Anesthesia and pain management at Baylor University Medical Center

MICHAEL A. E. RAMSAY, MD

"And the Lord God caused a deep sleep to fall on Adam, and he slept; and He took one of his ribs, and closed up his flesh instead thereof" (Genesis 2:22).

In December 1984, Dr. Michael A. E. Ramsay was summoned to the boardroom of Baylor University Medical Center (BUMC) to meet with Mr. Boone Powell, Jr., president of the medical center; Dr. John S. Fordtran, chief of the Department of Internal Medicine; Dr. Göran B. Klintmalm, recently appointed director of transplantation services; and other medical staff leaders. Those already assembled were on a conference call with Dr. Thomas E. Starzl, professor of surgery and director of transplantation at the University of Pittsburgh School of Medicine. First Lady Nancy Reagan had asked Dr. Starzl if a 4-year-old child, who had been part of the White House Christmas tree-lighting ceremony, could have a liver transplant. An organ was available, but there were no open hospital beds at Pittsburgh. Dr. Starzl had called to inquire whether the transplant could be done as the first liver transplant procedure at BUMC. The decision was made to proceed. Dr. Starzl flew to Dallas and together with his previous fellow, Dr. Klintmalm, performed the first successful orthotopic liver transplant in Texas, with Dr. Ramsay, Dr. Peter T. Walling, and Dr. Thomas W. Swygert assisting with anesthesia.

Organ transplantation could not have been contemplated save for centuries of effort to develop effective anesthetic agents and techniques for managing high-acuity patients for extended periods of time. Making the momentous decision to perform the transplant at BUMC was feasible only because of the near-century-long effort to develop BUMC's medical staff, technical support, equipment, facilities, and financing, together with detailed planning, guided by Dr. Starzl, to develop a major organ transplantation program at BUMC.

THE DEVELOPMENT OF ANESTHESIA

The earliest mention of anesthesia is found in the Book of Genesis (see above). Physicians have tried to relieve the pain of surgery since antiquity:

Opium and alcohol had long been used as analgesics, and Dioscorides, who lived at the beginning of the Christian era, urged that the root of Atrop Mandragora (mandrake) steeped in wine be given to patients before facing the knife. Medieval patients were given a "soporific sponge," soaked in opium, mandragora and hyoscamine (popularly known as henbane), the poor man's opium (1).

Figure 1. Christopher Wren. Photo courtesy of the Wood Library Museum, Park Ridge, Ill.

In 1657 Sir Christopher Wren (1632–1723, Figure 1), the architect of St. Paul's Cathedral, injected opium into a dog's vein through a quill. Experience taught the dangers of dulling pains by plying patients with opium, and few further developments followed until the chemical revolution produced the first anesthetic gas. In 1766 Antonio Mesmer evolved the technique of "Mesmerism," the first description of hypnotism as a form of anesthesia. In 1820 a young English surgeon, Henry Hill Hickman (1800–1830), vainly endeavored to get the medical profession to investigate the possibility of preventing pain during surgical operations. He experimented on animals, rendering them unconscious by removing atmospheric air. This resulted in the understanding of the importance of oxygen and carbon dioxide in respiration.

Over the centuries, opium was a commodity available on the free market. Its chemically produced form, morphia, was intro-

From the Department of Anesthesiology and Pain Management, Baylor University Medical Center, Dallas, Texas; and the Department of Anesthesiology and Pain Management, The University of Texas Southwestern Medical Center at Dallas.

Corresponding author: Michael A. E. Ramsay, MD, Department of Anesthesiology and Pain Management, Baylor University Medical Center, 3500 Gaston Avenue, Dallas, Texas 75246 (e-mail: docram@baylordallas.edu).

Figure 2. Surgery without the benefit of anesthesia in ancient times. Photo courtesy of the Wood Library Museum, Park Ridge, Ill.

duced in the 1820s, and the hypodermic syringe was introduced in the 1850s and declared “the greatest boon given to medicine since the discovery of chloroform.” “Nothing did me any good,” Florence Nightingale noted during one of her illnesses, “but a curious little new fangled operation of putting opium under the skin, which relieved one for 24 hours” (2). In 1898 the German company Bayer introduced heroin (diacetylmorphine), the “heroic drug” which, they said, shared morphine’s ability to relieve pain but was safer.

Prior to October 16, 1846, any surgical operation was accompanied by severe pain (Figure 2). Preparation for surgery often included plying patients with alcohol and opium until they were stuporose. (BUMC representatives found a similar practice in Romania in 1989 after the fall of the Ceausescu regime as they helped rebuild the country’s health care system.) After they were sufficiently groggy from this premedication technique, patients would be held down while surgery was rapidly performed. At The London Hospital, founded in 1775, an operating theatre bell (cast at the famous Whitechapel foundry) was rung to summon strong orderlies to restrain patients prior to the initial incision. Surgeons became very adept at performing fast operations—amputating a leg in 1 or 2 minutes. “Pitilessness” was expounded as an essential characteristic of a surgeon. Pain was considered a symptom of importance only in differential diagnosis, not as a problem related to surgical procedures. (It is fortunate that these conditions and practices no longer prevailed during the 20th century at The London Hospital, the alma mater of Dr. Michael A. E. Ramsay, chief of anesthesiology at BUMC since 1989; Dr. B. Roy Simpson, chief of anesthesiology from 1975 to 1989; Dr. Adrian E. Flatt, chief of orthopaedics from 1982 to 1996; Dr. Alain Marengo-Rowe, director of special hematology and transfusion services since 1972; and Dr. Peter Walling, attending staff anesthesiologist since 1976.) Among The London Hospital’s other historical vignettes are that the “Elephant Man’s” skeleton

Figure 3. Dr. Horace Wells. Photo courtesy of the Wood Library Museum, Park Ridge, Ill.

is kept in the medical school museum, and Sir Frederick Treves removed the appendix of the Prince of Wales (later King Edward VII) in 1902 with anesthesia administered by Sir Frederick Hewitt. Dr. Hewitt later designed the first oral airways, probably as a result of taking care of the king, an overweight, bearded man.

Credit for coining the word “anesthesia” (an = without, es-thesia = sensibility) is generally given to Dr. Oliver Wendell Holmes (1809–1894).

Nitrous oxide

Joseph Priestley (1733–1804) discovered nitrous oxide in 1773, but he did not realize that it could render a person insensible to pain. This English Methodist minister also developed the first carbonated beverage by charging water with carbon dioxide, but his most important discovery was oxygen in 1774. Priestley, a supporter of the underclass in the French Revolution, emigrated to the USA following a mob attack on his home. He continued his scientific research in Pennsylvania. Contemporaries there included Benjamin Franklin (1706–1790), John Adams (1735–1826), Thomas Jefferson (1743–1826), and Dr. Benjamin Rush (1745–1813).

In England, Sir Humphrey Davy (1778–1829) carried out further research into nitrous oxide. Thomas Watt (1734–1819), the inventor of the steam engine, designed the first face masks for delivery of nitrous oxide for Humphrey Davy. In 1800 Davy published a treatise on nitrous oxide, in which he observed that it appeared capable of destroying physical pain.

Nitrous oxide was demonstrated at stage shows as “laughing gas.” During one such show in 1844, a subject fell and injured his leg. A dentist, Dr. Horace Wells (1815–1848, Figure 3), noticed the accident and also observed that the participant felt no pain. Following this observation, Wells inhaled nitrous oxide himself while a colleague painlessly extracted one of his teeth. In January 1845, he attempted to demonstrate a tooth extraction under

Figure 4. Dr. Crawford Williamson Long. Photo courtesy of the Wood Library Museum, Park Ridge, Ill.

nitrous oxide anesthesia at Massachusetts General Hospital, but the patient cried out in pain. Dr. Wells was jeered at as a failure. The crowd laughed at him and shouted, “humbug!” Dr. Horace Wells gave up dentistry, later became a chloroform addict, and then committed suicide, despondent over his failure.

Ether

The credit for the initial use of anesthesia for surgical procedures belongs to Dr. Crawford Long (1815–1878, *Figure 4*), a country practitioner of Jefferson, Jackson County, Georgia, who had begun using ether for minor surgery cases on March 30, 1842. His first patient, James Venable, inhaled from an ether-soaked towel and became unconscious. Long then removed a cyst from his neck. However, he did not publish or otherwise publicize information about his techniques until 1849 (3).

Therefore, the official recognition for using anesthesia has been given to Dr. William T. G. Morton (1819–1868), another dentist and medical student in Boston, who, on October 16, 1846, was able to demonstrate successfully the anesthetic properties of ether at Massachusetts General Hospital (*Figure 5*). The patient anesthetized by Dr. Morton underwent without pain the surgical removal of a jaw tumor by Dr. John C. Warren (1778–1856). Dr. Warren announced to the audience, “Gentlemen, this is no humbug!” Warren was fortunate in that Dr. Henry J. Bigelow published a report of Morton’s first 2 successful cases, thereby giving him the recognition for administering the first anesthetic for a surgical procedure (4). Dr. Bigelow wrote: “It has long been an important problem in medical science to devise some method of mitigating the pain of surgical operations. An efficient agent for this purpose has at length been discovered.” As news of this development became known, it was hailed as “the greatest gift ever made to a suffering humanity.” This was a uniquely American discovery; the colonists were finally sending medical innovation back to the motherlands.

Figure 5. The first public demonstration of ether anesthesia at Massachusetts General Hospital. Photo courtesy of the Wood Library Museum, Park Ridge, Ill.

Morton tried to patent ether as “Letheon” but was promptly shunned by his colleagues who considered this very unethical, and Dr. Warren had him banned from the Commonwealth of Massachusetts. He withdrew the patent application. The amphitheater at Massachusetts General Hospital was later renamed the Etherdome and designated a national historic site in 1965. The argument still continues on who should be recognized as the discoverer of anesthesia. The American College of Surgeons, meeting in Atlanta in 1921, named Long the discoverer and in 1926 erected a statue of Long in Statuary Hall, Washington, DC.

The chemical ether was discovered by Valerius Cordus (1515–1544), a German botanist, or perhaps by Paracelsus (c. 1493–1542), a Swiss physician. In 1540 Paracelsus sweetened the feed of fowl with the sweet oil of vitriol (ether) and discovered that the inhalation of the vapor could induce sleep in chickens without causing any harm. However, its potential as an anesthetic was not realized for another 200 years. (There is even some evidence that the eighth-century Arabian philosopher Jabir Ibn Hayyam had compounded ether, not realizing its potential as an anesthetic agent.)

Ether was used by partygoers to get “high.” Ether “frolic parties” became popular; the pungent gas was sniffed, frequently causing loss of consciousness. Ether was also used for respiratory ailments such as asthma and was one of the early “bronchodilators.”

Chloroform

An obstetrician from Edinburgh, Scotland, James Young Simpson (1811–1870, *Figure 6*), was using ether for the relief of labor pains and delivery. However, he wanted a more pleasant-smelling compound. His search found chloroform, which he tried on friends at a dinner party. Under the influence of this new drug, his wife suddenly exclaimed, “I’m an angel! I’m an angel!” Everyone in the group then quickly became unconscious under its effects. Therefore, in 1847 Simpson introduced chloroform into clinical practice. Two years later, on June 8, 1849, an article appeared in the *Texas Republican* entitled “Uses of chloroform,” indicating that medical news had traveled to the state.

Later, Sir James Simpson advocated the use of anesthesia for obstetrics, going against religious teaching at that time. The Church regarded the pain of childbirth as a punishment justly

Figure 6. Sir James Young Simpson. Photo courtesy of the Wood Library Museum, Park Ridge, Ill.

Figure 7. Dr. John Snow. Photo courtesy of the Wood Library Museum, Park Ridge, Ill.

Figure 8. Dr. Joseph Clover. Photo courtesy of the Wood Library Museum, Park Ridge, Ill.

inflicted by God. Simpson defended himself by quoting the birth of Eve as described in Genesis. However, the battle was not won until Simpson attended Queen Victoria's birth of Prince Leopold on April 7, 1853. He asked his friend and notable anaesthetist, Dr. John Snow, to administer a chloroform anesthetic to the queen. Snow poured a small amount of chloroform onto the queen's handkerchief and held it under her nose. The queen remained conscious but felt no pain. She became a strong advocate for obstetric anesthesia, causing a major cultural change that led to the development of modern obstetrics.

Dr. Snow, later to be knighted, is recognized as the first anaesthetist (Figure 7). He was a masterful physician and dedicated researcher. He made notable advances in anesthesia and was the first to investigate anesthesia mortality, observing that cardiac paralysis occurred with increasing concentrations of chloroform (5). Snow also studied infectious diseases and, based on his hypothesis that cholera was water-borne, had water pump handles removed in an area of London, which led immediately to the cessation of a cholera epidemic. For this work he is also honored as the first epidemiologist.

Chloroform was, in fact, a toxic chemical with lethal effects if given in too high a concentration. The first reported anesthetic death was that of Hannah Greener, a 14-year-old child who died of a chloroform overdose on January 28, 1848. In response to these risks, Dr. Joseph Clover (1825–1892, Figure 8) developed the first apparatus that provided controlled concentrations of chloroform. This is one of the earliest reports relating to issues of patient safety.

Because of its toxicity, chloroform was administered in England only by physicians who had the scientific knowledge to provide a safe outcome. Therefore, England employed only physicians for anesthesia, then and now. Ether anesthesia, unlike chloroform, was easily mastered and in the USA was frequently left to the surgeon's nurse or assistant to administer. This resulted in the development of nurse anesthesia schools.

Local anesthesia

For centuries, the Indians in Peru used the saliva produced when chewing coca leaves to anesthetize wounds. Dr. Sigmund Freud (1856–1939) studied the cerebral stimulant effects of cocaine in 1884, and a surgical intern working with him, Carl Koller (1857–1944), tasted the cocaine and noted that his tongue had become numb. He realized that cocaine had potential as a topical anesthetic and was able to anesthetize his own cornea.

In 1888 Dr. Leonard Corning performed the first spinal block with cocaine, but it took another 14 years before this technique was used for surgical operations. Two German physicians, Dr. Heinrich Quinke and Dr. August Bier, popularized the technique in Europe, and Dr. Rudolph Matas from New Orleans wrote extensively about his experience in the USA. Two French physicians, Dr. Jean Sicard and Dr. Fernand Cathlin, developed the less dangerous extradural (epidural) technique in 1901. The general use of cocaine for nerve blocks was the result of the pioneering work of Dr. William S. Halsted of Johns Hopkins Hospital, who not only injected the nerves of thousands of his patients undergoing minor surgical procedures, but also experimented on himself. Unfortunately he did not know of the highly addictive properties of this drug, to which he developed a lifelong dependency.

Innovations

The development of anesthesia, initially in the mid-1800s and with major advances in the last half of the 19th century and throughout the 20th century, enabled rapid progress in surgery, obstetrics, organ transplantation, and pain management.

Concerns for patient safety led to the development of physiological monitoring systems. Dr. Harvey Cushing (1869–1939) introduced the blood pressure cuff into the operating room. The electrocardiogram, although designed by Dr. Willem Einthoven (1860–1927) in 1903, did not become an operating room patient monitor until 1945, because of the risk of explosion. Early car-

diac monitors were heavily shielded and had an oscilloscope that displayed only 3 complexes. These monitors were called “bullets” because of their design. They continued as standard equipment at BUMC until 1978. The continuing expansion and proliferation of anesthesia-supported surgical and related procedures required that hospitals add and increase the size of operating rooms, provide technical staff to operate equipment, and consider adding increasingly specialized medical staff members.

In 1924 anesthesia equipment was still very basic. The British Oxygen Company in London, Draeger in Germany, and 3 different US companies—Foregger, Heidbrink, and McKesson—were developing anesthesia delivery machines. This was a time for innovation and invention. In 1919 Sir Ivan Magill developed a technique of placing a breathing tube into the trachea, and endotracheal anesthesia was born. Later, in 1932, Dr. Ralph Waters, at the University of Wisconsin in Madison, accidentally placed a longer endotracheal tube into the right mainstem bronchus. He realized that he could ventilate one lung while the surgeon operated on the other lung. Modern thoracic surgery was now possible.

At the Mayo Clinic in 1934, Dr. John Lundy introduced an intravenous anesthetic, sodium pentothal, into anesthetic practice. Pentothal rapidly became the standard induction agent, being much more pleasant than inhaling the pungent ether. (It was not until the 1990s that propofol, a more rapidly metabolized agent with fewer side effects, finally replaced pentothal.) Although the existence of curare had been known for many years (it was mentioned by Sir Walter Raleigh in 1596 as an arrow poison of the South American Indians), it was not used in surgery to deliberately cause muscle relaxation to facilitate access to the abdomen until Dr. Harold Griffith and Dr. Enid Johnson administered it on January 23, 1942, in Montreal, Canada.

As the medical specialty of anesthesia grew in importance, the first society was founded by G. A. F. Erdmann in 1905, The Long Island Society of Anaesthetists. This became the New York Society of Anaesthetists in 1911 and became national in 1936 as the American Society of Anaesthetists. In 1945 the title was changed to the American Society of Anesthesiologists. The American Board of Anesthesiology was formed in 1937 as an associate of the American Board of Surgery.

Development of anesthesia in Texas

The first anesthetic given in Texas was recorded in May 1850. The 60-year-old patient, J. Witherspoon, was given chloroform for a mid-thigh amputation of his gangrenous leg. Dr. J. J. B. Wright, US Army, administered the anesthetic, and Dr. George Cupples (1815–1895) performed the surgery (6). The first anesthesiologist in Dallas was Dr. Rufus Whitis (1859–1949), and he was referred to as “the physician in charge of chloroform.” Dr. Whitis trained at Jefferson Medical College and came to Dallas in 1885. He is buried in Oak Cliff Cemetery.

In the 1890s as many as one third of the physicians practicing in Dallas had served in the Confederate army or navy. They would have brought their wartime experience of anesthesia to Dallas with them. Chloroform anesthesia was extensively used during the 4 years of the war. Despite its known toxicity, few deaths were attributed to chloroform, even though it was estimated to have been used in over 80,000 patients (7, 8).

In 1892 the University of Texas opened its Medical Branch in Galveston, and Dr. David Cerna (1857–1953) joined the Department of Therapeutics as one of 8 professors on staff. During his time there he authored numerous articles, among them studies on opium, belladonna, nitrous oxide, and chloroform (9, 10). He was able to confirm John Snow’s observations on chloroform but also noted that respiratory failure preceded cardiac paralysis. Dr. Cerna was born in Coahuila, Mexico, and had an intense interest in the culture of the native Indians of that country. In 1932 he wrote an essay on the pharmacology of the ancient Mexicans, in which he described the use of opium, obtained from the poppy, being used to narcotize prisoners to prepare them for human sacrifice, where the chest was opened and the beating heart offered up to the gods (11).

The Texas Society of Medical Anaesthetists was organized in 1939, with Dr. Carl Hoeflich as president. In 1948 the name was changed to the Texas Society of Anesthesiologists, with Dr. J. G. Youngblood as president. Dr. Joe Billy Wood and Dr. Pepper Jenkins played a significant role in this development.

THE TEXAS BAPTIST MEMORIAL SANITARIUM: 1903–1921

The Texas Baptist Memorial Sanitarium (TBMS), the progenitor of today’s BUMC, was established in 1903, a period dominated by the triumvirate of anesthesia, sepsis, and surgical pathological anatomy and characterized by resection to cure tumors, inflammations, injuries, or anomalies. The first hospital structure was a residence converted for use as a clinic and private hospital by Dr. Charles M. Rosser (1861–1945). Soon found inadequate for patient care and teaching, it was closed and replaced by a community hospital with operating rooms, patient rooms, and wards—a total of 250 beds in 6 large wards and 114 private rooms. The new hospital opened in October 1909. Shortly thereafter, Dr. Edward H. Cary, one of the nation’s outstanding eye, ear, nose, and throat surgeons, performed the first surgical procedure in the amphitheater and planned it so that spectators, including family members of the patient, could watch the operation (12). Dr. Elbert Dunlap and Dr. G. Hackler performed the first laparotomy, and an intern, Dr. Abell D. Hardin, gave the anesthetic. From 1909 until 1919, most of the anesthetics were administered by interns. A few surgeons had medical doctors or dentists give their anesthetics. In 1915 Dr. John R. Worley and Dr. James Granger Poe came to TBMS to administer anesthesia.

In the early years of TBMS, surgery was performed under ether, chloroform, or nitrous oxide anesthesia. Dr. John Worley was the first person to administer nitrous oxide at TBMS. He had extensive experience in the use of nitrous oxide in obstetric anesthesia (13). His office was located in the Medical Arts building downtown, and he always carried a little black bag and wore a black coat. In his obituary printed in 1953, he was described as a urologist, dermatologist, and anaesthetist.

Ether and chloroform were delivered by the open drop technique: a rag was soaked in the anesthetic liquid and held over the patient’s face by a wire Schimmelbusch face mask. The rag was kept soggy by the addition of more anesthetic dropped onto it from a bottle. The technique was taught until the 1970s; being portable, it could be used in the field. It was also very inexpensive and could be used in countries where the cost of more

Figure 9. Dr. James Granger Poe, Baylor's first anesthesiologist.

Figure 10. The first anesthesia textbook published in Texas by Dr. James Granger Poe (frontispiece).

Figure 11. The Sanders apparatus. Reprinted from Poe JG. *Modern General Anaesthesia, A Text Book for Students and Practitioners of the Art of Anaesthesia*. Dallas, 1926.

modern anesthetics was prohibitive. The use of ether finally stopped at BUMC in the 1970s as halothane became the agent of choice. Flammable anesthetics were then banned because of the risk of explosion from static electricity or electrical cautery used in the close vicinity.

James Granger Poe, MD

From 1915 until 1919, Dr. James Granger Poe (1873–1935, *Figure 9*) gave anesthesia for Dr. A. B. Small. In 1919 he decided to limit his practice solely to anesthesia and became the first physician to be employed by the hospital as an anesthesiologist. Putting patients to sleep with open drop ether, he would say, “Think about peaches and cream, think about peaches and cream,” until one young lady of the street told him in no uncertain terms what to do with that!

Dr. Poe was born in Alvaton, Kentucky, on April 3, 1873. He graduated from the Southern Normal School and Business College at Bowling Green, Kentucky, in 1889. By special dispensation from the dean of the University of Tennessee Medical School, he was allowed to graduate with first honors in his class of 91 students before he was 21 years old. He began practicing and teaching medicine in Dallas in 1898. He published the first anesthetic textbook in Texas, *Modern General Anaesthesia*, in 1926 (*Figure 10*) (14). Inside the front cover of the book, he wrote, “To the service of those who suffer and need help in the ministry of surgery this little volume is dedicated.” A second edition was published in 1931. He also wrote a second textbook devoted to his experience with chloroform anesthesia.

In 1920 Dr. Poe, together with a nurse anesthetist, Mr. L. A. (Pinkie) Sanders developed the Sanders anesthetic machine. The Sanders machine was a 4-prong apparatus with 2 tanks of nitrous oxide, 1 tank of carbon dioxide, and 1 tank of oxygen (*Figure 11*). Dr. Poe believed that this was a very safe machine in regards to any risk of explosion:

The Sanders Apparatus, which embodies the most practical construction for the administration of Ethylene-oxygen, Nitrous Oxide-oxygen, Carbon dioxide, and Ether combined as desired, by the Gatch rebreathing method, was devised in our own service by L. A. Sanders and is used exclusively in the hospital, and is also extensively used throughout Texas, and in other states, with a tabulation of approximately 185,000 administrations of Ethylene without an explosion occurring. Therefore we believe that the safety and proficiency of this machine and method is thoroughly established, and we feel as confident in the use of Ethylene as we do Ether in anesthesia (15).

However, the gas flow was completely unregulated, and the mixture delivered was often highly toxic. Nevertheless, the Sanders machine was very popular for 20 years.

Dr. Poe died at age 62 years in his home at 4110 Junius Street.

BAYLOR HOSPITAL AND BAYLOR UNIVERSITY HOSPITAL: 1921–1950

In early 1921, TBMS became part of Baylor University and was renamed Baylor Hospital (BH). It was the principal teaching hospital of Baylor College of Medicine until the school moved to Houston in 1943. The hospital was renamed Baylor University Hospital (BUH) in 1936.

During the 1920s through the 1950s, advances in surgery were, of necessity, often preceded by advances in anesthesiology.

Nurse anesthesia

Shortly after TBMS became BH, Dr. Poe became the first medical director of the Department of Anesthesia, which at that time included 3 nurse anesthetists. Mrs. L. C. Hart, hired in 1919, was the first nurse anesthetist. In 1922 Dr. Poe established a nurse anesthetist training program within BH, later to be called the Baylor School of Nurse Anesthetists. The first student nurse was Mrs. Eunice Oliver, who entered on October 1, 1922, and completed her course in 4 months. The next student was Miss Bess Huskerson (Duncan) in 1923, and she was followed by Mrs. Velma Goode Thompson Ferguson in 1924.

Figure 12. A nurse anesthetist using a Sanders inhalation mask on a patient during surgery in the late 1920s. Photo: Baylor University Medical Center.

Mrs. Velma Ferguson graduated in February 1925 and became a Baylor anesthetist. The next year, 1926, she was appointed assistant director of nurse anesthesia, and in 1930 she became director of the School of Nurse Anesthetists, a position she held until 1963. At that time, Mrs. Ferguson's 42-year tenure was the longest for any Baylor employee. A Bell County rattlesnake played a leading role in the start of her career. The rattler's bite almost killed her younger brother but for Velma's quick and daring treatment. An admiring doctor convinced her mother that the girl should be allowed to study nursing.

When she became director of the School of Nurse Anesthetists, she was joined by Mrs. Sallie Knight Moore, a graduate of Parkland Hospital. Together they developed a very successful nurse anesthesia program. In the early days of their careers, they had to purchase rubber tubing and fashion their own intratracheal tubes to help patients breathe in certain operations.

In 1963 the School of Nurse Anesthetists was flourishing. Mrs. Lucille Stampley, a graduate of the school in 1951, became the director, and Miss Bennie Sinclair became the assistant director. Between 1929 and 1970, a significant number of anesthetics were administered by nurse anesthetists (*Figure 12*). The school continued to do well until 1978. At that time the recruitment of anesthesiologists had resulted in an insufficient variety of cases available for the school to maintain accreditation, and the school was closed. The school had existed for 56 years, and when it closed it was fully accredited by the American Association of Nurse Anesthetists and in good standing. Approximately 400 graduates had passed through.

Department leadership

Dr. Howard Dupuy took over direction of the anesthesia department in 1935. He continued the practice of supervising nurse anesthetists. Ten years later, in 1944, Dr. Dupuy left to return to the practice of orthopaedics at the Dallas Medical and Surgical Clinic. Dr. Earl Foster Weir ("The Moose") was then appointed director of the department. Dr. Weir was the first physician trained in anesthesia to practice in Dallas. He took a

Figure 13. Dr. Gerald G. Mullikin and Dr. Louis Porter.

residency in Iowa with Dr. Stewart Cullen, a notable figure in American anesthesia.

With increasing surgical demands, increasing patient acuity, and the move of the Baylor School of Medicine to Houston, an anesthesiology residency program was established at BUH. The first resident was Dr. Joe Billy Wood, who, upon completion of his residency in 1948, became Dr. Weir's assistant.

BAYLOR UNIVERSITY HOSPITAL AND BAYLOR UNIVERSITY MEDICAL CENTER: 1950–1981

After the Second World War, especially after 1950, BUH developed progressively as a medical center and in 1977 was renamed Baylor University Medical Center. During this period, Mr. Boone Powell, Sr., served as executive director. The George W. Truett Memorial Hospital was completed in 1950, the Karl and Esther Hoblitzelle Memorial Hospital was added in 1959, the Erik and Margaret Jonsson Medical and Surgical Hospital was finished in 1970, and the Carr P. Collins Hospital was dedicated in 1972. Specialized facilities included the Charles A. Sammons Cancer Center, A. Webb Roberts Center for Continuing Education, Caruth Surgical Research Laboratory, and the 2-towered Baylor Medical Plaza physicians' office building.

As BUH, a typical community hospital of its era, was transformed into a major medical center and a regional referral center offering progressively more sophisticated services, it developed a larger medical staff comprising board-certified specialists in most recognized fields, attracted referral patients from northeast Texas, expanded residency programs, and encouraged clinical research.

This was the time when the need for new technology grew, as did biochemical and immunological knowledge. The increasingly systemic approach taken for diagnostics, treatment, and risk and outcome assessment often blurred the traditional frontiers between surgery, anesthesia, and other disciplines, medical and beyond. This was also the era in which surgery was replaced by other therapies based on a metabolic understanding of disease. Moreover, novel procedures such as prosthetic joint replacement and open-heart surgery were replacing traditional surgical and anesthesia techniques. These changes called for the major development of BUH's cadre of anesthesiologists and anesthesia services.

Introduction of private practice

As BUH's medical staff was expanded, Dr. Joe Billy Wood and Dr. Gerald G. Mullikin (*Figure 13*), both graduates of Dr. Weir's program, were granted staff privileges for the private practice of anesthesiology in 1950. This was against the wishes of Dr. Weir

and required much fortitude and persistence on their part. In 1952 Dr. Louis Porter (*Figure 13*), another graduate of Dr. Weir's program, joined Dr. Wood's practice. Dr. Porter was followed by Dr. George Emmett, the next graduate of the program.

These early private practitioners went on to receive other honors. Dr. Wood became chief of the department in 1964, and Dr. Emmett became interim chief in 1974. Dr. Joe Billy Wood was elected president of the Texas Society of Anesthesiologists in 1955. Dr. Gerald Mullikin was elected president of the Texas Society of Anesthesiologists in 1969, and in 1982 Dr. Louis Porter became the first anesthesiologist to be elected president of BUMC's medical staff. The ultimate accolade was awarded to Dr. Oliver F. "Mike" Bush, another of the private practitioners (who practiced mainly at St. Paul Hospital); he was elected president of the American Society of Anesthesiologists in 1964.

Figure 14. Dr. Raymond F. Courtin (photo courtesy of the Courtin family).

Raymond F. Courtin, MD

In July 1954 Dr. Weir retired and returned to Wisconsin. Dr. Raymond F. Courtin, an English physician, was recruited from the Mayo Clinic and appointed chief of anesthesia (*Figure 14*). Dr. Courtin had studied under 2 great pioneers of anesthesia, Dr. John Lundy and Dr. Albert Faulconer at the Mayo Clinic. Dr. Courtin was awarded a master's of science degree in anesthesiology from the University of Minnesota for his thesis entitled "Electroencephalography during surgical anesthesia with nitrous oxide and ether" (16). He was the first person to describe the effects of an anesthetic agent on the electroencephalograph and how it could be used to accurately assess the depth of anesthesia. He brought this important experience to BUH and presented the results of his continued research into the effects of halothane on the electroencephalogram at the World Congress of Anesthesiologists in London, England, in 1968 (17). This work proved to be ahead of its time, and only in recent years has such a monitor become commonplace in anesthetic practice as a tool to prevent awareness under anesthesia.

Dr. Courtin promoted regional anesthesia very strongly and brought his capability and enthusiasm to BUH, expounding the virtues of regional anesthesia and using it almost exclusively. The timing was good, as drugs such as lidocaine, first used as a local anesthetic by Dr. T. Gordh in Stockholm, Sweden, were now readily available. Dr. Courtin introduced caudal and epidural anesthesia to BUH.

The first pain clinics in the Dallas area were started by Dr. Courtin. He tried to persuade the medical staff and the administration about the virtues of a pain clinic in 1956 but was opposed. Despite persistent efforts he was unable to create a pain clinic at Baylor, so in 1976 he opened his own clinic on Junius Street, next door to BUH. He was joined by Miss Jean Simo, CRNA, who later became Mrs. Courtin.

Courtin had worked with Dr. John Lloyd of Oxford when the latter developed the cryoprobe. The cryoprobe is an instrument

and technique used for freezing nerves of spinal cord lesions without causing permanent damage. This technique also proved to be very useful in the treatment of acute facet joint pain (18). In addition to his accomplishments with regional techniques, Dr. Courtin introduced a new inhalational agent, halothane, to BUMC. This agent initially was administered in a similar way to trichlorethylene because its effect on soda lime was unknown. Halothane maintained its foremost place in clinical practice until the late 1990s, when it was finally replaced by sevoflurane, a minimally metabolized agent that patients recovered from quickly.

Dr. Courtin resigned as chief in 1966, and Dr. J. B. Wood was appointed in his place.

Postanesthesia care unit

In 1956 the Parkland Hospital experience showed that patients could come to harm after surgical procedures were completed and they had been returned to their rooms. The anesthetic agents required metabolism for recovery to take place, and this took many hours when the patient was still obtunded and potentially compromised. Therefore, at BUH, 5 nurses were designated "recovery nurses." Each nurse under the direction of Miss Joyce Mackie, RN, would accompany patients from the operating room to their hospital room. The nurses had portable suction machines, as well as various airways and blood pressure equipment.

It was not until 1962, 6 years later, that a dedicated recovery room was opened on the fifth floor of the Truett Hospital building close to the operating rooms. Now called the postanesthesia care unit (PACU), under the management of Ms. Jean Aguanno, RN, this area acts as an "overflow" intensive care ward as well as a recovery unit.

Figure 15. Dr. Joe Billy Wood.

Development of the anesthesiology staff

Joe Billy Wood, MD. Dr. Wood was the first anesthesiologist to enter the private practice of anesthesiology in Dallas (*Figure 15*). He became chief of anesthesia in 1966 and was instrumental in establishing an open medical staff, within which competitive, consultative anesthesia practice was developed. Dr. Wood also created an advisory committee to help establish and implement departmental policies and procedures. The advisory committee continues as an integral and important component of departmental activities at BUMC.

On November 30, 1982, Dr. Wood was awarded the Dallas County Anesthesiology Society Citation of Merit. This was given "in recognition of his many years of dedicated service to patients through the practice of anesthesiology; in appreciation of his having opened the frontiers for the private practice of anesthesiology in Dallas; in gratitude for his steadfast espousal of the highest principles of ethics in anesthesiology; and in thankfulness for his part in providing a bright heritage for those following in anesthesiology." Dr. Wood resigned as chief in 1975, and Dr. George Emmett took over as interim chief.

Figure 16. Dr. Harold Boehning, Dr. Donovan Campbell, Dr. Oneita Hedgecock, and Dr. Robert Rehmet.

Harold Boehning, MD. In 1958 Dr. Harold Boehning (Figure 16) joined the attending staff, after surmounting the restriction that limited the total number of anesthesiologists at BUH to 10. How this restriction came to be is a controversial issue. According to some anesthesiologists on the staff at the time, the hospital administration wanted to protect the nurse anesthesia program. Other anesthesiologists believed some of the existing department members wanted to protect their private practices. Whatever the reason, the staff opened up from that point forward, with the only restrictions being related to the quality of the applicant.

Dr. Boehning had an outstanding career in which he promoted most strongly the private consultative practice of anesthesiology. He was a supporter, both politically and clinically, of anesthesia as the practice of medicine. Dr. Boehning, along with Dr. Oneita Hedgecock, developed a large group of anesthesiologists who practiced mainly at Baylor. He was elected president of the Texas Society of Anesthesiologists in 1978 and later the Dallas County Medical Society. For his major contributions to the Dallas County Medical Society, he was awarded the Max Cole Leadership Award in 1995. Dr. Boehning chaired the advisory committee for most of Dr. Simpson's tenure as chief.

Donovan Campbell, MD. In 1959 Dr. Donovan Campbell (Figure 16) joined the BUH staff, having previously been chief of anesthesia at March Air Force Base in Riverside, California. Dr. Campbell believed that the Baylor anesthesia department should be the best in the world. He personally obtained state-of-the-art physiological monitors so that patients undergoing open-heart surgery could be monitored intensively. This pioneered the concept of intensive monitoring of the cardiovascular system for all high-acuity patients.

Dr. Campbell stayed on the "cutting edge" of anesthesia, bringing new techniques and technology to Baylor. He introduced halothane into neurosurgery and personally purchased a calibrated halothane vaporizer that opened its use for thoracic anesthesia. To reduce the cost of halothane, he developed a semi-closed patient rebreathing system to conserve the use of the agent. Dr. Campbell was very independent and was prepared to go against the tide of medical opinion if he believed that he was right, and frequently he was. He developed the technique of brachial artery cannulation for monitoring blood pressure continuously. Even without sound evidence, many authorities adamantly described this as dangerous. After using this technique on many thousands of patients, Dr. Campbell was able to show how safe the procedure really was. Now it has been shown to be a better monitoring technique for patients with poor cardiac ventricular

function than the more traditional radial artery cannulation. Dr. Campbell's interest in thoracic anesthesia led him to bring the double-lumen endobronchial tube for differential lung ventilation to Baylor. Dr. Campbell was an ardent supporter of proper patient care, and to the chagrin of many, he would not tolerate poor care or compromise his high principles.

Oneita Hedgecock, MD. The first female anesthesiologist to join the Baylor medical staff was Dr. Oneita Hedgecock in 1961 (Figure 16). She was appointed following completion of her residency in Los Angeles. The first female anesthesiologist in Texas had been

Dr. Claudia Potter, who practiced in Temple, Texas, from 1902 until 1948, but she had not completed a residency training program. The first female anesthesiology resident graduated at the University of Iowa in 1923. Therefore it was well overdue for this appointment to be made at Baylor.

Dr. Hedgecock was an ardent patient advocate. She introduced patient warming blankets to maintain body temperature during prolonged surgeries. She also chaired the morbidity and mortality conferences and a continuous quality improvement committee. She became a founding member of the credentialing committee at Baylor, probably one of the most influential committees at that time.

Other physicians. The attending staff was gradually increased when Dr. Frank H. Coufal, Jr., and Dr. Maurice W. Epstein joined the staff in 1960 and 1961, respectively, after completing residency programs at The University of Texas Southwestern Medical School.

Dr. Epstein had trained in the technique of controlled hypotension and was able to introduce this to Baylor, enabling oral surgery procedures to be undertaken with a much reduced blood loss. The technique that he used included the agent trichloroethylene, which had a residual analgesic effect that improved the recovery of these patients. Dr. Epstein also pioneered the use of "roller boards" so that patients could be safely transferred from gurneys to the operating room table and back without injury to either the patients or the care team.

Obstetric anesthesia (part 1)

The lack of the formalized provision of anesthesia care for obstetrical patients was recognized as a major factor in the significant national incidence of maternal morbidity. Therefore, in 1971 Dr. Robert Rehmet (Figure 16), having completed a residency at the University of Washington under Dr. John Bonica, joined the staff and developed an obstetrical anesthesia service. This was the first of several initiatives to provide first-class anesthesia for obstetric patients and the first specialized obstetric anesthesia service in Dallas. Despite strong support from some members of the obstetric division, many of the obstetricians continued to provide anesthesia themselves for their patients or supervised the nurse anesthetists.

Dr. Rehmet was not allowed to develop an obstetric care team with the nurse anesthetists because of anesthesia department policies; therefore, he had to work singlehandedly, only able to look after one patient at a time. This severely limited his role in the labor and delivery unit, and after 18 months with little sup-

port, he abandoned his attempts and decided to devote his efforts to surgical anesthesia.

Figure 17. Dr. B. Roy Simpson.

B. Roy Simpson, MD

In 1972 Dr. Campbell made one of many visits to The London Hospital in England. He made rounds in the anesthetic unit under Professor B. Roy Simpson. This unit was internationally recognized as one of the best anesthesia programs in the world. Dr. Campbell developed a firm relationship with Dr. Simpson and reported to Mr. Boone Powell, Sr., that BUH had an opportunity to recruit this world-renowned figure to come to Dallas to head the medical center's Department of Anesthesiology.

Dr. Simpson accepted the position as chief of the Department of Anesthesiology at BUH in 1975 and moved to Dallas (Figure 17). His aims were to transform the department, with its existing talented anesthesiologists engaged in the private practice of anesthesia, into a strong department with a more academic background and to improve the image of the department within BUH. His arrival had a major impact on the delivery and standard of anesthesia at Baylor and in the rest of the community. He started weekly anesthesia grand rounds that continue today. These meetings included presentations from visiting professors, morbidity and mortality sessions, and scientific meetings.

Dr. Simpson brought state-of-the-art physiological monitoring systems to each operating room. He also set up the first anesthesia technician program and provided training for them by a biomedical engineering department dedicated to the operating room. As equipment became more complex, the technician program ensured safety, proper maintenance of equipment, and an immediate response if failure occurred. These advances established Baylor's anesthesia department as a model for the city.

Dr. Roy Simpson was a dedicated educator. With the assistance of Dr. Ralph R. Tompsett, the director of Baylor's medical education program and chief of internal medicine, he set up an internship program for aspiring anesthesiologists.

Dr. Simpson took on many "political" battles during his tenure, mainly because of his zeal to develop a first-class anesthesia department delivering the best possible care to the patient. He did not seek the easy route of compromise but took controversies head-on. He realized the significant amount of revenue brought in by the department and also the considerable expense involved in keeping it running. Therefore, he appointed a business manager, Ms. Elaine Ganter, MBA, to oversee the budget. This provided the department with sound financial management, and the department continues to demonstrate a positive revenue flow.

Dr. Simpson trained in anesthesia at the world-famous department at the Radcliffe Infirmary, Oxford. He was a protégé of Sir Robert Macintosh, who invented the curved laryngoscope blade in 1943. While at Oxford, Dr. Simpson published a seminal paper on the management of postoperative pain with a thoracic epidural technique for patients undergoing upper abdominal

surgery who had respiratory insufficiency (19). This study led to the recognition that proper pain relief could facilitate recovery from surgery. In his younger days, Dr. Simpson was a national sprinter, rugby football player, and cricketer.

Dr. Simpson continued enhancing his national and international reputation and that of Baylor by being elected a member of the committee on panels and the committee on scientific papers of the American Society of Anesthesiologists. On numerous occasions he was invited to give presentations as a visiting professor, including a 4-week lecture tour of Latin America in 1982. He resigned as chief in 1989 but continued on active staff at Baylor until 1993.

Obstetric anesthesia (part 2)

The obstetric anesthesia "problem" had not been resolved when Dr. Simpson joined the staff. He recruited a group of anesthesiologists, many from the United Kingdom, to have obstetric anesthesia as one of their major interests. This team led by Dr. Simpson included Dr. Courtin, Dr. Peter Walling, Dr. Michael Ramsay, Dr. Colin Blogg, Dr. Robert Parks, and Dr. Catherine Blakeney. This group, formed in 1977, provided 24-hour in-house obstetric anesthesia service. The venture was only a partial success since many obstetricians continued to provide their own epidural analgesia for labor but wanted an anesthesiologist waiting in "the wings" if a problem occurred. This made it difficult for the group to make a living solely from obstetrics. Therefore, they also provided consultation to the main operating rooms. A single high standard of obstetric anesthesia was difficult to introduce, as was the team concept in labor and delivery. This effort, therefore, did not prevail. The major hurdles, however, had been addressed and recognized and the major battles won.

Common sense was about to prevail and, undaunted, Dr. Simpson, having now made tremendous advances in the delivery of quality obstetric anesthesia at Baylor, sought to attract another group of anesthesiologists with extensive experience in obstetric anesthesia who would make this the prime focus of their practice. He was strongly supported by younger obstetricians such as Dr. Robert Gunby and Dr. Dennis Factor. The timing was now right, and Dr. Roger Bullard was recruited to continue the development of a comprehensive obstetric anesthesia service. An anesthesia team with nurse anesthetists and anesthesiologists working together was formed. This model of obstetric anesthesia service was later adopted by the other major hospitals in Dallas. Dr. Bullard also developed a laryngoscope with prisms and lenses, so that it could facilitate difficult intubations. This instrument has become popular worldwide.

Peter T. Walling, MD

Dr. Peter Walling (Figure 18) joined the department in 1976, having spent a year in South Africa as a visiting professor. He trained at The London Hospital and joined Dr. Simpson's anesthetic unit, where as a senior lecturer and consultant he used an animal experiment model to identify the cause of an outbreak of neurological complications associated with spinal anesthesia in Brazil. Although his work prevented further catastrophes, because of political difficulties and the threat of legal proceedings, this important work was never published. Dr. Walling had

the distinction of delivering the last chloroform anesthetic in 1974, albeit unintentionally, when a halothane vaporizer was charged with the historic volatile agent.

Dr. Walling's inventive nature resulted in several innovations. He designed a "safety" syringe for pulmonary artery catheters that would not rupture the flotation balloon (20). In addition to his several medical inventions, he developed a transportable "whole steer barbecue" apparatus. He toured around the state of Texas providing first-class barbecue for major events. Unfortunately, this venture went up in smoke on the road to a large company gathering!

Law Sone, Jr., MD

Dr. Sone (*Figure 18*) joined Dr. Wood and Dr. Porter in practice at BUH in 1963. They were the leaders in developing a group of anesthesiologists with a reputation of unsurpassed quality. Dr. Sone became the 44th president of the Texas Society of Anesthesiologists in 1986 and was assistant chief of anesthesia at BUMC from 1992 until he retired from practice in 1998. He chaired the advisory committee of the department for over 10 years, and his counsel was sought often by Dr. Simpson and Dr. Ramsay. Dr. Sone was very influential in the recruitment of Dr. Ramsay from London. He traveled to England and spent a day in practice with Dr. Ramsay—a crucial factor in his decision to relocate.

BAYLOR UNIVERSITY MEDICAL CENTER AND BAYLOR HEALTH CARE SYSTEM: 1981–1999

In 1981 Baylor Health Care System was created, and BUMC was separately incorporated as the core hospital (with hospitals within it) of what was to become a multihospital, multifaceted, integrated health care system—one of America's larger voluntary hospital systems. This major step was made, with Mr. Boone Powell, Jr., as president, to allow the health care system to continue to develop and serve patients in the face of increasing competition and regulation, the growth of managed care, and the decline of fee-for-service payment. It also enhanced the system's access to capital needed to finance new facilities and advanced diagnostic and treatment equipment.

Same-day surgery admission

By 1984 the insurance companies and other payors were starting to exert pressure to limit the length of hospital stays for surgical procedures. Admitting patients the night before surgery was considered unnecessary by payors. They insisted on admitting patients on the same day as their surgery, which created problems in obtaining essential laboratory data, chest radiographs, electrocardiograms, history and physical examination reports, and previous records. It also constrained the time available for preanesthetic assessment. To meet these needs, Dr. Simpson undertook the organization of a same-day surgery admission center. Here, appropriate preoperative tests could be performed. With patients all admitted in the same area, not far from the operating rooms, the anesthesiologists had an opportunity to make preoperative rounds. The further development of this area was undertaken by Dr. Anthony D. Lehner, who helped improve communications between physician offices and the center.

Figure 18. Dr. Peter Walling, Dr. Law Sone, Jr., and Dr. Thomas Swygert.

Ambulatory outpatient surgery

At the same time, the need for a freestanding ambulatory outpatient surgery center near BUMC was recognized. The concept was that relatively short procedures could be performed on otherwise generally fit patients in a cost-effective and efficient manner. The planning task force stipulated that the medical director of the ambulatory surgery center should be an anesthesiologist and that an anesthesiologist should be assigned to each operating room for an entire day. The initial choice as medical director was Dr. Bruce Laubach, who had taken over the directorship of obstetric anesthesia from Dr. Bullard. Dr. Laubach was heavily involved in the planning and construction of the new "surgicenter." At the last minute, however, he decided to join several obstetricians and build a second competing surgery unit across the street from BUMC, using the experience he gained from the Baylor project. At this point Dr. Robert Rehmet stepped forward and agreed to take the position of medical director rather than have an outside search for a candidate who would be unknown to both the surgeons and anesthesiologists. Dr. Rehmet introduced the concept of "dedicated anesthesia" in a proposal to improve efficiency and provide more economic care in the surgicenter. This proposal sparked considerable controversy in the department.

Dedicated anesthesia

The concept of "one operating room—one anesthesiologist," or so-called "dedicated" anesthesia, was a radical change in physician practice at Baylor. This was met with significant opposition from those physicians in the department who had fought in the past for, and strongly believed in, the consultative practice of anesthesia. The consultative mode of practice meant that a surgeon or patient could select an anesthesiologist of his or her choice and not take an assigned physician. Many surgeons and anesthesiologists felt so strongly about this issue that they elected not to practice at the ambulatory outpatient surgery center. The existence of 2 practice patterns on 1 campus inevitably led to considerable tension when the 2 systems interacted.

The low-cost, super-efficient surgicenter became very successful, and by 1989, most of the "dedicated" anesthesia was being provided by one group of anesthesiologists. This was arranged by Dr. Dennis Johnson, who organized a group of anesthesiologists known as Metropolitan Anesthesia Consultants. He reached an agreement with the department that in exchange for providing 24-hour coverage for trauma patients, they would get the lion's share of the SurgiCare practice. This was approved by department members.

Dr. Rehmet obtained a master's degree in business administration and became a leader in the development of ambulatory surgery centers. He is now the medical director of a joint partnership between Baylor Health Care System and United Surgical Partners and oversees an extensive network of ambulatory surgery centers.

Roberts Hospital

In 1989 the Roberts Hospital was built as a component of BUMC and included an operating suite of 26 rooms. The design of these rooms and the physiological monitoring equipment was in part the result of a considerable amount of work and expertise from Dr. William A. Paulsen. Dr. Paulsen was recruited by Dr. Simpson as a biomedical engineer. He was a unique individual in that he also had been trained as a physician assistant in anesthesia. He was a leader in his field, gaining national stature as a major organizer of the Association for the Advancement of Medical Instrumentation. Dr. Paulsen was responsible for Marquette monitoring equipment being placed throughout the hospital. This state-of-the-art equipment could be found not only in the operating rooms but also in the intensive care units and special procedure rooms. Such uniformity provided safety, as only 1 system had to be learned by those using the equipment. Dr. Paulsen also introduced mass spectrometry to the operating rooms. This system provided for gas analysis to be performed for each patient so that proper ventilation could be confirmed and adequate levels of anesthesia could be monitored.

In the new Roberts Hospital, to facilitate the anesthesiologists in properly assessing their patients prior to coming to the operating room, a preanesthetic assessment area was set up in close proximity to the operating rooms. Here patients and their families could be visited by anesthesiologists.

Liver transplants

As described earlier, the first liver transplant was performed in December 1984 by Dr. Thomas Starzl and Dr. Göran Klintmalm, with Drs. Michael Ramsay, Peter Walling, and Thomas Swygert providing anesthesia. As the new transplantation service was established at BUMC, Dr. Simpson asked Dr. Ramsay to take charge of transplant anesthesia and to organize and coordinate the anesthesia consultation. This was not an easy task. Few volunteers could be found, as initially these procedures took place late at night and were very strenuous to manage. No single group of anesthesiologists was prepared to take on the transplants. Therefore, volunteers from 3 different groups came together to form a liver team. Fortunately, this allowed for flexibility in the provision of anesthesia since the procedures frequently took place when anesthesiologists were already committed to busy schedules.

Over the next few months, the infrastructure of a liver transplant program was put in place. Dr. Swygert spent a month in Pittsburgh with Dr. Andre de Wolf, Dr. Starzl's lead anesthesiologist. Dr. Swygert became medical director of Texas Surgery Center and assistant chief of the department in 1998 (Figure 18). Dr. William Paulsen played a significant role in putting together physiological recording devices so that data could be retrieved for research purposes. Mr. Guy Prater, senior perfusionist at Baylor, along with Dr. Paulsen, developed a veno-venous bypass system to assist venous return when the patient was anhepatic.

Transplant anesthesia fellowship

A major-organ transplant anesthesia fellowship was initiated by Dr. Ramsay, with Dr. Timothy Valek as the first fellow in July 1985. This rigorous fellowship eventually expanded into 2 positions and attracted many later-to-be very successful anesthesiologists. Many graduates from the program stayed on as staff members, having demonstrated their experience in taking care of the sickest patients. The clinical research performed by these fellows resulted in numerous publications in major medical journals and presentations at national and international meetings. Dr. Charles Whitten, a fellow in 1988, went on to become the Jenkins Professor at The University of Texas Southwestern Medical School.

Anesthesia research

Dr. Paulsen not only contributed enormously to the running of the department, but he also assisted with research efforts that were beginning at this time. The liver transplant program was the stimulus to the development of a very active anesthesia research program. To date, >100 major manuscripts have been published in peer-reviewed journals relating to the transplantation programs and anesthesia. Some of the significant contributions made by the department to liver transplantation have included demonstrating that the processing and reinfusion of salvaged blood during the procedure was safe and effective. The physiological changes associated with veno-venous bypass were described, and several contributions to the better understanding of renal function in end-stage liver disease were made. The management of patients with portopulmonary hypertension has been elucidated from the program's leading experience in this field. Research studies completed in the following areas have resulted in significant recognition for members of BUMC's medical staff:

- Renal protection during orthotopic liver transplantation (21)
- The safe control of fibrinolysis during liver transplantation by using low-concentration infusions of antifibrinolytic agents (22)
- Assessment of liver graft function intraoperatively by monitoring the metabolism of neuromuscular blocking agents (23)
- Evaluation of the role of inhaled nitric oxide in portopulmonary hypertension and hepatopulmonary syndrome (24)

The B. Roy Simpson Anesthesia Research Laboratory was opened in 1990. The results of the work performed there have made BUMC a world leader in anesthesia for liver transplantation. As a result, Dr. Ramsay has been asked to speak and join panels at numerous national and international medical meetings.

Departmental leadership

In 1989 Dr. Roy Simpson announced his impending retirement. Dr. Michael Ramsay (Figure 19) was appointed his successor after an interdisciplinary search committee made this recommendation to Mr. Boone Powell, Jr., the president of BUMC. The appointment was then ratified by the anesthesia section. (This was a significant change in Baylor's appointment procedure. Dr. Simpson had been directly appointed by Mr. Boone Powell, Sr., in 1975 while he was executive director, a procedure essential at that time but inappropriate in 1989.)

The department had developed professionally and increased substantially in numbers and subspecialization during Dr. Simpson's

Figure 19. Dr. Michael A. E. Ramsay.

tenure. Much remained to be done, however. "Dr. Ramsay's selection was a timely and inspired appointment. The rapier replaced the bludgeon" (personal comment, B. R. Simpson, 1999).

Sedation scale

Dr. Ramsay designed a study on controlled sedation for patients in the intensive care unit, together with Dr. Roy Simpson in 1974 (25). In this article a sedation scale was described that 20 years later was to become a standard international scale known as the Ramsay Sedation Scale. This scale is now part of routine sedation monitoring in hospitals throughout the world (*Table*).

The routine use of sedation scales in the critical care unit results in an objective assessment and close control of the level of sedation of the patient. The precise control of sedation and analgesia can reduce the need for muscle relaxants and the potential complications associated with their administration. Sedation agents administered to a defined clinical endpoint, as opposed to a set dosage regimen, allows for a continual reassessment of the patient, continuity of care, cost-effective use of drugs, and the avoidance of under- or oversedation. The target-controlled infusion of sedative results in fewer adverse events, shorter stays in the intensive care unit, and substantial economic savings.

Organ transplants

Following the successful start of the liver transplant program, a series of first heart and lung transplants were performed at Baylor by Dr. Peter A. Alivizatos, with Dr. Ramsay administering anesthesia. The first heart transplant was performed at Baylor in 1986; the first "domino" heart-lung transplant, in 1989. This was followed by the first successful single-lung transplant and the first double-lung transplant in Texas in 1990 and 1993, respectively.

Pediatric anesthesia

In 1989 Dr. Ramsay and Dr. Robert Kramer, chief of pediatrics, designed the concept of a children's hospital within BUMC. In addition to a dedicated pediatric operating room, the first

Figure 20. Dr. H. A. Tillmann Hein, Dr. Catalina Garcia, and Dr. Robert I. Parks, Jr.

pediatric induction room in Dallas was constructed. A preoperative holding area and recovery room were also constructed on the fifth floor of the Hobbittelle hospital, close to the operating room. A pediatric ward with a play area was built on the fourth floor of Hobbittelle Hospital with a friendly environment and decor for children. A dedicated group of pediatric-trained staff served both floors. A policy of minimal parent-child separation was formulated. When appropriate, parents could stay with their children during induction of anesthesia and could be present in the recovery room as they awakened.

Pain management

The demand for a multidisciplinary pain management center was recognized, and Dr. Ramsay chaired an initiative to set up such a program in 1991. In 1992 Dr. Carl Noe and Dr. Robert Haynesworth were appointed medical directors of the Baylor Pain Center and developed a multidisciplinary chronic pain program. In 1995 a second center was opened at Baylor Medical Center at Garland, and the following year another center opened to serve Arlington and Irving. In 1997 the Pain Center was accredited by the Commission on the Accreditation of Rehabilitation Services.

Discussion between Dr. Ramsay and Dr. Dennis Landers, the new chairman of the Department of Anesthesiology and Pain Management at The University of Texas Southwestern Medical School, resulted in an agreement to collaborate between their respective pain programs. In 1999 Dr. Noe was appointed joint medical director of both the Baylor and the medical school programs.

The relationship between Dr. Landers and Dr. Ramsay continues to be very strong. A joint clinical-base year in anesthesia program was started in July 1999. This program, approved by the American Committee on Graduate Medical Education, is another example of the close interaction between the departments since Dr. Landers became chairman in 1995.

Continued quality improvement

Dr. H. A. Tillmann Hein (*Figure 20*) took over responsibility for the BUMC quality assurance committee from Dr. Barry Gilbert in 1996. He made tremendous advances in outcomes analysis by creating a database with benchmarks against which the department's performance can be evaluated against that of other departments. Dr. Hein, who has an ardent interest in supporting research and education, was appointed clinical professor of anesthesiology at the medical school.

Table. Ramsay Sedation Scale*

Patient awake:

- Level 1: Patient anxious and agitated, restless, or both.
- Level 2: Patient cooperative, oriented, and tranquil.
- Level 3: Patient responds to commands only.

Patient asleep (sleep level dependent upon response to a light glabellar tap or a loud auditory stimulus):

- Level 4: A brisk response.
- Level 5: A sluggish response.
- Level 6: No response.

Scale scored from 1, least sedated, to 6, most sedated.

*From reference 24.

Anesthesiologist groups

Dr. Thomas Swygert led an effort in 1998 to combine the various groups of anesthesiologists into a single group, Southwestern Anesthesiology Consultants. This was not an easy task, as these groups had been very competitive, and the anesthesiologists disagreed on matters of practice management and economics. The advantages of working together and improving professional time use and costs eventually prevailed. In early 1999 the groups moved into a single set of offices. Initially each group maintained some independence in practice patterns by creating divisions. However, the total integration of the groups was perceived as a possible goal. The obstetric anesthesia group found itself unable to support the initiative and, very early on, withdrew from the venture.

Community service

Many of the anesthesiologists, together with anesthesia technician Monico Solomon, Jr., donate their medical services to developing countries. These countries include the Dominican Republic, Belize, Mexico, Syria, Taiwan, Thailand, and Myanmar.

Professional leadership

Dr. Catalina Garcia (*Figure 20*) was appointed to the Texas State Board of Medical Examiners by the governor of Texas in 1991. She was the first anesthesiologist to hold this position. In 1994 she was appointed to the practicing physician advisory council of the Health Care Financing Administration by the Secretary of Health and Human Services. In 1999 Dr. Garcia joined an advisory panel to the Food and Drug Administration, and locally she became a member of the Dallas Team, a group planning the future development of the city.

In 1998 Dr. Ramsay was appointed co-medical director of operating room services at BUMC along with Dr. Ronald Jones, chief of surgery. Dr. Ramsay was also elected to the board of trustees of BUMC in 1999, one of the first 3 physicians to serve on the board. This exciting move is a major change from the American tradition of excluding physicians from hospital governing board membership and will provide a new professional perspective on BUMC's board.

Dr. Robert Parks (*Figure 20*) led the medical staff into the new millennium as president, and he continues in various leadership positions on state and national anesthesia society committees. The more important roles that he has filled include president of the Dallas County Anesthesiology Society (1983–1984), president of the Texas Society of Anesthesiologists (1992–1993), and president of the BUMC medical staff (1999–2000). At a national level he has been a member of the professional standards committee of the American Society of Anesthesiologists since 1994, and locally he has been a member of the powerful credentials committee since 1994. His outstanding contributions to the medical profession continue.

The department enters the second millennium with almost 100 anesthesiologists with privileges at BUMC.

THE NEW CENTURY

During the 20th century, BUMC's capabilities in surgery, transplantation, and anesthesiology have gained national and international recognition for the medical staff and medical center. These capabilities have been developed through the unified

efforts of a number of generations of anesthesiologists, surgeons, and internists working in concert. Medical staff and Baylor administrative leaders plan to continue efforts to provide the quality of care, teaching, and research in the fields of anesthesiology, pain management, surgery, and transplantation that will continue to place BUMC among the national and international leaders in the century ahead.

Plans for the future for the Department of Anesthesiology include the development of an automatic electronic information management system to increase access to patient and medical information and enhance availability and accuracy of medical records. It will also allow immediate and aggregated data analysis for continuous quality improvement purposes and provide direct cost information. One of greater challenges that BUMC and BUMC's anesthesiologists will face during the 21st century will be providing excellence in health care under increasing economic restraints.

Anesthesiologists in the century ahead can be expected to play a leading role in perioperative medicine, pain management, critical care, and operating room management. This will allow for the continued development of complex interventions to help even the most compromised patients have a successful outcome and improved quality of life. The major focus of the Department of Anesthesiology and Pain Management will continue to be patient safety. The advances made over the past decades will be improved upon. In 1970 the national mortality directly associated with anesthesia was 1 in 7000 patients; this improved to 1 in 10,000 in 1980 and 1 in 250,000 to 400,000 today. This improvement has been the result of better training, better patient monitoring, and more receptor-specific drugs. Continuous quality improvement strategies will make understanding and preventing human error a number 1 priority so that patients can confidently undergo anesthesia knowing that their personal well-being is secure.

The role of BUMC and its anesthesiologists in the new century will be to be world leaders in providing the best health care to the community.

Acknowledgments

Significant assistance with this manuscript was provided by Drs. Harold Boehning, Donovan Campbell, Raymond Courtin, Bill Epstein, Oneita Hedgecock, Roy Simpson, Law Sone, and Charles Tandy and Ms. Dorothy Colvin. Editorial oversight by Dr. Larry Wilsey and invaluable secretarial help from Vickie Howard and the Baylor Scientific Publications Office staff is also acknowledged.

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APPENDIX

BUMC-affiliated presidents of the Texas Society of Anesthesiologists

Joe Billy Wood, MD	1955–1956
M. T. (Pepper) Jenkins, MD	1962–1963
Gerald Mullikin, MD	1969–1970
Harold Boehning, MD	1978–1979
Law Sone, Jr., MD	1986–1987
Robert I. Parks, Jr., MD	1992–1993

BUMC-affiliated presidents of the Dallas County Anesthesia Society

Law Sone, Jr., MD
Robert I. Parks, Jr., MD
Michael A. E. Ramsay, MD
Thomas W. Swygert, MD
Anthony D. Lehner, MD
H. A. Tillmann Hein, MD