current practice, training and equipment availability for the difficult airway. Common practice patterns emerged with the use of induction and intubation techniques for categories of difficult airway scenarios. Previous work suggests that optimal management of the difficult airway relies more on the anesthesiologist's experience, skill and familiarity with airway devices than the devices themselves.[3] Structured training in alternative airway techniques including practice in simulation centres, exposure to new techniques in airway workshops followed by repeated uses in patients and continuing medical education activities are essential steps to incorporating new airway techniques into our repertoire. Our study reveals that mannequin training is not nationally available during residency and only 55% of respondents had recently attended difficult airway workshops. Finally, although many airway adjuncts are readily available in respondents' workplaces, the lack of essential equipment such as cricothyroidotomy and difficult airway carts needs to be addressed.

## Acknowledgements

We would like to thank Dr. Richard M. Cooper for his review of the original manuscript, and the Canadian Anesthesiologists' Society for providing membership data.

## References

1 *Caplan RA, Benumof JL, Berry FA, et al.* Practice guidelines for management of the difficult airway. A report by the American Society of Anesthesiologists Task Force on management of the difficult airway. Anesthesiology 1993; 78: 597–602.
2 *Benumof JL.* Laryngeal mask airway and the ASA difficult airway algorithm. Anesthesiology 1996; 84: 686–99.
3 *Rosenblatt WH, Wagner PJ, Ovassapian A, Kain ZN.* Practice patterns in managing the difficult airway by anesthesiologists in the United States. Anesth Analg 1998; 87: 153–7.
4 *Crosby ET, Cooper RM, Douglas MJ, et al.* The unanticipated difficult airway with recommendations for management. Can J Anaesth 1998; 45: 757–76.
5 *Rose DK, Cohen MM.* The airway: problems and predictions in 18,500 patients. Can J Anaesth 1994; 41: 372–83.
6 *Finucane B.* The difficult airway - a Canadian perspective (Editorial). Can J Anaesth 1998; 45: 713–8.
7 *Koppel JN, Reed AP.* Formal instruction in difficult airway management. A survey of anesthesiology residency programs. Anesthesiology 1995; 83: 1343–6.
8 *Slotnick HB.* How doctors learn: physicians' self-directed learning episodes. Acad Med 1999; 74: 1106–7.
9 *Davis D, O'Brien MAT, Freemantle N, Wolf FM, Mazmanian P, Taylor-Vaisey A.* Impact of formal continuing medical education. Do conferences, workshops, rounds, and other traditional continuing education

activities change physician behavior or health care outcomes? JAMA 1999; 282: 867–74.

10 *McGuire GP, Wong DT*. Airway management: contents of a difficult intubation cart. Can J Anesth 1999; 46: 190–1.