

One Method of Teaching Anesthesia to Medical Students

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MANY medical students appear to be influenced in their choice of a medical specialty by the instruction, experience, and personal attention they receive during their rotation through the various services. In most medical school curricula, instruction in anesthesia is limited, and it is incumbent upon the faculty to make the most effective use of this time not only for imparting useful information but also for recruitment. Students respond favorably to direct personal interest and to the presentation of that sort of information that they think will make them competent practicing physicians. They are very receptive to small-group teaching and opportunities to participate directly in the management of patients.

In attempting to outline a program for medical students in the field of anesthesia, one must take into consideration several factors. All of the students have had instruction in the basic sciences, most of them are anxious to exercise their newly acquired talents and information, all of them have had relatively little exposure to anesthesia as a specialty, and all of them are heading toward internships and increased opportunities to function independently. Some have decided upon the specialty they will enter and of these, many are skeptical that the specialty of anesthesia has anything to offer them. These students consider anesthesia a technical specialty and approach their service on anesthesia with disinterest. Nevertheless, these are young people avid for knowledge and especially practical knowledge, and if effort is made to teach them, the rewards are many. The number of hours assigned to anesthesia in a curriculum is not as critical as the manner in which those hours are used.

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Following is a description of the approach made to medical-student teaching at the University of California in San Francisco. No claim is made for the uniqueness of this approach. It is presented simply as a sample of undergraduate teaching of anesthesia. The pattern is somewhat different in the present year because anesthesia, as with other specialties, is an elective during the senior year. That the approach used and the effort put into it has been satisfactory can be attested to by the fact that 5 per cent of the Class of 1962 have been appointed as residents in anesthesiology for 1963, and half of the present senior class selected anesthesia as one of their block electives.

In planning this approach to student teaching we assume that over 90 per cent of the students will never be engaged in the practice of the specialty of anesthesia; and on a percentage basis, we assume that many of this same 90 plus per cent will work with technician anesthetists and so be forced to provide medical care for the patient during anesthesia. In addition, we believe that the specialty of anesthesiology is broad enough in scope to provide valuable and useful information for patient care in all fields of medicine.

The second-year medical-student's contact with the clinical faculty in anesthesia includes a lecture and laboratory demonstration on the muscle relaxants. More importantly, one of the faculty in anesthesia works one-half time in pharmacology and participates in medical-student instruction as a part of the course in pharmacology.

The third-year students receive five lectures on anesthesia topics, including local anesthesia, airway management, methods of ventilation, the philosophy of preanesthetic medication, and similar broad, general areas.

The fourth-year students are exposed to anesthesia in two areas: the dog-surgery laboratory and the operating room. In the dog-surgery laboratory members of a group of four students rotate through the positions of surgeon, surgical assistant, scrub nurse, and anesthetist, and perform eight operations. Each student administers open-drop ether anesthesia to two dogs in the course of an eight-week period.

In the hospital operating rooms, each group of students (usually four) spends a total of seven days. The time is spent in observation, question and answer sessions with the residents, participation in the administration of anesthetics, preoperative and postoperative rounds, and conferences with faculty members. The students also attend the teaching sessions for residents. In the coming year, one or two students will spend two weeks each as a block elective and the same pattern of instruction will be used.

The Dog-Surgery Laboratory

In this area supervision is by one faculty member. He "covers" eight operating teams, in one room. At the start of each eight-week period, he demonstrates open-drop ether technique to the entire group, establishing the "reference points" in the induction and maintenance of anesthesia. The technique is demonstrated on a dog which has not received preanesthetic medication and on one which has received a drying agent and morphine. During the periods of student-conducted anesthesia, the instructor is constantly available to the student anesthetists for assistance, advice, instruction, admonition, and even consolation, throughout the period of anesthesia.

The benefits intended are several. First, the student learns the classical signs of the stages and planes of anesthesia. He learns the importance of "end" points in anesthetic technique. For example, for abdominal surgery the dog is maintained in a "plane" of anesthesia wherein the abdominal musculature does not tighten on expiration, but the intercostals are still very active. Second, he learns the value of premedication and the necessity for individualization of the drug dosage. Periodically, the dogs are overdosed with morphine to an extent that induction is difficult.

The problem is explained and treated with intravenous narcotic antagonists: a sound cause and effect pattern which the students seem to appreciate. Third, he learns the value of lightened anesthesia at the end of the procedure. Operations last up to four hours, and there have been no fatal postanesthetic pulmonary complications in the past year's work. Fourth, he experiences the problem imposed by airway obstruction, learns how to intubate the trachea of the anesthetized dog, and learns how to ventilate the lungs of a dog. Fifth, he learns the necessity for, and means of, constant monitoring of the vital functions. He maintains an anesthetic record of his animal's pulse and respiration and of every event involving the anesthetized animal. Sixth, he learns how important the anesthesia is for surgery. He spends time on both sides of the drape to see the problem from both sides. As a surgeon he knows the problems of the anesthetist and as an anesthetist he sees the full picture. Only after experience in both areas has been had by all four students is there a "team" effect; everybody has "been there." Seventh, he makes postanesthesia rounds on his animal, looking for signs of impending difficulty. Chest sounds, pulse, and respiratory rate, and rectal temperature are checked daily for three or more days. The student learns what he is to look for and treat, and he learns the early diagnosis and treatment of postoperative atelectasis and pneumonia.

He learns to ask for help when situations arise which puzzle him. He asks for help in evaluating responses of the animal to both anesthesia and surgery. He learns to watch the color of the blood in the surgical field. He learns to appreciate the information he can glean from constant monitoring of the heart sounds.

The Hospital Operating Room

The students in groups of four spend seven days in the operating rooms, sometime during the eight weeks in which they are also in the dog-surgery laboratory. When they arrive on the service they are assigned to a specific resident for five days. The last two days they may "float" if they choose to do so. Each group receives an introductory description of what is expected of them on the service. They

are told they will not learn techniques of anesthesia by practice, but that their primary objective is to learn the care of the patient under anesthesia. They are advised to review the sections on the respiratory and cardiovascular systems in a standard physiology textbook. Whether or not they study a text on anesthesia is left to their own judgment. They are told to watch the anesthetic progress of the patients handled by the resident to whom they are assigned and to note all physiological changes from the normal which the patient exhibits. They are advised to try to learn "why" the aberration occurs and what is the rational treatment for the correction of the abnormal situation. It is stressed to them that the resident will answer their questions to the best of his ability. The residents are selected on the basis of experience and willingness to teach. We do not, commonly, utilize the residents who are most advanced in their training. We want the students to see the marked variations in physiological status that are common in cases handled by relatively inexperienced residents.

The actual participation, by the student, in anesthetic procedures includes learning how to provide an airway, to intubate the trachea of an edentulous patient, to start an intravenous infusion, to pump blood, to give premedication to patients subject to the resident's approval, to do epidural or intrathecal punctures, and to watch a patient in the recovery room. A student may manage a short, simple anesthetic procedure from start to finish, but usually only if he has exhibited keen interest and aptitude and if he has established appropriate rapport with his resident.

Special Student Conferences

The conferences with a faculty member require about 12 hours of time for each group. These 12 hours are made up of several sessions of varying length. The longer sessions are broken up every one to one and a half hours for a ten-minute "rest break."

The subject matter of these sessions includes: several concepts under which anesthesia is managed or administered, a study of the indications for ventilation, and discussion of postoperative and postanesthetic problems. This program keeps constant contact with the cur-

rent problems the students are seeing in the operating and recovery rooms and encourages the students to participate in the discussions.

An attempt is made to modify the basic material so that there is useable material for each student regardless of his intended field. The prospective internist and pediatrician are made to see that their interest must be focused on preoperative preparation and the problems they may meet when they are called to the operating or recovery room as consultants. The prospective obstetrician has his attention focused on patient care and the problem of the unborn and the newborn, especially in relation to narcotics and to ventilation. The neo-pathologist is not a problem if he is to take a rotating internship; everything he hears applies to him. The occasional budding pathologist who will take a straight "path" internship is reminded that he is a physician as well as a pathologist and as such must be aware of his obligation in the presence of accidents and emergencies in general.

The subject matter of the conferences is more fully described in the following material.

CONCEPTS UNDER WHICH ANESTHESIA IS ADMINISTERED

(1) "There are no safe anesthetic agents; there are no safe anesthetic procedures; there are only safe anesthetists." Emphasis is made on the subject of safe work habits and the concept of care for the patient. Stress is laid on continuous monitoring of vital signs by simple measures.

(2) "The anesthetic procedure is not ended until the patient has regained all the defense mechanisms of which he was deprived by the anesthesia." The possible physiological aberrations consequent to the various anesthetic drugs and procedures, the need for recognition of the abnormalities, and the compensatory devices employed by the anesthetist for the patient are discussed. It is stressed that the care of the patient under anesthesia is the provision for replacement of the protective mechanisms by the person responsible for the patient's care. The areas discussed are airway, cardiovascular control, ventilation adequacy, temperature regulation, and postoperative depression.

(3) "There are no minor anesthetics." The

hazards of "minor" anesthetics are discussed, including poor preparation, and the serious error of "playing the percentage." The inherent dangers of all forms of anesthesia are considered, including those of local anesthesia. In discussing local anesthetic procedures, emphasis is laid on six rules aimed at avoiding high concentrations of the drugs in the blood stream at any given moment.

(4) "In anesthesia the 'back door' is kept open." There is emphasis on anticipating difficulties rather than waiting for them and then trying to catch up with the problem. The stress is placed on monitoring to catch early warning signals of severe trouble and on safe work habits in general.

(5) "Dangerous drugs are given according to the patient's needs, not by the book." The concept developed here is that an individual's reactions to a given drug with a lethal limit are unknown. It is stressed that dangerous drugs should be given only after a specific end point has been decided upon. Especial emphasis is made on the subject of postoperative narcotic orders and pain, as well as the problem of obstetrics and depressant drugs.

(6) "The selection of an anesthetic for a given patient is the practice of medicine." It is pointed out that the selection requires knowledge of the requirements of the operation, of the capabilities of the anesthetist, and above all of the patient as a total person. It is emphasized that an anesthetic procedure must provide safety for the patient, convenience for the surgeon, and comfort for the patient, and that safety is never moved from its prime position in this sequence. There is some discussion of the concept of enlightened consent and its components and requirements as elaborated in the Nuremberg trials.

THE GENERAL PROBLEM OF VENTILATION

This is a large blank area in the education of the medical students who rotate through anesthesia. It is necessary to review basic pulmonary anatomy and physiology and pathology with them and to consider certain aspects of cardiopulmonary physiology. The basic need for ventilation is clarified. The indications for ventilation are discussed on the basis of specific problems, including morphine poisoning, barbiturates poisoning, and apnea neo-

natorum. There is specific training in expired air resuscitation, and there are two forms of artificial manual ventilation taught. The application of these methods to common problems is pointed out. The actual practice of the three means of artificial ventilation is effected with a trained subject. No effort is made to teach the use of ventilation equipment because we believe that there is a tendency on the part of the students, interns, and residents to rely on equipment rather than their brains and hands. The teaching is basic and thorough. Anything a student wishes to add to his armamentarium in the handling of ventilation problems is welcome, but he must add it because of his own interest and on his own time.

POSTANESTHESIA PROBLEMS

Postanesthesia problems that are discussed in considerable detail are illustrated by the recovery room problems that have been seen by the students. The chief areas of discussion are atelectasis, pneumothorax, shock of any and all origins, postoperative bleeding, the care of patients with tracheostomies, routes of administration of fluids and blood to injured or "shocky" patients, and the rational use of vasopressors. Any other general problems the student may wish to have discussed are added. These subjects are discussed from basic points of view, forcing the students to review their own stores of basic science to understand the problems.

Summary

Each group of four fourth-year medical students that rotates through the anesthesia service receives 16 hours of staff time a week and, in addition, 20 or more hours of resident plus staff-supervision time. The results are interesting. A reasonable percentage of each class chooses anesthesiology as a specialty. The vast majority of the students indicate that they believe they will be more competent to handle the emergencies that will arise during their internship and residency. They appear to appreciate the effort that is made to slant the discussions toward their own personal futures. They indicate that they appreciate the effort that is made to keep the discussions practical and to give them solid cases on which to "hang" their review of the basic sciences.