

Anesthesiologists and Surgeons at Mount Sinai:

A Partnership in Excellence

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Abstract

Although anesthesia was available to patients when the doors of The Jews Hospital opened in 1855, "professional anesthetists" were not appointed to the staff until 1902. This article traces the history of the anesthesiology staff and department, and documents their accomplishments over the past century.

Key Words: Anesthesiology, history, The Mount Sinai Hospital.

THE SUCCESSFUL DEMONSTRATION of ether anesthesia by Dr. William Morton in 1846 was followed one year later by the introduction of chloroform by Sir James Simpson. These discoveries set the stage for the more complex, sophisticated forms of surgery to be performed in modern hospitals. One of these new facilities was the Jews Hospital, in New York City, which opened its doors in 1855. Although it is not recorded in the casebook, we can assume that the first patient, admitted on June 8, 1855 with a rectal fistula and successfully operated upon by Dr. Israel Moses, was sedated with one of these anesthetic agents. The first recorded use of anesthesia at the new hospital occurred on September 30, 1855, when Dr. Alexander Mott removed "20 enlarged glands of various sizes, requiring more than two hours to complete the operation, the patient being under the influence of chloroform." The operation was performed on a young woman, to remove her tuberculous cervical glands (1).

It would be almost a half-century later before "professional anesthetists" were appointed to the staff of the facility, now known as The Mount Sinai Hospital. Before then, anesthesia was given by either the untrained house staff or other members of the surgical staff. The anesthetic agents were often administered to patients on the wards or in their rooms, shortly before transport to the operating room. Major

problems frequently occurred. This led Dr. Samuel Brickner of the Gynecology service to comment in 1895 concerning anesthesia services (2): "It is well for us occasionally to pause in the midst of routine practice to inquire whether the methods that have characterized our work are the correct ones, in view of modern light, and whether we can improve on them to our satisfaction, and to the welfare of those who see fit to put themselves under our professional guidance and care." After speaking about the "sins of omission," such as when a patient about to undergo anesthesia is allowed fluid or food intake and is thereby exposed to the dangers of aspiration, Brickner stressed the need to train young anesthetists and stated: "Make the young men who act as controllers of life and death read some standard work on anesthesia . . . and pass a rigorous examination before a committee of attending surgeons before the lives of patients are entrusted to their willing but helpless care."

Following a death in 1898, the Medical Board decided that "anesthetization in the future shall be carried out by two members of the house staff in place of one unless otherwise ordered by the operator." The Board of Directors (Trustees) continued to be concerned and pressed the Medical Board for further action. After prolonged consideration, they created the position of anesthetist in March 1902, and within a month, two physicians, Drs. M.L. Maduro and C.P. Denton, were appointed. They "went on duty as instructors of anesthetics to the House Staff" and were expected to be on duty for six months each during the year, to instruct incoming House Staff in "the principles and administration of the various general anes-

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thetics” and to be on call “to administer anesthetics to such ward and private patients as the surgeon may desire” (3). By 1903, two anesthetizing rooms and two recovery rooms were built opposite the operating rooms, and the administration of anesthetics in private rooms and wards was eliminated.

In their first report (3), the two anesthetists strongly recommended the use of nitrous oxide and ether, rather than ether alone, on the basis of safety. Because of Maduro and Denton’s preferences, the use of chloroform declined, but when it was used, caffeine was first given by injection. It was believed that caffeine was a respiratory stimulant and that it had a good effect on the heart, preventing the initial fall in blood pressure which could occur with induction of anesthesia with chloroform (3). Maduro had published a number of articles, including a description of an adaptation of an earlier anesthetic apparatus of Hewitt, a British anesthesiologist, which allowed for continuous administration of chloroform during head and neck, and throat procedures (4, 5).

Drs. Maduro and Denton quickly gained credibility within the institution for their service as well as their research. Their investigation into the causes of postoperative pneumonia found that body cooling during or after surgery, and unclean rubber breathing bags in the anesthesia apparatus, were important factors in the development of this complication. They recommended maintaining body heat with blankets and boiling the rubber bags for five minutes (3).

In 1905 Dr. Thomas Bennett was appointed to the staff. Already well known for developing the Bennett apparatus for the administration of nitrous oxide and ether, he would remain on the staff until his death in 1932. Bennett, originally from Kansas, was on the staff of both the Roosevelt Hospital and the Hospital for the Relief of the Ruptured and Crippled (today known as the Hospital for Special Surgery), and would eventually be placed in charge of anesthesia at the Presbyterian Hospital (6). He had published significant articles prior to joining our staff (7–9).

In 1884, Dr. Carl Koller in Vienna introduced cocaine for clinical use as a local anesthetic (10). It has been stated (11), “The reading of [Koller’s] first paper on the subject at an ophthalmological congress in Heidelberg marks the inception of the modern period in anesthetic practice.” After Koller joined the staff in 1890, cocaine became a very popular local anesthetic at Mount Sinai. He served for many years as

chief of Ophthalmology. In 1903 Maduro noted that “local anesthesia in the general surgical service has been made use of in such operations as herniotomies, colostomies, and gastrotomies. A number of such operations begun by this method have been finished under general anesthesia” (3).

Spinal anesthesia did not fare as well at Mount Sinai. It was first performed successfully in humans by August Bier in Kiel, Germany, in 1898. Maduro commented four years later (3): “We are happy to say that subarachnoid cocainization has been performed but once within the past two years. The dangers attendant on the use of this method have influenced our surgeons to consider it as still in the experimental stage of development.”

Dr. William Branower, a graduate of the Columbia University College of Physicians and Surgeons (1904) who had served his internship and surgical residency in the private pavilion at Mount Sinai, was appointed as anesthetist in 1908 “at a salary of \$100.00 for the six months.” At the same time he served as a surgeon in the outpatient department. Named a “supervising” anesthetist in 1923, Dr. Branower and Bernard Eliasberg served as the nominal heads of the anesthesia service for 20 years until Branower’s retirement. In 1936, Branower developed a respirator which was widely accepted and used for many years (12).

An important event in the history of anesthesia occurred at Mount Sinai on February 20, 1910 (11). On that date, Dr. Charles Elsberg, who had completed his training in 1895 and thereafter served as a member of the Surgical Service, administered the first intratracheal insufflation of anesthesia in humans. It was based upon the experimental work of Meltzer and Auer of the Rockefeller Institute. Using a portable anesthesia apparatus designed with the help of Dr. Bernard Eliasberg, Elsberg, after extensive animal studies (13), tested the technique by successfully administering oxygen to a comatose patient with advanced myasthenia gravis. Although that patient died, the technique proved feasible. Shortly thereafter, Elsberg successfully administered anesthesia for the drainage of a lung abscess by thoracotomy performed by Dr. Howard Lilienthal. This success was followed by a procedure on a patient who had drainage of an empyema. Elsberg presented the work before the New York Surgical Society on May 11, 1910. Subsequently published in the *Annals of Surgery*, the last sentence of the paper presages the development of

thoracic surgery (14): “If the future will show that it is as safe for the human being as it is for the animal — and our experiences seem to point in that direction — then surgery will have a very simple method for the prevention of the dangers from acute pneumothorax, a danger which has been the chief hindrance to the development of intrathoracic thoracic surgery.” Lilienthal, in reporting the surgical aspects of the case, commented (15): “The most notable feature of the anaesthesia . . . was the total disappearance of the rattling respiration which existed during the administration of the ether by the usual method.” In a series of papers over the next two years, Elsberg would report on almost 500 cases of intratracheal anesthesia administered for general and thoracic surgical procedures; Eliasberg administered the anesthetic for most of the cases (16–18). A man of many talents and trained in general surgery and neurosurgery, Elsberg would go on to even greater fame in the field of neurosurgery.

In 1910, Dr. Bernard Eliasberg, a graduate of Cornell Medical School who had trained at Mount Sinai, was appointed as the resident anesthetist to the private pavilion. He and Branower, working together, gradually expanded the corps of trained anesthetists, so that by 1940 the staff consisted of more than 10 physician and nurse anesthetists. In 1943, after the death of Branower, Eliasberg was appointed Anesthetist to the Hospital, a position he held until 1950. The service was represented for the first time on the Medical Board. A founder of the New York State Society of Anesthesiologists and an original member of the American Board of Anesthesiology, Eliasberg was also responsible for training the first resident in anesthesiology at Mount Sinai, Dr. Gerda J. Weil, who graduated from the program in 1943. Two years later, Dr. Irma Back served in the program and was joined in 1946 by a second resident.

A gentleman of great knowledge, wisdom and humor, Eliasberg was a superb teacher of a generation of anesthesiologists, and beloved by many. He played a pivotal role in the development of anesthesiology at Mount Sinai. For his service to Mount Sinai and to anesthesiology, Bernard Eliasberg was the first and, to date, the only anesthesiologist to receive Mount Sinai’s coveted Jacobi Medallion. Following Dr. Eliasberg’s death in 1962, through the generosity of his family, the department, and industry, the Bernard Eliasberg Memorial Symposium was established, an event which continues to the present.

Dr. Milton Adelman was named director of Anesthesia and Anesthesiologist to the Hospital in 1950 upon the retirement of Eliasberg. Appointed to the staff in 1942, Adelman was called to military service in World War II almost immediately thereafter and served with distinction as a regional consultant in anesthesia to the European Theater of Operations. Adelman authored one of the earliest papers on the potential fatal interaction of epinephrine when given during cyclopropane-ether anesthesia, some of the early papers on allergic reactions during anesthesia (19), and on the use of promethazine (20, 21). Adelman developed an automatic controlled respirator which, by relieving the anesthesiologist of the burden of manually inflating the lungs, proved of inestimable value in the management of endotracheal anesthesia (22, 23). The technique also greatly simplified anesthesia in the experimental laboratories, by allowing for continuous endotracheal anesthesia without the presence of an anesthesiologist (24).

Adelman formalized the residency training program, which had five positions in 1950. As the program grew, he gradually phased out the nurse anesthetists who had been on staff. A second year was added to the residency in 1951. In that year the anesthesiology and physics departments developed an electro-shock machine for the treatment of ventricular fibrillation. In 1957, the Inhalation Therapy Department became part of the Anesthesiology Department. Many of the graduates of the program would remain on staff, as the department expanded to keep up with the increasing volume of the surgical services. Joseph Jagust became one of Mount Sinai’s premier anesthesiologists. Following Dr. Jagust’s early retirement due to illness, the Joseph A. Jagust Award in Anesthesiology was endowed; it is presented annually to a graduating medical student who has excelled in the anesthesiology clerkship.

A most valued colleague of Adelman, Dr. Morris Bien, appointed to the staff in 1943, served Mount Sinai for more than 30 years. A pioneer in the development of techniques for regional anesthesia, Bien was also at the forefront of chronic pain management. He recognized the need for preoperative medication to allay patient apprehension (25), and the need for the anesthesiologist to visit the patient preoperatively, once again to allay fear (26). He symbolized the partnership which existed in Mount Sinai operating rooms between the surgeons and anesthesiologists. In 1946 he stated,

“The anesthesiologist has two responsibilities — to the patient and to the surgeon. While he is selecting the best anesthetic agent and the procedure best suited to the patient, he must always bear in mind that the anesthetic risk can be equal to, or less than, the surgical risk; but it can never be greater. The anesthetist makes the surgeon as comfortable as possible, gives him a clear field in which to work, and enables him to devote his entire attention to the operation” (25). Bien also had the distinction of being the first faculty member of the Mount Sinai School of Medicine to have a family member in the school. His son Ralph, now a psychiatrist, graduated with the Class of 1973.

Herman Turndorf, recruited to the staff from Harvard in 1963, left after 7 years to assume the chair of Anesthesiology at West Virginia University School of Medicine. He returned to New York in 1974 to become chair of the Department of Anesthesiology at New York University School of Medicine, a position he held for more than 25 years.

Following the trend to appointment of full-time chiefs of service, Dr. Leslie Rendell-Baker was named chairman of the department in 1962, a position he held for 17 years. Trained in England, Rendell-Baker came to Mount Sinai from Cleveland, where he had been on the faculty at Case-Western Reserve. He was instrumental in setting standards for anesthesia equipment and for the safety of the operating room (27–45). Rendell-Baker chaired the International Standards Committee of the American Society of Anesthesiologists for many years. He also played a major role in the development of special equipment for the pediatric population.

The years of Rendell-Baker’s tenure, spanning as they did the opening of the medical school, saw enormous growth in the role of the anesthesiologist within the institution. In a major collaborative effort with the Department of Surgery in the late 1960s, Dr. Rendell-Baker and Dr. Allan Kark, chairman of the Department of Surgery, proposed the development of a surgical intensive care unit (SICU) to be operated conjointly and staffed with full-time faculty who would be engaged in patient care, teaching and research. A 5-bed unit already existed, but in this small unit, surgeons were responsible for the care of their own patients. Considerable resistance to the new unit was encountered from both the surgeons, who felt they would lose control of their patients, and the administration, who did not want to absorb the cost of the unit and the salaries of the faculty. The plans were

eventually embraced, and the unit opened in 1970, with Dr. William Shoemaker of Surgery as the director and Dr. Christopher Bryan-Brown of Anesthesiology as co-director.

Over the years, the ICU would become a jewel in the crown of Mount Sinai. A complete history of the SICU can be found in the article by Dr. Andrew Leibowitz in this issue of *The Journal* (46).

With the recruitment of Drs. Robert Litwak and Howard Gadboys in 1962, to develop the Division of Cardiothoracic Surgery within the Department of Surgery, a major cardiac surgery program was begun, necessitating the development of a division of cardiac anesthesia. Dr. Barbara Lipton was recruited to head the division, and with her colleagues she made major contributions to the management of these patients (47, 48), especially in the area of the neurological sequelae of open heart surgery (49). Dr. George Silvay, originally recruited by Dr. Litwak as the associate director of the cardiothoracic surgery research group, joined the Anesthesia faculty after completion of his residency. His writings included a number of significant papers on the use of microfilters (50, 51) and on early endotracheal extubation following open heart surgery (52).

Lipton also became the senior anesthesiologist working in the hyperbaric chamber when it was completed. In conjunction with her colleague Dr. Avram Weinreich and with Dr. Julius Jacobson of the Department of Surgery, she conducted a series of elegant experiments on the physiology and role of hyperbaric oxygen (53–56). Lipton’s career was tragically cut short by her untimely death from breast cancer in 1974 at the age of 46. A letter written by her to the graduating residents just three weeks before her death epitomizes the compassion and humanistic view of the specialty of anesthesiology that has characterized this department throughout its existence. In it she states (57) “. . . the patient must always be uppermost in your thoughts, his welfare the most important thing for you to care about; you must be patient with him and gentle; his anesthetic and surgical procedure may be routine to you, but to him he is experiencing one of the most vital and traumatic days of his life. As an anesthesiologist practicing your profession with skill, you, as a matter of course, will deprive him of his consciousness, respiration, autonomic reflexes. You take him into the great unknown and you are as responsible as any one person can ever be for anyone else, including a parent for a child.”

Other significant contributions in the field of anesthesiology were made in many areas during this period. In the rapidly growing Obstetrical Division of Anesthesiology, Roberts' and Shirley's work on the prevention of aspiration pneumonitis during cesarean section was classic (58). A very large institutional program in myasthenia gravis with an emphasis on transcervical thymectomy led to major papers on the anesthetic management of this difficult group of patients. Girnar and Weinreich (59), in a large series of cases, demonstrated for the first time that tracheostomy was not needed for the vast majority of these patients. This was confirmed by others in the department subsequently (60–64). With the recruitment of Dr. Alexander Goldblat, the first professor of anesthesiology in Belgium and a founding member of the World Federation of the Societies of Anesthesiology, the department became heavily invested in the developing area of neuroleptanalgesia.

Caseloads increased consistently. In 1977, the department cared for 18,000 patients, including 3,000 obstetrical patients. The Gaisman Surgical Pavilion, dedicated in 1974, provided 19 new operating rooms and recovery facilities for general and specialty surgery in the newly opened Annenberg Building. It was the first time that a 24-hour-a-day recovery room was available at Mount Sinai.

With the growth of the medical school, the teaching program of the department evolved to include a fourth-year elective for medical students. The residency expanded and a third-year program in cardiothoracic and neurosurgical anesthesia was introduced. In 1962, the Bernard H. Eliasberg Library was created in the department, and the next year the Eliasberg Memorial Lecture was established. The first lecture, "Quantitation in Anesthesia," was presented by Professor William W. Mushin, who, in 1953, had coauthored a major text, *The Principles of Thoracic Anesthesia: Past and Present*, with Rendell-Baker (65). The Memorial Lecture grew to be a full-day symposium in 1971.

Dr. Rendell-Baker retired in 1979 and was succeeded by Dr. David C.C. Stark, the assistant director of the department since 1970. At the time of the transition, there were 44 residents in the department. Dr. Stark, a superb clinical anesthesiologist, also emphasized the importance of research by members of the department. A cell culture laboratory was developed. The three editions of Stark and Roberts'

book *Practical Points in Anesthesiology* (1974, 1979, 1985) were all well received (66).

Anesthetic management of the older patient has been an interest of the department for many years (67, 68). More recently, studies of cognitive function during the perioperative period have been studied, both clinically and in the laboratory (69–71).

The appointment of Dr. Joel Kaplan as chairman in 1983 brought to Mount Sinai an internationally known clinician and researcher in cardiac and thoracic anesthesia. Recruited from Emory University School of Medicine, where he had been chief of Cardiothoracic Anesthesia, Kaplan quickly converted the members of the department into a totally full-time faculty. A prolific writer, Kaplan had edited *Cardiac Anesthesia* (72), the primary textbook in the field, now in its fourth edition, and authored major papers on nitroglycerin infusion during coronary artery surgery (73); the precordial electrographic lead in patients with coronary artery disease (74); the optimal management of patients with ischemic heart disease who are undergoing noncardiac surgery (75); and the early diagnosis of myocardial ischemia using the pulmonary artery catheter (76).

In 1986, Dr. Kaplan was named to the then newly created Horace W. Goldsmith Chair in Anesthesiology. In that same year he became the founding editor-in-chief of the *Journal of Cardiothoracic Anesthesia*, the only journal in the field. Kaplan published another seminal paper in 1988, on the role of ultrashort-acting beta blockers in the perioperative period (77).

One of Kaplan's earliest priorities was to create a mandatory anesthesia clerkship for all third-year students in the medical school. This rapidly became most popular and increased the number of our students choosing a career in the specialty.

In 1987, Dr. Randall Griep was appointed chief of the Division of Cardiothoracic Surgery. He and his team significantly increased the number of cases in the specialty, and the Cardiothoracic Anesthesiology Division also became more active, both clinically and in the research arena. Konstadt and Reich, the co-directors of Cardiac Anesthesia, and their colleagues championed the intraoperative use of transesophageal echocardiography (TEE) and were the first to validate left ventricular function with this modality (78). They helped establish the guidelines for the use of TEE (79), and established its usefulness in detecting atherosclerosis of the ascending aorta during cardiac

surgery (80), as well as detecting a patent foramen ovale (81). TEE became a sensitive indicator for the detection of cardiac preload changes induced by transfusion and phlebotomy in the pediatric population (82), as well as helping to determine the severity of mitral regurgitation in the operating room (83). An algorithm was developed to assess intraoperative mean arterial pressure lability (84), and predictors of failure of pulse oximetry data were identified (85).

A Division of Thoracic Anesthesia was also created, and under the leadership of Dr. Edmond Cohen, it produced a number of important papers relating to one-lung ventilation (86–88). Cohen's text *The Practice of Thoracic Anesthesia* (89) has become one of the leading texts in the field.

The 1980s saw the rise of ambulatory surgery and the need to develop, test and provide anesthetics for short-term procedures that would allow the patient to return home the same day in a stable condition (90–94). Computers and automation began to play an increasing role in the department's service. Databases of anesthetics and outcomes were created and work was begun on creating expert systems in anesthesiology.

The institution of the liver transplant program in 1988 provided yet another opportunity for important contributions to the literature in this area from the Division of Transplant Anesthesia. Collaborating with the transplant surgeons, Dr. George Gabrielson and his colleagues showed that flushing a donor liver with autologous blood improved intraoperative hemodynamic stability and early graft function (95). Gabrielson was also the senior author of a major paper on the use of continuous infusion of phentolamine and esmolol in the management of patients with pheochromocytoma (96). This technique has been adopted by almost all centers managing these patients.

As noted earlier, Morris Bien was the first of the anesthesiologists at Mount Sinai to be involved in pain management; at that time, pain management consisted primarily of regional blocks for either acute or chronic conditions. Many years later, Owitz and Koppolu recognized the value of sympathetic blockade as a diagnostic and therapeutic modality and began to employ nerve blocks in the relief of cancer pain (97–99). A formal pain service was organized in the mid-1980s with both inpatient and outpatient components. Postoperative pain therapy with intravenous patient-controlled analgesia (PCA) was begun in 1988. Shortly thereafter,

continuous epidural fentanyl infusion was added as a therapeutic option. Both techniques gained rapid patient and surgeon acceptance.

Under the leadership of Dr. Joel Kreitzer since 1991, growth of the pain management service has been exponential. In 1994, a fellowship training program was approved by the Accreditation Council for Graduate Medical Education (ACGME); it now trains four fellows per year. Between 1996 and 1999, patient census doubled, and almost 4,000 procedures were performed on the entire population in 1999. In 1999, almost 5,000 postoperative patients were treated with either IV or epidural PCA. A recently instituted program uses continuous axillary and interscalene catheters for postoperative pain in upper extremity surgery. Concurrently, the case load of the chronic pain service has grown dramatically. Multiple publications dealing with postoperative and chronic pain management have been published, relating to new drugs, new delivery systems, and improved techniques of management (100–111).

The new Guggenheim Pavilion was completed in 1992, and included a 22-room surgical suite, a large recovery area (now called the Post-Anesthesia Care Unit) and 66 specialized intensive care unit beds.

In 1994, Dr. Kaplan encouraged the acquisition of the first computerized, simulated patient in this geographical area. The department has since acquired two more. These mannequin simulators provide a realistic environment for students and residents to practice the administration of anesthetic agents and injected drugs, as well as to measure cardiac output and practice intubation. The program represents Mount Sinai Medical Center's commitment to advancing education and patient safety.

The clinical service flourished under the leadership of Drs. Raymond Miller and Ian Sampson. Superb teachers and mentors of residents, students, and junior faculty, they assumed responsibility for the ever-increasing patient load and the ever-increasing complexity of the cases operated upon. In 1999, 35,000 anesthetics were administered by a faculty of 75 at Mount Sinai. There were, in addition, 36 attending anesthesiologists at Elmhurst Hospital Center, The Bronx VA, Mount Sinai of Queens, and Queens Hospital Center. In the 1999–2000 academic year there were 42 residents and 12 fellows in training.

Dr. Paul Goldiner was recruited to the faculty in 1992. A former chairman of the departments of anesthesiology at Memorial Sloan

Kettering Cancer Center and Albert Einstein College of Medicine, Goldiner had served as president of the New York State Society of Anesthesiology and was widely known and respected for his abilities as a leader and teacher. When Kaplan left the Mount Sinai School of Medicine in 1997 to become dean of the University of Louisville School of Medicine and provost and vice president for health affairs of the University, Goldiner became the interim chair and succeeded to the chairmanship in 1999. When Dr. Goldiner was installed as the second Horace W. Goldsmith Professor of Anesthesiology at the School of Medicine's convocation in 2000, Dean Arthur Rubenstein stated: "You have made seminal contributions to anesthesia and critical care medicine, emphasizing the improvement of perioperative care of cancer patients; initiatives which you have spearheaded in your department at Mount Sinai, such as the expansion of clinical trials, have produced enormous benefits. Under your direction the residency training program in Anesthesia has become one of the leading programs in the country. For your leadership in all three components of the tripartite mission of academic medicine — research, education and patient care — I am delighted to invest you as the second Horace W. Goldsmith Professor of Anesthesiology." With these words, Dr. Goldiner took the helm of an outstanding department.

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