
The role of anesthesiologists in Canadian undergraduate medical education

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Purpose: To examine the current role of anesthesiologists in Canadian undergraduate medical education (UME).

Methods: A 93-item questionnaire was mailed to the undergraduate course chairs/coordinators for anesthesia at the 16 medical schools in Canada.

Results: Of the faculty anesthesiologists in Canada, 1.7%, 4.9%, and 4.9% teach pre-clerkship lectures, seminars, and PBL tutorials, respectively. Annually, anesthesiologists teach an average of 3.3 hr (range: 0 to 15) of pre-clerkship lectures and 12.8 hr (range: 0 to 48) of pre-clerkship seminars at each medical school. The topics most commonly taught by anesthesiologists in pre-clerkship lectures and seminars are pharmacology and perioperative patient assessment, respectively. An anesthesia rotation during clerkship is mandatory at 13 schools, with an average duration of 9.6 dy (range: 5 - 20 dy). Clerkship teaching methods vary: ten schools provide seminars, eight use videos, six use computers, six use an airway skills laboratory, and four use an anesthesia simulator. The most common topics taught in clerkship anesthesia seminars are airway management and fluid therapy.

Conclusion: A very small proportion of faculty anesthesiologists participate in Canadian UME at the pre-clerkship level. Considerable variation exists in the amount and format of teaching by anesthesiologists among the Canadian undergraduate curricula, particularly at the pre-clerkship level. However, our results indicate that anesthesiologists are assuming a more important teaching role during clerkship. Our findings may suggest that Canadian medical schools are overlooking the advantages that anesthesiologists offer to UME at the pre-clerkship level, or that many anesthesiologists are reluctant to assume pre-clerkship teaching responsibilities.

Objectif : Examiner le rôle actuel des anesthésiologistes dans la formation canadienne des étudiants en médecine (FEM).

Méthode : Un questionnaire comportant 93 éléments a été posté aux directeurs/coordonnateurs des programmes d'anesthésie des seize écoles de médecine du Canada.

Résultats : Parmi les anesthésiologistes des corps d'enseignement du Canada, 1,7 %, 4,9 % et 4,9 % offrent des cours d'avant-stage, des séminaires et le tutorat du programme d'apprentissage par problème (APP), respectivement. Annuellement, les anesthésiologistes enseignent en moyenne 3,3 h (intervalle : 0 à 15) sous forme de cours d'avant-stage et 12,8 h (intervalle : 0 à 48) de séminaires d'avant-stage à chaque école de médecine. Les sujets abordés le plus souvent pendant les cours et les séminaires sont respectivement la pharmacologie et l'évaluation périopératoire du patient. Une rotation en anesthésie est obligatoire pour les stagiaires de treize écoles et dure en moyenne 9,6 jrs (intervalle : 5 - 20 jrs). Les méthodes d'enseignement varient : dix écoles offrent des séminaires, huit utilisent la vidéo, six font usage d'ordinateurs, six présentent un laboratoire de compétence en intubation et quatre utilisent un simulateur d'anesthésie. Pendant les séminaires sur l'anesthésie, le stagiaire entend surtout parler de la ligne de conduite à adopter pendant l'intubation et l'hydratation intraveineuse.

Conclusion : On note un faible taux de participation des professeurs anesthésiologistes à la FEM canadienne pré-stagiaire. La quantité et la forme de l'enseignement prodigué par les anesthésiologistes auprès des étudiants en médecine du Canada varient beaucoup, particulièrement au niveau pré-stagiaire. Cependant, nos résultats indiquent que les anesthésiologistes enseignent davantage pendant les stages. Nos observations peuvent laisser croire que les écoles de médecine canadiennes méconnaissent les avantages offerts par les anesthésiologistes à la FEM avant les stages ou que de nombreux anesthésiologistes sont réticents à assumer des responsabilités de professeur dans ce même cadre.

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GIVEN the broad-based knowledge and technical skill of anesthesiologists, they are a rich resource for undergraduate medical education (UME).¹⁻⁵ Anesthesiologists are ideally suited to teach physiology, pharmacology, resuscitation, pain management, perioperative assessment, and technological medicine.^{1,2} As intensivists, many anesthesiologists are well suited to teach medical ethics, including consent, allocation of scarce resources, and end-of-life decision-making.^{2,3} Today's anesthesiologists also have unparalleled insight into the practice of ambulatory medicine and efficient health care management as increasingly more surgical patients are admitted to hospital on the day of surgery, and most Canadian anesthesia departments manage busy pre-admission consultation clinics.⁶ Furthermore, anesthesiologists play an integral role in various hospital settings including the operating room, post-anesthesia care unit, ICU, pre-admission clinic, obstetrical ward, and pain clinic, all of which inherently translate into excellent teaching environments for problem-based learning (PBL).⁶ In fact, anesthesiologists have been teaching anesthesia residents in a PBL format for decades, for example, daily in the operating room setting, weekly at the popular "Trouble Rounds" held at most Canadian teaching institutions, and monthly at "Morbidity and Mortality Rounds".⁶ Nevertheless, the teaching potential of anesthesiologists in UME has been greatly undervalued such that the role of anesthesiologists remains limited in many undergraduate curricula, mostly because tradition holds anesthesia a postgraduate subject, partly because of inadequate funding, and possibly because many clinicians are unaware of the tremendous breadth of contemporary anesthetic practice.^{2,3,7} However, the recent shift by North American medical schools towards the small-group PBL model inevitably increases the demand for teaching faculty, and thus presents the ideal opportunity to engage anesthesiologists in various teaching roles within the reformed undergraduate curricula. The inaugural meeting of the Undergraduate Education section of the Association of Canadian University Departments of Anesthesia (ACUDA) held in Calgary, Alberta, in June 1999 demonstrated considerable variability in the undergraduate anesthesia experience among the Canadian medical schools.⁶ An examination of the current role of anesthesiologists in Canadian UME is well due, hence the subject of our study.

Methods

In January 2000, a 93-item questionnaire was sent to the undergraduate course chairs/coordinators for anesthesia at each of the 16 medical schools in Canada. Our questionnaire was generated from the proceedings of

the 1999 ACUDA meeting and was divided into two main sections. Section 1 examined the participation of anesthesiologists in teaching at the pre-clerkship level, including lectures, seminars, and PBL tutorials. Also identified were the topics taught by anesthesiologists at the pre-clerkship level. Section 2 examined the clerkship anesthesia program, including the organization and duration of the mandatory clerkship anesthesia rotation, student evaluation processes, teaching methods, and clerkship electives. Inquiries regarding undergraduate administration and demographics were included at the end of the questionnaire.

The questionnaire was designed to be self-administered and predominantly in the form of yes/no type questions, with some short-answer type questions. Written comments were solicited. Certain respondents were contacted via electronic mail in those few instances where reported answers required clarification.

Results

The chairs/coordinators of undergraduate anesthesia education at all 16 medical schools in Canada responded to our questionnaire (100% response rate). Table I demonstrates the number of faculty anesthesiologists at each medical school that participate in pre-clerkship lectures, pre-clerkship seminars, and pre-clerkship PBL tutorials. We found that 1.7%, 4.9%, and 4.9% of the total number of faculty anesthesiologists in Canada teach pre-clerkship lectures, seminars, and PBL tutorials, respectively. Interestingly, the medical school with the least number of anesthesiologists on faculty (i.e. Queen's University) reported the greatest proportions of faculty anesthesiologists involved in teaching both pre-clerkship lectures and pre-clerkship seminars. Annually, anesthesiologists teach an average of 3.3 hr (range: 0 to 15) of pre-clerkship lectures and 12.8 hr (range: 0 to 48) of pre-clerkship seminars at each medical school (Figure 1). The topics most commonly taught by anesthesiologists in pre-clerkship lectures are pharmacology (82% of schools) and physiology (18% of schools), while those most commonly taught by anesthesiologists in pre-clerkship seminars are perioperative patient assessment (44% of schools), airway management (33% of schools), and pharmacology (33% of schools). Eight schools provide "Link" courses designed to facilitate and integrate the transition between the pre-clerkship and clerkship levels; anesthesiologists teach in "Link" courses at five of these schools. Pre-clerkship anesthesia electives are offered at 11 schools, and anesthesiologists at all 16 schools are involved in career counseling sessions designed to familiarize medical students with the specialty of anesthesia as a career.

A clerkship anesthesia rotation is mandatory at 13 medical schools. The duration and undergraduate year in which the rotation takes place are recorded in Table II. Importantly, two medical schools intend to implement a mandatory clerkship anesthesia rotation in the near future. Table III lists the components used to evaluate student performance upon completion of the rotation. Anesthesiologists teach seminars as part of the rotation at 10 schools; the average number of seminars per rotation is 5.4. Figure 2 demonstrates that the topics most commonly taught in clerkship anesthesia seminars are airway management (90% of schools) and fluid therapy (80% of schools). Clerkship teaching aids vary across the country: eight schools

use videos, six use computers, and six use an airway skills laboratory. An anesthesia simulator is currently available at five schools; four use their simulator for undergraduate teaching, and none use their simulator to evaluate student performance upon completion of the mandatory clerkship anesthesia rotation. Additionally, two medical schools plan to acquire a simulator for future use.

Anesthesia residents assume undergraduate teaching roles at 13 schools. Of these, all permit residents to teach medical students in the operating room setting and eight schools allow residents to teach undergraduate seminars. Only one of the five schools with an anesthesia simulator involves residents in teaching medical students using the simulator. Residents are formally evaluated on their undergraduate teaching skills at five medical schools.

All 16 medical schools offer clerkship anesthesia electives. Annually, each medical school accepts an average of 18.1 students to undertake a clerkship anesthesia elective for an average duration of 3.0 wk. Unfortunately, the anesthesia department at one medical school is continuously forced to decline the majority of medical students requesting clerkship electives due to an insufficient number of anesthesiologists.

There is a formal undergraduate education committee for anesthesia at 10 medical schools. Five schools have an anesthesiologist serving as the course director for at least one undergraduate course at the pre-clerkship level. Finally, the anesthesia departments at six schools are affiliated with a professional educator.

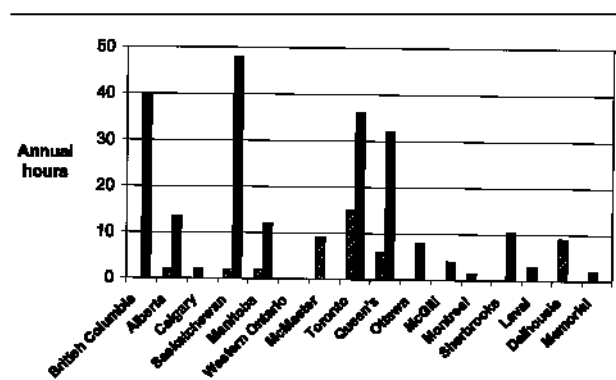


FIGURE 1 Number of total annual hours of pre-clerkship lectures (shaded bars) and pre-clerkship seminars (black bars) taught by anesthesiologists at each medical school.

TABLE I Number of faculty anesthesiologists participating in pre-clerkship lectures, pre-clerkship seminars, and pre-clerkship problem-based learning (PBL) tutorials.

Medical school	Number of faculty anesthesiologists	Number of faculty anesthesiologists teaching lectures	Number of faculty anesthesiologists teaching seminars	Number of faculty anesthesiologists teaching PBL tutorials	Number of faculty anesthesiologists writing PBL cases
British Columbia	140	0	10	6	2
Alberta	80	1	3	0	0
Calgary	100	2	0	1	1
Saskatchewan	41	1	4	1	1
Manitoba	60	2	3	0	2
Western Ontario	53	0	0	2	0
McMaster	50	2	0	8	1
Toronto	190	1	18	13	2
Queen's	13	4	4	2	0
Ottawa	62	0	4	4	0
McGill	66	0	3	0	0
Montreal	80	2	0	3	0
Sherbrooke	22	0	4	4	1
Laval	69	1	0	0	0
Dalhousie	45	2	0	9	0
Memorial	18	1	0	0	0
TOTAL	1089	19	53	53	10

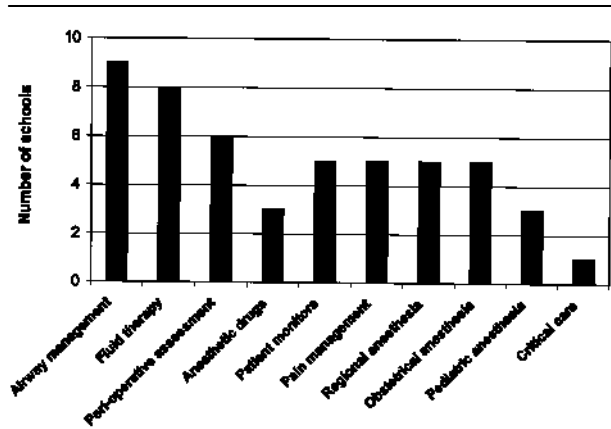


FIGURE 2 Frequency of topics taught in clerkship anesthesia seminars.

TABLE II Organization of the clerkship anesthesia rotation.

Medical school	Mandatory anesthesia rotation	Undergraduate year at time of rotation*	Duration of rotation (days)
British Columbia	Yes	3rd	10
Alberta	Yes	3rd or 4th	5
Calgary	Yes	3rd	10
Saskatchewan	Yes	4th	10
Manitoba	Yes	3rd	10
Western Ontario	Yes	3rd	10
McMaster	No		
Toronto	Yes	4th	10
Queen's	Yes	4th	10
Ottawa	Yes	3rd	10
McGill	Yes	2nd	5
Montreal	Yes	4th	10
Sherbrooke	Yes	4th	5
Laval	Yes	4th	20
Dalhousie	No		
Memorial	No		

*McMaster and Calgary have three-year undergraduate medical programs; all other Canadian medical schools have four-year undergraduate medical programs.

Discussion

Our results demonstrate that a very small proportion of faculty anesthesiologists in Canada participate in UME at the pre-clerkship level. Our findings may suggest that Canadian medical schools are overlooking the advantages that anesthesiologists offer to UME at the pre-clerkship level. Alternatively, the small number of anesthesiologists involved in pre-clerkship UME may reflect reluctance among anesthesiologists to undertake teaching responsibilities outside of the

operating room, in large part due to inadequate funding. Nevertheless, our results suggest that anesthesiologists complement the reformed pre-clerkship curricula as considerably more faculty anesthesiologists teach either PBL tutorials or seminars than lectures. Importantly, data accumulated by the University of Toronto supports anesthesiologists as highly effective pre-clerkship teachers.⁸ Since 1996, 6589 teacher evaluation forms have been collected from pre-clerkship students at the University of Toronto, where multiple consultants from various specialties, including anesthesia, jointly teach in the pre-clerkship curriculum. With respect to teacher effectiveness, pre-clerkship students assigned anesthesiologists an average score of 8.73 out of 10, while the average score for all other consultants was 8.56.

Our findings also indicate that anesthesiologists are progressively assuming a more important teaching role in the clerkship setting compared with past years. Since a 1994 survey of the anesthesia departments at the 16 Canadian medical schools,⁹ the number of schools currently providing a minimum 10-day mandatory clerkship anesthesia rotation has increased by 43%. It is noteworthy that although the optimal duration of undergraduate clinical anesthesia instruction has yet to be determined, the Royal College of Anaesthetists in the United Kingdom advises a minimum of two weeks,⁴ while the authors of a recent study which surveyed undergraduate anesthesia teaching at 73 medical schools worldwide recommend four weeks.¹⁰

In the wake of Canada's current shortage of anesthesiologists, time and financial constraints restrict anesthesiologists' availability to participate in UME outside of the operating room setting. One potential remedy to enhance the contribution that anesthesiologists make to UME may be to hold teaching sessions outside traditional daytime school hours. For example, we found that 50% of all PBL tutorials at McMaster University take place after 5:00 p.m. in order to accommodate the unyielding daytime schedules of PBL tutorial leaders. Moreover, anesthesia simulators may prove efficient since simulator sessions could be videotaped for future viewing such that anesthesiologists need not defer their daytime clinical duties in order to evaluate medical students. However, despite encouraging data supporting the validity and objectivity of the simulator in evaluating medical student performance,¹¹ we found that none of the five Canadian schools with a simulator incorporate their simulator into the student evaluation process of the mandatory clerkship anesthesia rotation. Finally, in order to attract additional anesthesiologists to UME, an active commitment to teaching should be consid-

TABLE III Methods of student evaluation upon completion of mandatory clerkship anesthesia rotation (expressed as relative percent value of final evaluation).

<i>Medical school</i>	<i>Clinical skills evaluation</i>	<i>Written evaluation</i>	<i>Oral evaluation</i>	<i>OSCE*</i>	<i>Other</i>
British Columbia	30	70			
Alberta	50	50			
Calgary	33	33	33		
Saskatchewan	50	50			
Manitoba	75		25		
Western Ontario	90		10		
McMaster	Not applicable				
Toronto	40	60			
Queen's	33	33	33		
Ottawa	40	20		20	20
McGill	75	25			
Montreal	70	30			
Sherbrooke		100			
Laval	80		20		
Dalhousie	Not applicable				
Memorial	Not applicable				

*OCSE = Objective Structured Clinical Examination.

ered equivalent to research endeavours for academic appointment and funding within each institution.

The time is ripe to enlist other anesthesia teaching resources, placing particular importance on anesthesia residents. Our review of the literature revealed no data regarding the teaching potential of anesthesia residents at the undergraduate level, but found the value of residents as teachers in other specialties, including internal medicine, surgery and pediatrics, to be highly favourable.¹²⁻¹⁶ Furthermore, the residency training objectives of the Royal College of Physicians and Surgeons of Canada emphasize teaching as a necessary skill to become a competent anesthesia consultant. Although we found that anesthesia residents are assuming teaching roles at over 80% of the residency training programs in Canada, additional investigation is required to assess the quality and outcome of undergraduate teaching by anesthesia residents.

As the demand for anesthesiologists in Canada continues to outstrip the supply, the importance of recruiting future anesthesia residents cannot be overstated. Interestingly, Yang and associates demonstrated that no correlation exists between the quantity of anesthesia-related theory and practicum exposure in Canadian medical schools and the number of students entering anesthesia residency training programs in Canada.⁹ In fact, the greatest influence on specialty choice stems first from the interplay of faculty members and clinical experiences, and second from faculty members by themselves; clinical experiences alone affect few students' career choice.¹⁷ Moreover, members of the teaching faculty exercise a strong role-

modeling effect upon students throughout medical school.¹⁷ A recent Australian study indeed found that 94% of students intending a career in anesthesia identified positive role models in the anesthesiologists they had met during medical school.¹⁸ The involvement of anesthesiologists in all aspects of UME is therefore essential in order to recruit much-needed future residents to our specialty.^{2,19}

In view of the considerable heterogeneity of educational activities described as "PBL" at different medical schools,²⁰ we did not quantify the number of hours that anesthesiologists teach pre-clerkship PBL tutorials. We believe that this limitation does not undermine our study's main findings. In addition, we recognize the usefulness of data quantifying the involvement of other consultants, including internists, surgeons, and pediatricians, in pre-clerkship UME as a means of comparison with our study's findings. However our review of the literature revealed no such reports. Finally, it is our assumption that the majority of faculty anesthesiologists take part in one-on-one teaching inside the operating room with students during the mandatory clerkship anesthesia rotation; therefore, we did not attempt to quantify anesthesiologist participation in teaching at the clerkship level.

In conclusion, we found that a very small proportion of faculty anesthesiologists in Canada participate in UME at the pre-clerkship level. Considerable variation exists in the amount and format of teaching by anesthesiologists among the Canadian undergraduate medical curricula, particularly at the pre-clerkship level. However, our results indicate that the teaching role of

anesthesiologists during clerkship is progressively more prominent. Our findings may suggest that Canadian medical schools are overlooking the advantages that anesthesiologists offer to UME at the pre-clerkship level, or that many anesthesiologists are reluctant to assume pre-clerkship teaching responsibilities. To investigate the reasons why more anesthesiologists do not participate in pre-clerkship UME – with a view towards improvement – would be a worthwhile future endeavour.

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