

## C. Intensive Care

The department of anesthesiology can be proud that it was instrumental in establishing intensive care at the Mayo Clinic. Currently, members of the department continue to be involved in this field, which has become a specialty in its own right. As a major medical referral center, the Mayo Clinic needs excellent intensive care staff and facilities. The story of how these developed is a fascinating one. It is a tale of steady progress but also one of trials and tribulations, overcoming obstacles from both within the institution and from outside. It is one that also had its humorous moments as well. The success of this endeavor would not have been possible without collaborative team efforts among physicians, the dedicated nursing staff, respiratory therapists, dietitians, and numerous other disciplines, who have all brought their expertise and skill to the treatment of patients admitted into the intensive care units. Outstanding persons in each of these fields contributed greatly to the development of this discipline. Finally, over the years, many patients in the units have been helped but others were not. Our unfailing gratitude is owed to each and every one of them for enhancing the knowledge and clinical skills on how to appropriately take care of critically ill patients.

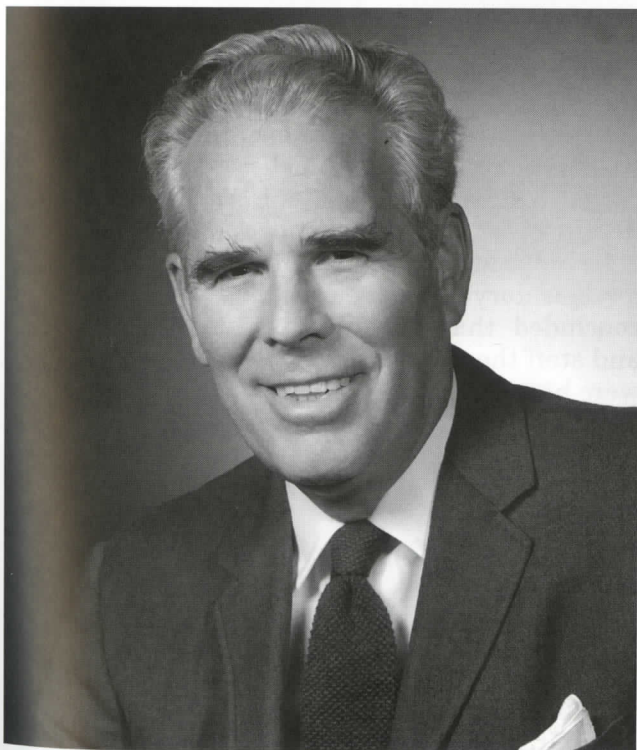


Fig. 1. Dr. Frederick H. Helmholz.

### 1. The Story Before Intensive Care

In 1916, Dr. Walter M. Boothby (1880-1953), a physician anesthetist at the Peter Bent Brigham Hospital in Boston, Massachusetts, well known for his work on respiratory physiology and basal metabolism, accepted an offer from Dr. Henry S. Plummer (1874-1936) to set up a metabolism laboratory in Rochester, Minnesota. The arrival of Dr. Boothby was delayed by his involvement in World War I (1914-1918), but once here, he soon established the standard values of basal metabolism in health and its variations caused by thyroid diseases. Dr. Boothby had an illustrious career in many fields of endeavor. In 1942, he recruited Dr. Frederick H. Helmholz, Jr., (1911- ), a physiologist, to assist him in his work in the metabolism laboratory, to provide oxygen therapy, and to service the tank ventilators used to support the ventilatory function of some patients, particularly poliomyelitis victims. For this work, they had the assistance of two technicians who originally worked as janitors at the Mayo Clinic. Subsequently, Dr. Helmholz became involved in developing other modalities to help patients with respiratory muscle weakness including providing intermittent positive-pressure breathing treatments, designing a pneumobelt and devices to facilitate coughing. He also collaborated with some of the early manufacturers of positive-pressure ventilation devices, which were being found to be superior to the tank ventilators in managing patients who needed ventilatory support.

In the mid-1950s, Dr. Helmholz (Fig. 1) participated in establishing the fledgling cardiac surgery program, directed by Dr. John W. Kirklin (1917- ). Dr. Helmholz provided advice on post-operative ventilatory support when needed for its patients. As this program grew, Dr. Kirklin used to call on Dr. Helmholz's expertise anytime, day or night, when one of his patients had a post-operative respiratory problem. Within a few years, this arrangement proved to be a suboptimal situation for Dr. Helmholz. In the early 1960s, Dr. Helmholz began talking to Dr. Albert Faulconer, Jr. (1911-1985), chairman of the department of anesthesiology at that time about this problem.

A similar unsatisfactory situation regarding the management of patients needing respiratory support was occurring at the Methodist Hospital. Here, likewise such patients were cared for by nurses and residents not formally trained in this field. Dr. E. Paul Didier (1925- ) (Fig. 2), an

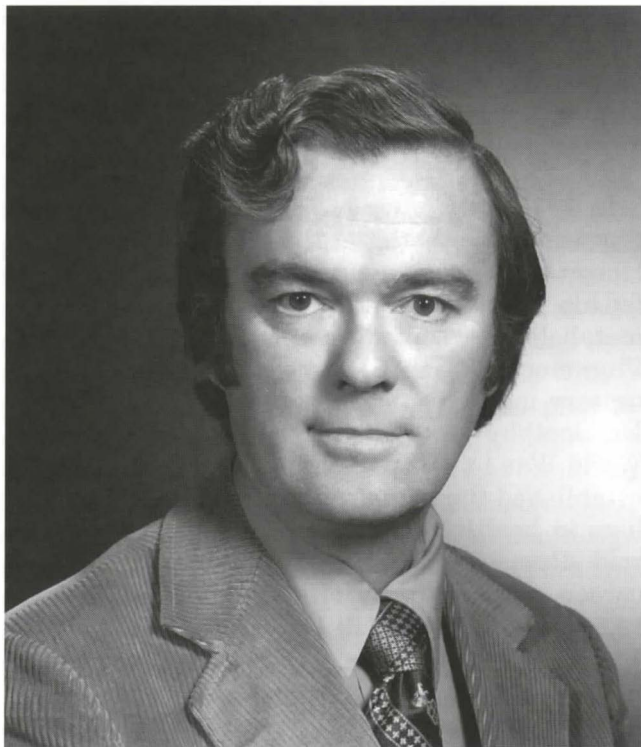


Fig. 2. Dr. E. Paul Didier.

anesthesiologist based at the Methodist Hospital at the time, was frequently requested to help treat these patients, often at times only after a crisis arose. In 1964, Dr. Didier wrote to Dr.

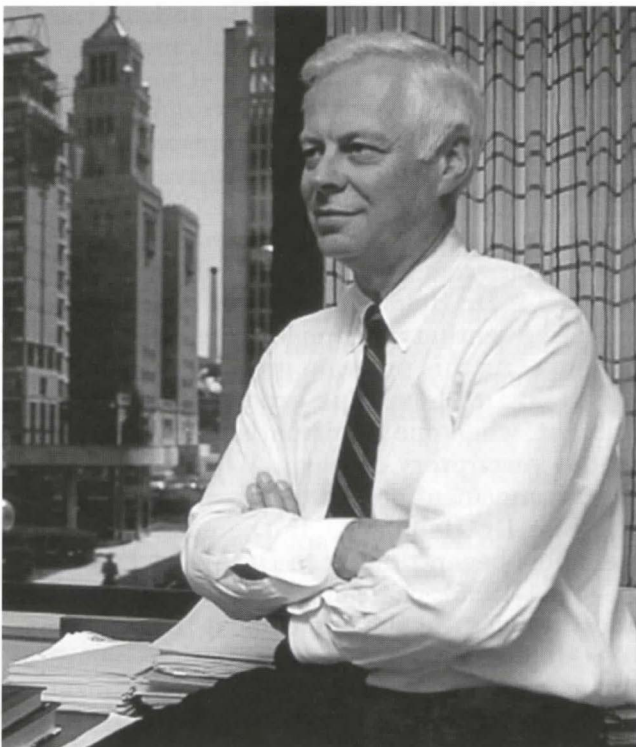


Fig. 3. Dr. Alan D. Sessler shown here in his office when he was chair of the department of anesthesiology

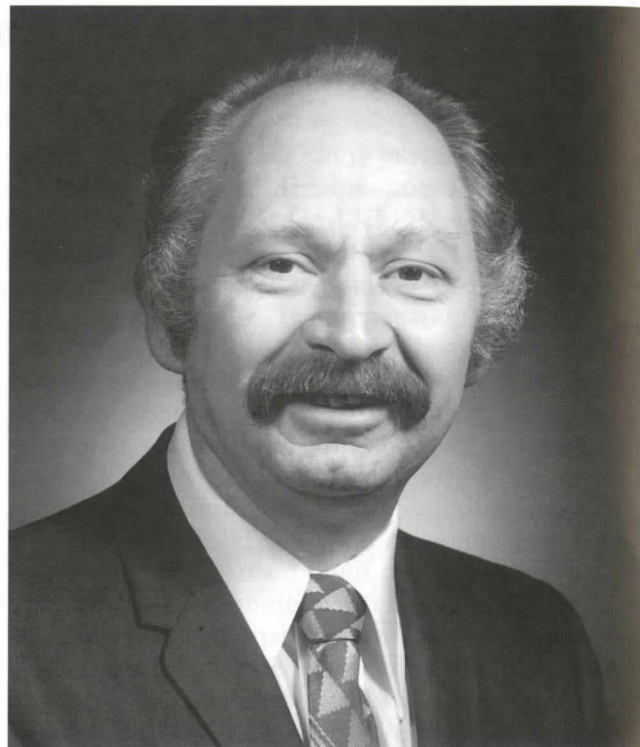


Fig. 4. Mr. Bernard P. Gilles, CRNA.

Faulconer documenting his involvement in the care of these patients and identifying the need to establish an intensive care unit at the Methodist Hospital.

## 2. Early Days of the Intensive Care Units

In the subsequent year (1965), Dr. Faulconer established an *ad hoc* committee consisting of Drs. Didier, Helmholz, John D. Michenfelder (1931- ), and himself to examine these issues. At that time, a new Methodist Hospital and the Alfred Wing at Saint Marys Hospital were under development, and the members of the committee believed that each of these facilities should have a respiratory intensive care unit. The committee concluded that anesthesiologists should direct and staff these intensive care units, because they were hospital-based physicians, could provide 24-hour coverage, and were knowledgeable about respiratory emergencies and providing care to obtunded patients. Despite opposition from some factions within the institution, Dr. Faulconer received permission to establish such intensive care units (ICUs). In 1966, Dr. Didier at the Methodist Hospital and Dr. Alan D. Sessler (1932- ) (Fig. 3) at Saint Marys Hospital, both at that time relatively new members of staff, were each given the task to establish these ICUs at their respective hospitals. These two physicians subsequently were to become elder states-

men in this field and rise to positions of national authority in medicine. To fulfill their task, Drs. Didier and Sessler were each assigned a certified registered nurse anesthetist (CRNA) to work with them.

In January 1966, Dr. Didier with Renee Caspersen (1927- ), CRNA, opened the first ICU at the Methodist Hospital on station 45. The unit was equipped with three beds to treat patients with ventilatory or airway problems (or both) and three beds for patients needing coronary care. Dr. Sessler began his service at Saint Marys Hospital before a dedicated unit for his patients had been opened. In his work, Dr. Sessler was assisted by Mr. Bernard P. Gilles (1930- ), CRNA, (Fig. 4), a taciturn ex-infantry North Dakotan who possessed real leadership skills and subsequently became a pivotal, vital member of the team responsible for the success of respiratory intensive care in our institution. In 1967, Dr. Didier's unit was moved to station 65 in the Methodist Hospital and Dr. Sessler was able to consolidate many of his patients with the opening of the 3-Alfred Unit at Saint Marys Hospital. The Methodist ICU was to move again briefly to station 85 before finally finding a permanent home on station 11-1 in the early 1970s (Fig. 5). Drs. Didier and Sessler were each responsible for

directing their own units. The annual report of 1967 stated that the 3-A unit of Saint Marys Hospital admitted 297 patients and the Methodist ICU admitted 201 patients, of which 108 were admitted for cardiac care and the rest for respiratory support. Electrocardiogram and invasive arterial pressure monitoring were performed on as-needed basis. Bird pressure-preset ventilators were the usual devices used to provide ventilatory support. The nurse anesthetist was responsible for providing chest physiotherapy and a tracheotomy care service.

At Saint Marys Hospital, analysis of blood specimens for determinations of blood gas tensions and pH was initially performed using equipment available in the research laboratory directed by Dr. Emerson A. Moffitt (1924- ) and supported by National Institutes of Health (N. I. H.). Dr. Kai Rehder (1928- ), as a fellow in anesthesiology, had worked with Drs. Richard A. Theye (1923-1977) and Ward S. Fowler (1915-1982) and had gained extensive experience in the research laboratory with the use of the oxygen electrode. This experience facilitated the subsequent use of the electrodes for clinical purposes. In 1967, the new ICUs at both hospitals acquired space near them in order to house blood gas analyzers.

At the same time that these ICUs were being established, attempts were initiated within the institution to improve the caliber of emergency resuscitation services in both hospitals. Before this time, many areas in these hospitals lacked the trained personnel and resources to provide such a service. Dr. Didier, having emphasized this fact in a letter to the institution's clinical practice committee, was named chair of a resuscitation committee charged with addressing this issue. Over the objections of some eminent physicians at the institution, a training program on resuscitation was launched. In 1966, Dr. Didier and Mr. Earl A. Schwerman (1933- ), head of the Methodist Hospital's pharmacy, initiated the "Code 45" cardiopulmonary arrest call system. This number was chosen because it was not in use at the clinic at that time and was instantaneously recognizable. Initially, when the telephone system announced such a "Code 45", pre-assembled boxes containing the necessary equipment and drugs were taken from the operating rooms and pharmacy to the scene where the primary service performed the resuscitation. This protocol proved to be unsatisfactory, and from 1968 onwards, designated members from the ICU staff and the division of cardiovascular diseases & internal medicine were charged with providing the resuscitation effort.

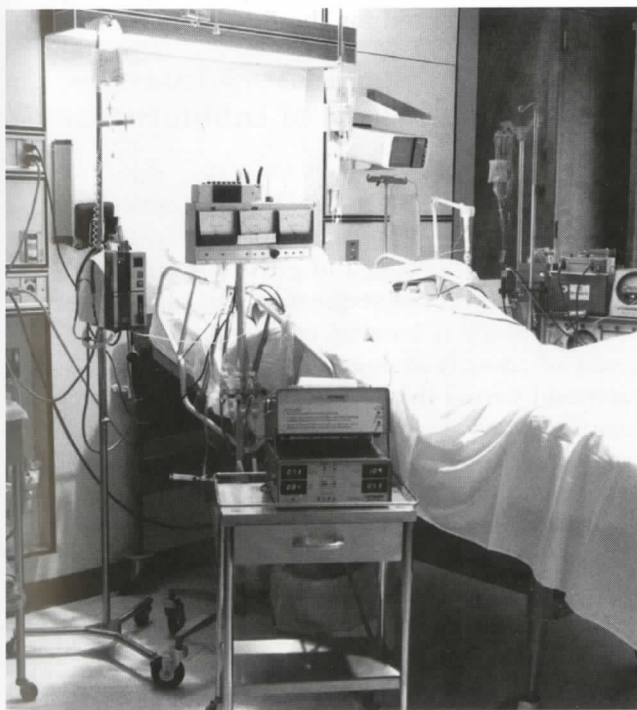


Fig. 5. The 11-1 Intensive Care Unit at the Methodist Hospital in the early 1980s. Note the monitoring equipment including galvanometers used to display invasive pressure signals.

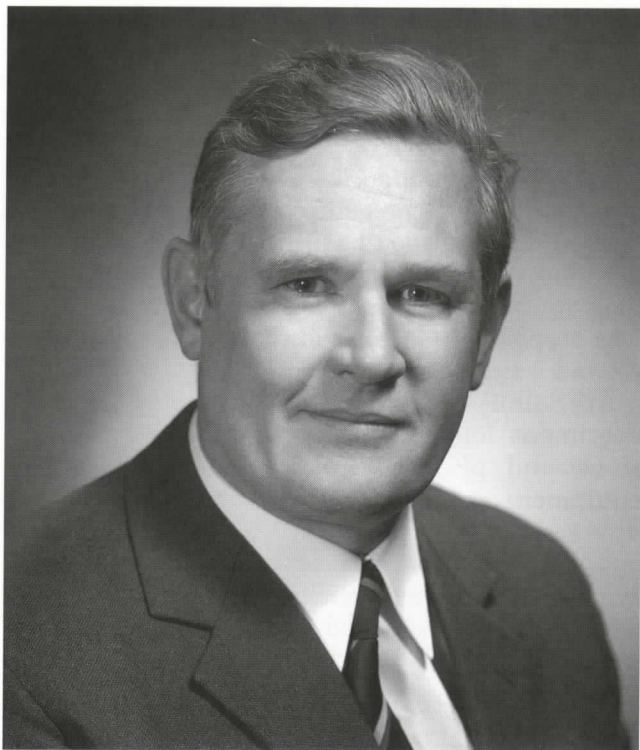


Fig. 6. Dr. Kai Rehder.

The number of patients managed in the ICUs during the next few years increased rapidly. This increase occurred because Drs. Sessler and Didier always made their services available. In so doing, they overcame significant reservations about the value of ICUs in many quarters. In 1968, 524 patients were cared for in the ICU of the Methodist Hospital. In 1969, 860 patients were managed in the Methodist Hospital's ICU and 673 in the 3-Alfred unit at Saint Marys Hospital. In addition, the Saint Marys service provided a daily consultation for all ventilator-dependent patients in the other ICUs at that hospital. Such patients were found in cardiac surgical units, the coronary care, neurosurgical, and pediatric ICUs. Rounds on these patients involved a 3-mile walk each day for the team.

At this time, the division of thoracic diseases & internal medicine was providing only a consulting service to ICU patients on an as-needed basis. The year 1968 was the first in which the department of anesthesiology made representations to the board of governors that the division of thoracic diseases & internal medicine should become more involved in this growing field. Although repeated on an annual basis, this suggestion was to remain unanswered until the next decade.

In 1968, Dr. Kai Rehder (Fig. 6) joined the ICU at Saint Marys Hospital and began his long and

distinguished research effort into the pathophysiology of the impaired gas exchange associated with anesthesia and mechanical ventilation of the lungs. Initially, Dr. Rehder also had clinical responsibilities and the task of assisting in the setting up of a pulmonary function laboratory adjacent to the unit at Saint Marys Hospital, which opened in 1969. Dr. Rehder was successful in attracting some outstanding young investigators, who also worked in the units while they were in Rochester. The first to come was Dr. David J. Hatch (1938- ) from England in 1968. Subsequently, he has become a professor of anesthesiology and an authority on pediatric respiratory physiology and anesthesia based in London. Dr. H. Michael Marsh (1939- ) from Australia did research in Dr. Rehder's laboratory in 1969 and subsequently returned from Australia to the institution to make many valuable contributions in a leadership capacity. In 1970, Dr. Rungson Sittipong (1941- ) from Thailand became a research fellow in Dr. Rehder's laboratory, a position that would lead to his appointment to the staff.

Continued growth of both ICUs, still distinct from each other, continued in 1970. That year marked the appointment of another much-respected CRNA, Myron Ricks (1923-1996), who soon became the heart and soul of the institution's airway management and cardiopulmonary resuscitation courses. Two respiratory therapists also were appointed for the first time that year.

### 3. Section of Respiratory Intensive Care and School of Inhalational Therapy

In 1971, Dr. Richard A. Theye became chair of the department of anesthesiology. In November of that year, the board of governors of the Mayo Clinic approved his request to establish a section of respiratory intensive care within the department of anesthesiology. This section was to be created by combining the two previously separate hospital services into a single administrative unit. Dr. Sessler was named head of this section. A proposal for the section to provide primary care was also approved at this time. The division of thoracic diseases & internal medicine agreed that, beginning in 1972, two of its consultants would participate on a part-time basis in the care of patients in this section. Dr. Rehder was named in charge of the section's research effort while he continued to be involved in the pulmonary function laboratory and to provide some clinical care. Dr. Didier was given the responsibility of leading the effort to establish a newly proposed inhala-

tional therapy (later to be called "respiratory therapy") school to be directed jointly by the Mayo Clinic and the Rochester State Junior College. Dr. Helmholtz helped in this last effort, which fortuitously was occurring at the time that the National Board of Respiratory Care was being formed. Finally, Mr. Gilles was appointed coordinator of both the section and the new proposed school.

Growth in the clinical workload in the ICUs continued in 1971. Mr. Lester J. Clapp (1937- ), another well-known person from the early days who had worked as a research technician with Dr. Khalil G. Wakim (1907-1985) in the department of physiology, joined the group in 1971 and worked in the blood gas laboratories. With the growth of the section, senior residents from the department of anesthesiology and the division of thoracic diseases & internal medicine began rotating through the service, and a vigorous teaching effort was mounted to ensure that they had a worthwhile training experience.

The year 1972 was the first year of the respiratory intensive care section. Anesthesiology consultants rotating on this service were Drs. Sessler, Didier, Sittipong, and Sheila M. Muldoon (1935- ). For the first time, they were joined by two consultants from the division of thoracic diseases & internal medicine, Drs. William W. Douglas (1934- ) and Matthew B. Divertie (1924-1986). Even though the latter two physi-

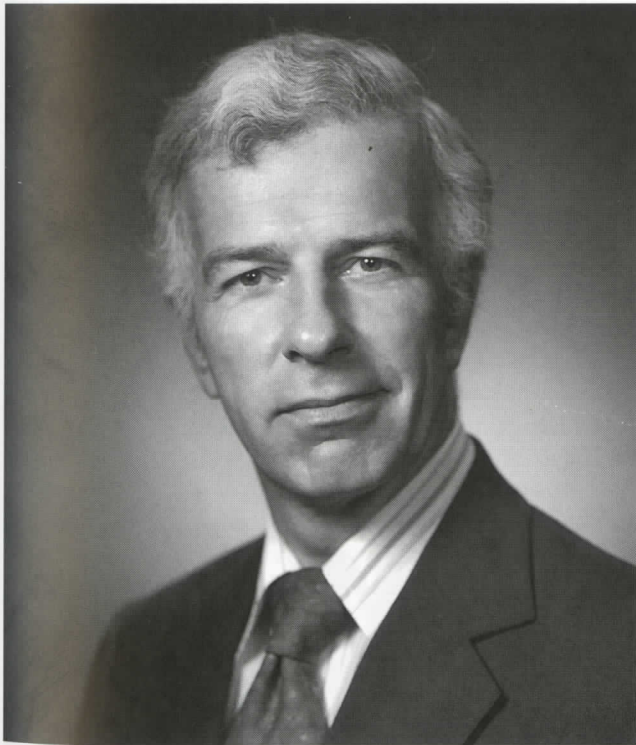


Fig. 7. Dr. William W. Douglas.



Fig. 8. Dr. Matthew B. Divertie.

cians worked only on a part-time basis, they added greatly to the strength of the service. Dr. Douglas (Fig. 7) was a consummate clinician and a first-class educator, and Dr. Divertie (Fig. 8) or Uncle Matt, as he was affectionately known, possessed these skills as well as being a recognized authority on acute lung injury. In the paramedical staff, Mr. Burdette V. Polk (1943- ), a CRNA, and Mr. Thomas R. Holtackers (1943- ), a physical therapist, began working in the section. The service started assuming primary care responsibilities for some patients at the Methodist Hospital. Volume-preset ventilators were purchased in significant numbers, and positive end-expiratory pressure was employed for the first time at the Mayo Clinic. The dedicated laboratory facilities started performing electrolyte determinations, in addition to blood gases analyses. Respiratory order forms were developed to track the work performed, and a cleaning and service area for respiratory equipment was established in the basements of both hospitals. Dr. Rehder was now permitted to pursue his research efforts on a full time basis. Finally, seven students were enrolled in the first year of the inhalational therapy school at the Rochester State Community College. This development was perceived as real progress to fulfill the continued need for growth.

The year 1973 was a year of consolidation. The first class of respiratory therapists graduated



Fig. 9. Dr. H. Michael Marsh.

after their clinical training at the Mayo Clinic. Drs. Divertie and Douglas began devoting 50% of their time to working in the units. The year was one of continued growth in patient numbers, and the section began assuming primary care for some patients at Saint Marys Hospital, in addition to having this responsibility at the Methodist Hospital. The section had five senior residents. Two of these residents were Dr. Denis A. Cortese (1944- ), currently the chief executive officer of the Mayo Clinic Jacksonville, and Dr. Peter A. Southorn (1941- ), from the United Kingdom. The clinical workload demanded that these residents be on-call every other day several weeks at a time. Called to a "Code 45" while taking a shower at 5:00 a.m. before morning rounds, one of the residents proceeded to resuscitate the patient successfully while a towel around his midriff fell to the ground. Hilarious instances like this occurred with some regularity and became the stuff of legend associated with these early days.

In 1974, Dr. Muldoon left the service. She was to continue her research interest and became a recognized authority in malignant hyperthermia. Dr. Marsh (Fig. 9) returned from Australia. He and Dr. Sittipong from Thailand (Fig. 10) became full time consultants in this activity. Clever, charming, and affable but a bit disorganized Michael and brilliant and kind Rungson, who knew more about respiratory physiology than

anyone else and spoke English in his own inimitable oriental syntax, were wonderful characters to have on staff. They were the advance guard of what became to be called in the department of anesthesiology "Sessler's foreign legion in intensive care." Indwelling pulmonary artery catheters were utilized for the first time at the Mayo Clinic in the ICUs, and a Baby Bird ventilator was purchased to ventilate the lungs of children needing ventilatory support. Significant clinical research efforts began this year. Studies on phrenic nerve pacing were initiated to determine whether such pacing could benefit quadriplegic patients. Two patients with acute respiratory distress syndrome were placed on extracorporeal membrane oxygenators in ultimately unfortunately failed attempts to provide life support while they recovered from their acute lung injury. A proposal was submitted to the N. I. H. seeking funds to examine treatment of this life-threatening lung injury. Whole lung bronchial lavage was performed for the first time at the Mayo Clinic to treat a patient with alveolar proteinosis. On the administrative front, the service began to work in the new ICU on the top floor of the Methodist Hospital. The service also overcame an attempt to cut back on the employment of respiratory therapists in favor of using more intensive care nurses. This attempt came to be known as the "Black Sting" by the respiratory therapy community. In 1975, Dr. James A.



Fig. 10. Dr. Rungson Sittipong.

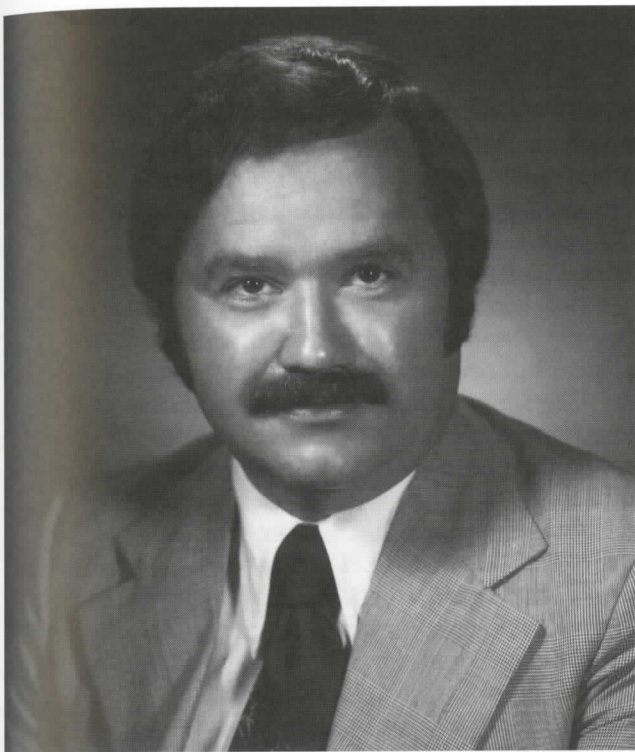


Fig. 11. Dr. Douglas R. Gracey.

Prentice (1937- ) joined the section briefly, and Dr. Denis C. Moriarty (1944- ) from Ireland, who later in his career was to become dean of the Faculty of Anaesthetists in Ireland, worked as a senior resident. Mary Ann Healy (1943- ), a registered nurse (RN), was appointed the first director of intensive care nursing services this year. Residents from the department of internal medicine rotated through the service for the first time this year. The service began managing the ventilatory support of children and neonates in the pediatric ICU at Saint Marys Hospital. A portable metabolic cart was developed to measure patients' oxygen consumption and carbon dioxide production to guide nutritional support. The laboratory began reporting its blood gas values with corrections for the difference between the patient's temperature and the temperature at which the blood gas tensions had been measured. The old card system used to track patients was replaced by a proper data retrieval system, which could tally the services given and report outcomes of the patient treatments. New monitoring equipment was ordered for both hospitals. The first Siemens model B ventilator was acquired for evaluation purposes only. Finally, the respiratory therapy school became fully accredited this year.

In 1976, Dr. Douglas R. Gracey (1936- ) (Fig. 11) from Chicago, who later was to become the chair of the division of pulmonary and critical care medicine & internal medicine, and Dr. Peter

A. Southorn (Fig. 12) joined the service. Drs. Sittipong and Helmholtz decided to leave the practice of intensive care in 1976. Dr. John C. McMichan (1941- ), an orthopedic surgeon from Australia, joined the service as its first intensive care fellow. The anesthesiologists in the section ceased providing simultaneous coverage of the operating suites and the critical care service when they were on call. The section purchased one of the first cardiac output computers, which was manufactured by the Waters Instruments Company in Rochester, Minnesota. This purchase allowed improved automated determination of a patient's cardiac output using a pulmonary artery catheter. The first of what would become a series of hemodynamic carts was constructed to house this equipment. A fiberoptic bronchoscope was purchased to facilitate airway management. The section started an outreach service, which entailed its residents particularly but also consultants riding on ambulances to outlying hospitals to transport patients needing ventilatory or airway support. The section also became even more heavily involved in the institution's cardiopulmonary resuscitation courses. It established a data base system for diagnostic coding. The year 1976 marked the beginning of a controversy as to whether intermittent positive-pressure breathing treatment was clinically efficacious, and the section decided to formulate



Fig. 12. Dr. Peter A. Southorn.

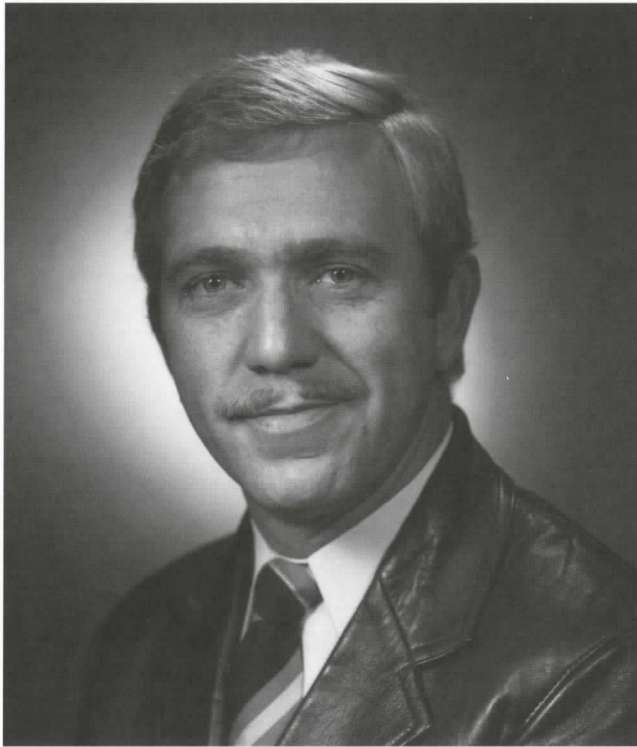


Fig. 13. Dr. John C. McMichan.

guidelines to ensure that this modality of care and chest physiotherapy were both appropriately utilized. The joint educational conference between the two hospitals staff on Friday mornings was established in 1976. Finally, Mr. Jeffrey J. Ward (1948- ), RRT, joined the Mayo Clinic and began contributing to the respiratory training program.

Illness forced Dr. Theye to step down as chairman of the department of anesthesiology in 1977. Dr. Sessler succeeded him, and Dr. Didier assumed the position of head of the division of respiratory intensive care, while continuing as medical director of the respiratory therapy school. In 1977, Dr. Divertie was honored by being elected president of the American College of Chest Physicians, and in this capacity he was active in the pulmonary advisory committee of the Heart, Lung, and Blood Institute of N.I.H. The major philosophical in-house debate in 1977 was how, in the presence of increasing growth, to control costs and simultaneously provide better care for patients. Many members of the section believed that the solution entailed providing primary care for all the patients. To facilitate this, the members agreed that a more multidisciplinary approach should be established in caring for both medical and surgical patients in the units and that the staff should be augmented with specialists of appropriate disciplines. To achieve this goal, a request was made to the institution for advice on this issue. These sentiments mirrored

a national debate occurring at that time as to the evolving nature of this sub-specialty. More parochially, the section established a group of respiratory therapists to support the placement of intravascular catheters and to aid with measurements of hemodynamics throughout the institution, except in the cardiac surgery units. In 1977, the section finally retired its last Bird pressure preset ventilator, over the objections of the cardiac surgeons.

By 1978, the institution had completed the requested review of its intensive care facilities and personnel. It suggested that it was appropriate to consider forming a multidisciplinary critical care service and that the name of the respiratory intensive care units should be changed to critical care units. After his fellowship, Dr. John McMichan (Fig. 13) joined the staff in 1978 and contributed to making hemodynamic monitoring more convenient, efficient, and accurate. In 1978 residents from the department of pediatrics began to rotate in the section.

In 1979, Dr. Daniel N. Wochus (1943- ) from the division of nephrology & internal medicine and Dr. James A. Meadows, III (1945- ) from the division of thoracic diseases & internal medicine joined the section and Dr. McMichan stepped down to complete his training in anesthesiology. A major effort in 1979 was made to establish a formal critical care teaching curriculum. Planning also started this year to establish new surgical and respiratory intensive care units on the 4th floor in the new Mary Brigh Building at Saint Marys Hospital. Determinations of oxygen tensions by transcutaneous electrodes were begun, especially in the pediatric patient population. Vigorous discussion occurred in-house and nationally as to whether pulmonary artery catheters were overutilized in the care of patients and the risks and benefits associated with the use of this device. At the request of the department of laboratory medicine and pathology, the institutional clinical practice committee (CPC) established an *ad-hoc* committee to recommend which facility should perform laboratory determinations that require a rapid turnaround. This reflected a national trend with departments of laboratory medicine trying to gain control of these facilities. The institution adopted the policy that the emergency laboratories should continue to perform blood gas analyses but that the number of electrolyte and other determinations performed by them should be limited. The CPC decided not to establish satellite hospital-based facilities of the main laboratory but directed that pneumatic tube systems be installed to enhance their services.



In 1980, Dr. Delmar J. Gillespie (1943- ), a pulmonologist who had an extensive research background in pulmonary mechanics from working with Drs. Robert E. Hyatt (1925- ) and Joseph R. Rodarte (1938- ), joined the section. Mr. Ward was appointed program director of the respiratory therapy training program. Events in 1980 included an invitation to the surgeons to join the section and have their residents rotate in it, an approach by the department of pediatrics for pediatric anesthesiologists to become involved in directing the pediatric ICU, the laboratories passing the College of American Pathologists site inspection, opening of the 4-Mary Brigham critical care unit at Saint Marys Hospital, and having a dedicated group of respiratory therapists start participating in the neonatal intensive care unit.

#### 4. Critical Care Service

In 1981, the board of governors of the Mayo Clinic agreed that the departments of internal medicine and anesthesiology should jointly form and conduct a critical care service (CCS). This name change would permit a more collaborative multidisciplinary approach to managing seriously ill patients and the establishment of a critical care training program. The director of CCS would rotate every 3 years between the two departments. Dr. Marsh was appointed the first director of CCS and Dr. Meadows its associate director, with Dr. Divertie being made the director of its training program. These changes were very much in line with what was occurring nationally and with the American Board of Medical Specialties in the late 1970s, establishing a joint commission on critical care medicine to explore having a common sub-specialty certification for this new specialty. To accommodate these changes, the department of anesthesiology created a new section called the critical care respiratory section to be responsible for the blood gas laboratories, chest physical therapy, and respiratory therapy services and to oversee the Rochester Community College-Mayo Clinic school of respiratory therapy. Dr. Didier was named the chairman of this section.

Patient care activities continued to increase in 1981. After completing his anesthesiology residency, Dr. McMichan rejoined the staff of the CCS and began studying the merits of pulmonary artery catheters equipped with fiberoptic oximetry. Significant efforts were made to improve the determination of nutritional requirements of patients. Several of the consultants, led by Dr. Southorn and later by Dr. Gillespie, became interested in high-frequency jet ventilation, and

approximately 10 patients were involved in their studies. Consultants continued their participation in advanced cardiopulmonary resuscitation courses. Drs. Wochus and Meadows spearheaded an effort to form a society of critical care physicians in the upper Midwest. The first meeting of this soon to be named North Central Critical Care Society was held at the Mayo Clinic in 1982.

In 1982, Dr. Martin D. Abel (1952- ), an anesthesiologist, joined the CCS. A very well-liked and respected colleague, his real forte and clinical interest was postcardiac surgery patients, and over time, he spent most of his CCS assignments working with these patients. His clinical research interest at that time was in pulse oximetry. Dr Abel continued to be a member of the CCS until 1989, when the responsibility of providing care to postcardiac surgery patients was transferred to the cardiovascular section of the department of anesthesiology to which he transferred his commitment. Robert Brigham (1955- ), RN, later in his career to become administrator to the department of anesthesiology, was appointed head nurse of the Methodist ICU in 1982.

Dr. Douglas decided to step down from his involvement in critical care in 1983. Everyone who had interacted with Bill appreciated his kindness and his homespun wisdom, and all profited from his superb educational commitment. Dr. Meadows resigned from the Mayo Clinic in 1983. The critical care fellowship training program, after much work, began this year. A list of physicians who have completed this program is given in Table 1. Until recently, most of the subsequent staff appointments in the CCS at the Mayo Clinic have been made from physicians who participated in this program. The board of governors approved the purchase of a new generation of monitors for the Methodist Hospital unit and the 3-Alfred unit of Saint Marys Hospital. A computer system to track and monitor respiratory therapy services, which had taken 6 years to develop, was finally operational in 1983. Nationally, the talks to establish multidisciplinary critical care certification were not making much progress, and the American Board of Internal Medicine announced that it was examining establishing its own critical care specialty examination. However, at the Mayo Clinic, the mantra of a multidisciplinary based critical care team still held sway.

In 1984, Dr. David J. Plevak (1953- ), an anesthesiologist, and Drs. Rolf D. Hubmayr (1949- ), W. Mark Brutinel (1948- ), and Paul D. Scanlon (1952- ) from the division of thoracic diseases & internal medicine, joined the CCS and Dr. Wochus resigned from the Mayo Clinic to enter

**Table 1.**  
Critical Care Medicine Fellows

Javier Aduen	Kevin S. Hara	Thomas J. Papadimos *
Bekele Afessa	Sharon Hargraves *	John Park
Robert Albright	Barry A. Harrison *	Raghunathan Parthasarathy
Robert M. Allen	Michael K. J. Hee *	Hemantkumar G. Patel
Alexander Allins	Monica A. Hennessy *	Samir K. Patel *
Ramzi Ammari	James T. Hynes	Prith Peiris *
Khalil Ansarin	Ashiqul Islam	Steve G. Peters
David A. Arrighi	Mohsim Ijaz	Gary C. Prechter
Yvonne Baerga-Varela	Ricardo Izurieta	Ourania Preventza
Ronald T. Bakondy *	Eric Jacobsohn *	Larry D. Price
Beth Ballinger	David Jawahar	Naga S. Pullakhandam *
Ashraf F. Banoub*	Thirumalairaj Jeevan	Natarajan Rajagopalan
Timothy J. Beaumont *	Scott S. Johnson*	Miguel Remolina-Schlig *
Robert E. Benkert	Bashar N. Jouma *	Thomas J. Rodenberg *
Keith H. Berge *	Luis Juncos	Frank D. Rossi *
Ines H. Berger *	Gerard S. Kamath *	Thomas A. Ryan *
Iqbal H. Biswas *	Ghassan E. Kanazi *	Nahel N. Saied *
Gilbert A. Blaise *	Mark T. Keegan *	Priya Sampathkumar
Glen Boudier	Farida Khan	John S. Sampson *
Alain Broccard	Youngmee Kim	Ambrish Shah
William T. Browne	Suneerat Kongsayreepong *	Joseph Shayeb
Peter D. Cameron *	Matthew M. Kumar *	Shawn T. Simmons *
Edmund G. Carton *	Tong K. Kwek *	Chanchai Sittipunt *
A. Cosmo Caruso	Joel S. Larson *	Kenneth G. Smithson *
Gilles I. Chemtob *	Panayota Liopyris *	Ann Steciw
Steven A. Conrad	J. Alberto Lopez	Susan K. Stein *
Mario L. Corona	Robert J. Lunn *	Kenneth H. Tan *
Dana Crino	Philip J. Lyng	KamthornH.Tantivitayatan*
Michael G. D'Souza *	Ian MacVeigh *	Mark Taylor
Maher Daas	Robert C. Maglio	Klaus D. Torp *
Lemsuel Dent	Syed Malik	Norman E. Torres *
Martin L. DeRuyter *	Steve Marks	Laurence C. Torsher *
Viren Desai	John C. McMichan *	William S. Turnage *
Gavin D. Divertie *	Diana P. Meadows *	Luis Urrutia
Elamin M. Ellamin	John Miller	Guringer M. S. Vasdev *
Scott A. Eskuri *	Syed Mobin	Dennis J. Verducci
James Y. Findlay *	Richard L. Morgan *	Robert W. Viggiano
Ognjen Gajic	Gamal Mostafa	Ravi Wahi *
Dorothee M. Gaumann *	Kamal F. Moukabary *	Maxwell Weinmann
John A. Gjevve	James J. Mulhall *	Jeffrey Wells
Monica Green *	Michael J. Murray	Lois Wise *
Brijendra Gupta	Elie Obeid	Frederick A. Zeller
Isam Habib	Okoronkwo U. Ogan *	Avishai Ziser *
John B. Hagan	Udaya B. Padakandla *	

\*Indicates Critical Care Medicine Anesthesiology Fellows

private practice. After completion of Dr. Marsh's term as director of the CCS, Dr. Divertie was appointed his successor in 1984.

The new method of government reimbursement for medical services, diagnostic related groups (DRGs) was beginning to have a negative impact on the bottom line of the Mayo Clinic's ability to care for critically ill patients, particularly those requiring prolonged ventilatory support. To try to control this, the CCS developed admission and discharge criteria for its units. A first attempt was made to evaluate illness severity scoring systems and their ability to predict clinical outcomes. This latter effort has continued and remains a prominent feature of practice

in intensive care since that time. Concern was expressed initially when the examination of these data began that, this evaluation might be used to limit care for some patients, but this fear has not materialized. Instead, outcome prediction scoring systems have proved invaluable in quality assurance studies. The institution made a commitment to commence performing liver transplants at the Methodist Hospital next year, and plans were developed to manage these patients in the intensive care units. Drs. Southorn and Plevak (Fig. 14), who were interested in taking part in this activity, participated in a series of interdepartmental meetings to formulate protocols governing the care of these patients. Finally,

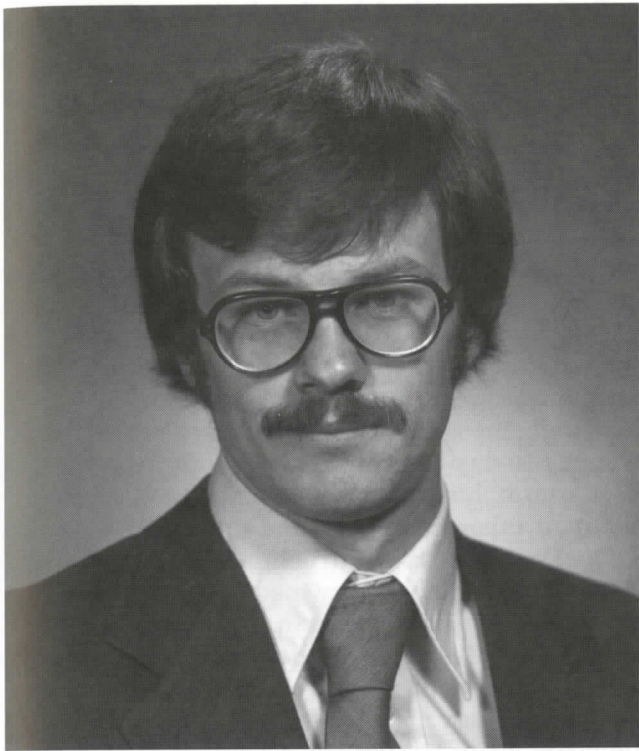


Fig. 14. Dr. David J. Plevak.

the success of the neonatal intensive care unit, now under the direction of Dr. Frederick Kleinberg (1940- ) from the department of pediatrics, resulted in requests from many smaller

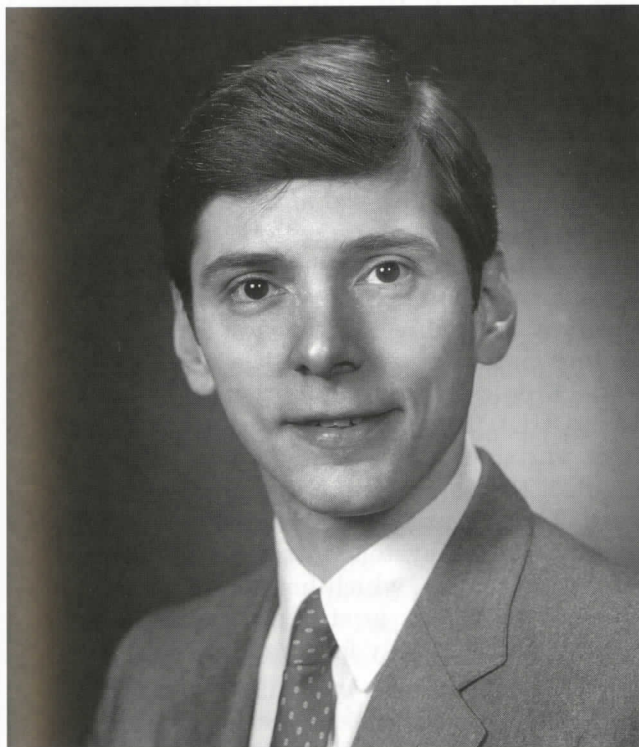


Fig. 15. Dr. Steve G. Peters.

regional hospitals to transfer their critically ill, often premature infants to the Mayo Clinic facilities. To meet these requests, respiratory therapists needed to be part of the team used to transport these infants by helicopter. This service began to be fully operational in 1985.

Dr. Steve G. Peters (1953- ) (Fig. 15), from the division of thoracic diseases & internal medicine, joined the CCS in 1985. A major clinical event that affected the CCS in 1985 was, as predicted, the start of the liver transplant program. Drs. Southorn and Plevak headed the involvement of the CCS. A well-appreciated part of this practice was that the hepatologists and surgeons involved in the transplant program believed in the team concept. They wanted the critical care physicians to be in charge of the patient management when they were in the intensive care unit, either preoperatively or postoperatively. The care of these patients was challenging, involving several new departures in the practice, including close monitoring of the patient's coagulation status, immunosuppression, new ways to prevent infection, providing nutritional support, sustaining the patient's liver function, and when the occasion arose, monitoring and treating raised intracranial pressure to prevent neurologic injury. Since 1985, more than 1,000 liver transplants have been performed, and the institution has an outstanding record of success in this area. Dr. Plevak is still involved in this program and has become an internationally recognized authority in the critical care management of these patients. Dr. Hubmayr, who like Dr. Gillespie had conducted research in the pulmonary physiology laboratory of Drs. Hyatt and Rodarte before joining the CCS, commenced his studies on the alterations in pulmonary mechanics caused by pulmonary edema. Another addition of the resident syllabus text was written with everybody contributing under the direction of Dr. Peter Southorn. Dr. Russell A. Van Dyke (1930- ) began a 2-year appointment as medical director of the blood gas laboratory. In a further effort to control costs, the institution's clinical practice committee suggested that ordering and delivering chest physical therapy be standardized, and this suggestion was implemented.

## 5. Critical Care Subspecialty Boards and the Dawn of the Modern Era

From 1986, physicians started to join and leave the CCS with increasing frequency. To keep the text clear, the names of these physicians will be identified at the beginning of the paragraph(s) describing that year.

In 1986, Drs. Jay H. Rhu (1951- ) and Michael J. Krowka (1946- ), from the division of thoracic diseases & internal medicine, and Drs. Michael J. Murray (1949- ), Bradly J. Narr (1954- ) and Jeffrey J. Lunn (1952- ), from the department of anesthesiology, joined the service. Dr. Krowka left within a year to join Mayo Clinic Jacksonville.

The year 1986 marked several important crossroads in the development of the CCS. The most tragic event this year was the sudden and unexpected death of Dr. Divertie. He was a true and trusted colleague who gave exemplary service to the practice and for many years assumed a leadership role in it. With his death, leadership of the CCS passed to Dr. Gracey. In addition to those identified at the beginning of this chapter, Dr. Cortese rejoined the group for 1 year before leaving for Mayo Clinic Jacksonville. Many consultants were now available who could potentially rotate in CCS. At any one time, the units were staffed by three consultants from the division of thoracic diseases & internal medicine and by three consultants from the department of anesthesiology. In addition, two full-time equivalents were available for staffing the division of intensive respiratory care in the department of anesthesiology.

Negotiations among the various specialties represented on the American Board of Medical Specialties broke down in 1986 owing to what seemed, on the outside, petty quarrels. Each medical board completed its plans to offer its own sub-specialty examination at about this time. All anesthesiologists working in the CCS took the examination in 1986.

The new intensive care unit in 11-3 on the top floor of Methodist Hospital was opened, and work was begun with colleagues in the division of cardiovascular diseases & internal medicine to develop a new monitoring system for use in the ICUs being contemplated at Saint Marys Hospital in the Mary Brigh complex. Infection control, always a major concern, was specifically addressed in 1986. The division of infectious diseases & internal medicine had already identified a group of consultants who participated in the liver transplant program, and now other consultants in this discipline were becoming increasingly more involved in the management of other patients in the intensive care units. A collaborative working relationship was initiated with this division to formulate policies to reduce incidences of bacteremias related to indwelling vascular catheters. The paramedical staff began wearing scrub attire in 1986 to reduce the incidence of infection.

Perhaps provoked by the decision of the CCS laboratory to begin measuring serum calcium and blood glucose levels, the department of laboratory medicine and pathology succeeded in gaining institutional support that it should administer the CCS laboratories jointly with the department of anesthesiology. This decision was in line with what was occurring in other institutions, with departments of laboratory medicine seeking control of all laboratory procedures to ensure that these meet quality assurance standards required for laboratory accreditation. This joint administration has continued until the present time, although most of the responsibility involved in the day-to-day running of the laboratories and its cost center has been transferred to the department of laboratory medicine and pathology. In 1990 Dr. Paula S. Santrach (1955- ) from the department of laboratory medicine and pathology and Dr. Southorn were named codirectors of these laboratories. On the whole, this involvement of the department of laboratory medicine and pathology has been positive, with that department providing the resources to introduce new tests to improve the management of critically ill patients. These tests have included blood coagulation tests and the ability to perform quick turn around cardiac isoenzyme measurements to help expedite the detection of myocardial infarction.

Clinical research progressed in 1986. Dr. Murray had expertise in nutrition research and embarked on studies examining the nutritional requirements of critically ill patients. Drs. Gillespie and Hubmayr continued their studies of the changes in respiratory mechanics found in lung disease that necessitated mechanical ventilation and also those found in patients with pulmonary edema. Several studies were performed on the liver transplant patient population, with this effort being directed by Drs. Plevak and Southorn. Drs. Marsh and McMichan became involved in evaluating the new method of predicting clinical outcomes by the acute physiology and chronic health evaluation scoring system (APACHE). This system was based on 34 physiologic variables and making a subjective assessment of the severity of chronic intercurrent disease. The system was the most sophisticated prediction scoring system introduced to date. The APACHE system, which has undergone two subsequent revisions, is still utilized at the Mayo Clinic and nationally for quality assurance studies.

In 1987, Dr. James P. Contarato (1953- ) from the department of anesthesiology and Drs. Robert W. Viggiano (1952- ) and Charles W.

Drage (1937- ) from the division of thoracic diseases & internal medicine joined the service. Dr. McMichan moved to Mayo Clinic Scottsdale to head the section of anesthesiology at that facility.

Dr. Marsh resumed being the director of the CCS this year. In 1987, combined kidney-pancreas transplants were begun at the Mayo Clinic in Rochester, copying many of the techniques that had been learned from the liver transplant program. Protocols for performing best positive end-expiratory pressure studies were put into practice. The APACHE II prediction scoring system was now being used in all ICUs under management of the CCS. Responsibility for the respiratory therapy training program was transferred to the division of education within the department of anesthesiology. The CCS involvement in supervising cardiopulmonary resuscitation services was also terminated.

In 1988, Dr. Sten G. E. Lindahl (1945- ) and Dr. Robert A. Strickland (1952- ) from the department of anesthesiology and Drs. Eric S. Edell (1954- ) and Peter C. Gay (1954- ) from the division of thoracic diseases & and internal medicine, joined the service, and Drs. Paul Didier and Conterato left it.

Dr. Paul Didier, decided to discontinue his involvement in critical care in 1988 and began working full time in the operating suite as an anesthesiologist. Paul Didier will be remembered in particular for shepherding and guiding the development of respiratory therapy profession. Dr. Plevak was named the new medical director of the respiratory therapy school. Planning began to establish the E. P. Didier Distinguished Lectureship to honor Dr. Didier's many contributions to the respiratory therapy profession to be held annually in Rochester during National Respiratory Therapy Week in the fall of each year. Dr. Sten Lindahl, a noted pediatric anesthesiologist from Sweden, who is now chairman of the department of anesthesiology at the Karolinska Hospital and deputy chair of the Nobel committee in Stockholm, Sweden and who had previously worked in Dr. Rehder's laboratory, joined the department of anesthesiology in 1988. Part of his responsibilities was to act as a facilitator for anesthesiologists to become more involved and lend their expertise to improving pediatric intensive care at the institution. Critical care service worked closely with him to accomplish this goal. Pediatric and neonatal intensive care units were areas of expansion of therapeutic modalities of care in 1988, including the use of nasal mask ventilation. The 6-Mary Brigh cardiac surgery intensive care unit at Saint Marys Hospital, built in part to accommodate

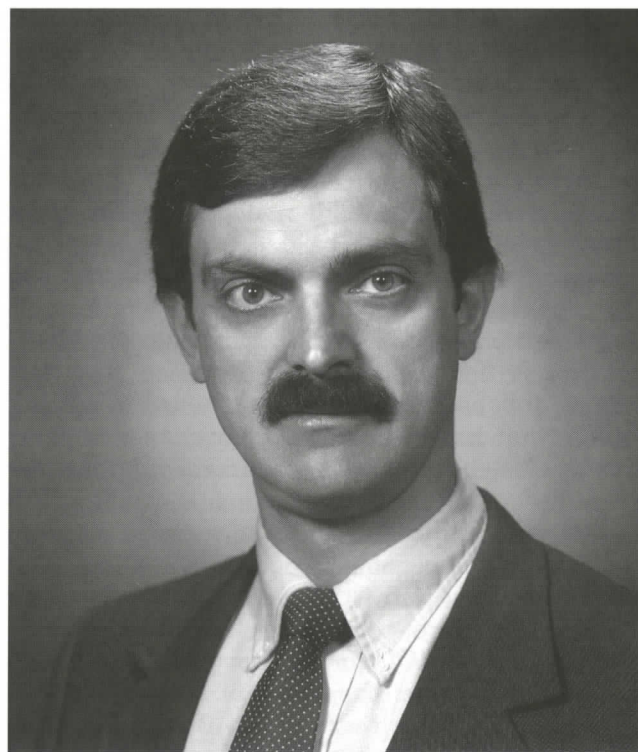


Fig. 16. Dr. Michael J. Murray.

patients undergoing heart and lung transplant surgery, opened in 1988. Drs. Peters and Rhu joined the group caring for the heart and lung transplant patients in this unit.

In 1989, Drs. William F. Dunn (1958- ) and Richard J. Pisani (1957- ) from the division of thoracic diseases & internal medicine, and Dr. Keith H. Berge (1958- ) from the department of anesthesiology joined, and Dr. Marsh left the service. Dr. Christopher M. Johnson (1952- ) was appointed director of the pediatric ICU.

In 1989, Dr. Roy F. Cucchiara (1943- ) assumed the chairmanship of the department of anesthesiology. Dr. Alan Sessler, his immediate predecessor and one of the founders of intensive care at the Mayo Clinic, had vigorously supported the development of intensive care throughout his tenure as chairman of the department. Dr. Michael Marsh, who was prominent in the development of the CCS, resigned in 1989 to become chairman of the department of anesthesiology at Henry Ford Hospital in Detroit, Michigan. Mike, a wise, kind, and intelligent person with natural leadership skills, had a special claim on the affection of all involved in critical care. Dr. Murray (Fig. 16) was appointed to complete Dr. Marsh's period as director of the CCS. At the request of the department of neurology to establish a critical care neurology section, Dr. Eelco F. M. Wijdicks (1954- ) started working on the CCS as

a special clinical fellow. Dr. Gracey obtained approval in 1989 to plan a six-bed unit in 2-Joseph at Saint Marys Hospital for the treatment of patients dependent on ventilatory support for more than 30 days. This unit was to be a Department of Health Care Finance Administration (HCFA) demonstration project, in which reimbursement based on cost was to be compared with that based on DRG basis. Dr. Gracey was to be appointed director of the unit, and his colleagues from thoracic diseases & critical care staffed the unit in his absence. The unit was established in 1990 and succeeded in getting HCFA financial support. Another change in practice in 1989, based on a government mandate for reimbursement, was that consultants had to countersign and code residents' notes of services rendered. The coronary care unit at Methodist Hospital closed and CCS assumed primary care of coronary care patients when they needed admission to an ICU in that hospital.

This period was the dawn of increasing subspecialization, which was to develop in the critical care service during the next decade. This change reflected a desire to assume more primary care responsibilities, particularly on the part of the colleagues from thoracic diseases. They started concentrating their efforts at Saint Marys Hospital to working in the medical ICU still located on the 3-Alfred unit, helping manage the heart-lung transplant patients, and working in the ventilator dependent unit set up by Dr. Gracey, which was soon to be called Graceland by everyone. At Saint Marys Hospital, the anesthesiologists in the CCS now directed their clinical time managing patients on the 4-Mary Brigh surgical respiratory intensive care unit and providing a consulting service to the neurosurgical unit. At the Methodist Hospital, the two specialties still rotated together in taking care of the patients. Dr. Southorn led some difficult but successful negotiations with leadership of the department of surgery for the critical care service to be the primary care physicians for surgical patients when they were admitted to ICU. This mode of practice lasted only a few years.

Starting various quality improvement initiatives became important events again in 1989. To reduce indwelling catheter-related bacteremias disposable pressure transducers were introduced for all hemodynamic monitoring. A Joint Commission for the Accreditation of Health Care Organizations inspection was passed successfully in 1989. The fellows in critical care began elective rotations to the Mayo Clinic facility in Jacksonville. Dr. Murray led an effort with Drs. Scanlon and Southorn to persuade a book pub-

lisher to market the latest version of the critical care in-house syllabus. This effort was ultimately unsuccessful. Multiple studies concerning the transplant patient population and work on the APACHE scoring system were continued, and the first of many protocols examining the acute respiratory distress syndrome in the modern era were begun.

In 1990, Dr. Edmund G. Carton (1955- ) from the department of anesthesiology joined the service. Dr. Murray was reappointed as director of the CCS in 1990 for a 3-year period. Dr. Scott E. LeBard (1956- ), an anesthesiologist with special qualifications in pediatrics, joined the staff of the pediatric intensive care unit, the first of several such appointments to what has become an exemplary sub-specialty. Members of the emergency room surgical service at Saint Marys Hospital made plans to become board certified in critical care and to establish their own surgical critical care service at Saint Marys Hospital. Responsibility for performing chest physiotherapy in the two hospitals was transferred to the department of physical medicine and rehabilitation. The hallmark in 1990, however, was the progress of the research effort. This progress included developing protocols on using surfactant to treat acute respiratory distress syndrome in adults, employing muscle relaxants in the ICU, using antitumor necrosis factor monoclonal antibodies to treat sepsis, and performing additional studies on the pulmonary mechanics in ventilator dependent patients, as well as numerous studies involving the transplant patient population. The service continued to gain a reputation for its academic prowess.

In 1991, Drs. Barry A. Harrison (1952- ) and Kevin P. Ronan (1956- ), from the department of anesthesiology, and Drs. Michael P. Bannon (1958- ) and Scott P. Zietlow (1957- ), from the department of surgery, joined the service, and Dr. Lunn left to work at the Mayo Clinic Scottsdale.

Dr. Duane K. Rorie (1936- ) became chairman of the department of anesthesiology in 1991. The new surgical ICU was opened at Saint Marys Hospital on the 7th floor of the Mary Brigh building in 1991. Drs. Bannon and Zietlow from the emergency room surgical service (ERSS) provided care in this unit. Dr. Berge was appointed director of the neurosurgical ICU at Saint Marys Hospital. HCFA implemented its resource board relative value scale (RBRVS) in 1991. The effect of this was to further reduce reimbursement provided by the government for patients needing prolonged hospitalization. It was indeed unfortunate that the 2-Joseph unit for ventilator dependent patients received HCFA approval as a

demonstration project this year. The first E.P. Didier Distinguished Lecture was given in the fall of 1991. New research projects that began in 1991 included examining an intravascular membrane oxygenator to help improve oxygenation of the arterial blood of patients with acute respiratory distress syndrome, a study to examine the benefits of recombinant human insulin-like growth factor on respiratory muscle strength, and ventilation weaning protocols using measurements of respiratory muscle strength and endurance. Multiple studies also continued on how to improve the practice of liver transplantation.

In 1992, Drs. Wijdicks and Jimmy R. Fulgham (1952- ), both from the department of neurology, joined the service and Drs. Ronan and Southorn from the department of anesthesiology left the service.

The directorship of the CCS reverted back to the division of pulmonary medicine in 1992, and Dr. Peters was elected to fill this position. The department of neurology appointed consultants to cover their sub-specialty component of critical care. The great tragedy that occurred this year was that Mr. Gilles, so instrumental in leading the efforts of respiratory therapy over the years, sustained severe head injuries in a car accident and was forced to retire. Bernie was known and admired by everyone, and he has been greatly missed. Mr. F. Curt Buck (1952- ), a CRNA, was appointed to succeed Mr. Gilles, and Dr. Narr was named medical director of respiratory therapy. Dr. Narr has worked diligently since then to find new avenues for respiratory therapists to work within the institution. This effort had been important to the department of anesthesiology, both because the new work performed by respiratory therapists has proved immensely valuable and because the traditional roles that respiratory therapists have had in patient care have suffered declining reimbursement in recent years. Examples of the new roles of respiratory therapists include their important contributions to the running of the clinical research unit at Saint Marys Hospital, participating in the preoperative medical evaluation clinic, and taking on such tasks as recording of electrocardiograms in the hospitals at nighttime.

In the years 1993 and 1994, Drs. Martin L. DeRuyter (1959- ), Gerard S. Kamath (1956- ), and Dr. Matthew M. Kumar (1957- ) from the department of anesthesiology and Dr. John P. Scott (1956- ) from the division of thoracic diseases & internal medicine joined the service. Dr. Robert W. Viggiano left to work at Mayo Clinic Scottsdale.

Dr. Gracey became chairman of the division of thoracic diseases & internal medicine in 1994. The storm in the teacup, which surfaced at this time, was the decision of his division to change its name to division of pulmonary and critical care medicine & internal medicine. In this decision, they followed the example of many other groups practicing their specialty, but to some anesthesiologists it appeared to be the final nail in the coffin of a multidisciplinary critical care service. In truth, the latter was in fact becoming a thing of the past at the Mayo Clinic. The institution decided for administrative purposes to bring all the various specialties now involved in the practice of intensive care under the umbrella of this division at this time. As a result, the CCS comprised 29 physicians, of whom 9 were anesthesiologists, 11 were pulmonologists, 3 were surgeons, 2 were neurologists, and 4 were pediatricians. Each of these specialties sought to subspecialize in their special area of expertise. A practice pattern also now began to be established, which has continued to the present time of consultants rotating in and out of the CCS for short periods. An achievement during this 2-year period was the excellent dialog established with colleagues in the CCS of Jacksonville and Scottsdale. Mayo Clinic Jacksonville had a well-established CCS that was modeled after the one in Rochester, and Mayo Clinic Scottsdale was structuring a similar one. A research study on the effect of adding nitric oxide to the inhaled gas mixture in patients with acute lung injury and pulmonary hypertension commenced, as did studies led by Dr. Gay examining noninvasive respiratory support.

In 1995, Dr. Laurence C. Torsher (1959- ), Dr. Norman E. Torres (1961- ), and Dr. Gurinder M. S. Vasdev (1962- ), from the department of anesthesiology, joined the service.

In 1995, Dr. Narr (Fig. 17) became director of the critical care service. Several practice issues affected the running of the units at this time. These included the reduction in number of surgical residents in the institution required by their residency accreditation. Also, to meet third-party reimbursement requirements, the need for written documentation of services rendered to patients by the consultants increased. For the same reason, consultants increasingly had to be physically present and supervise clinical interventions performed by residents. Another issue that surfaced in 1995 again was the desire on the part of surgeons to direct the care of their patients received in the intensive care units. To facilitate patient care, a new patient information management system was ordered for the units.

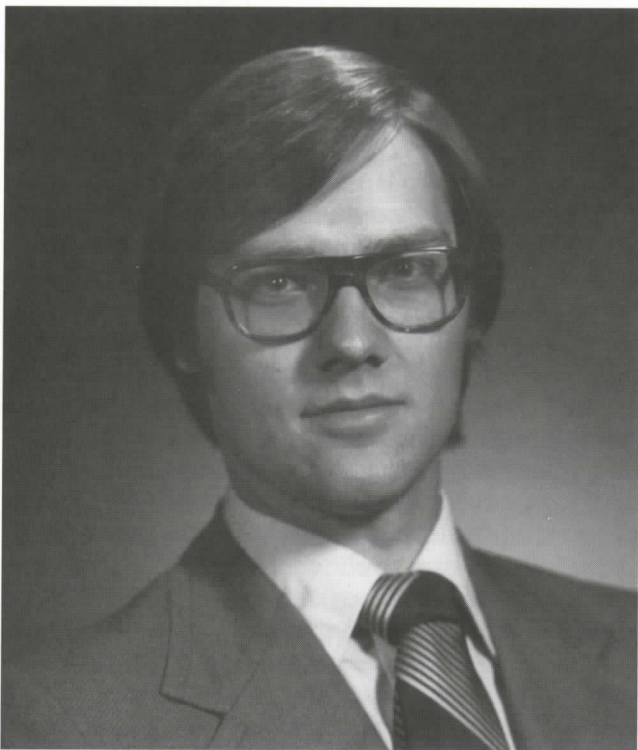


Fig. 17. Dr. Bradley J. Narr.

The year 1995 also saw the introduction of the point-of-care hand held portable blood gas analyzer, which was used to provide blood gas analyses in cardiac arrest ("Code 45") situations.

From 1996 to 2000, Dr. Jeffrey J. Lunn, Dr. James Y. Findlay (1962- ), Dr. Daniel R. Brown (1964- ), Dr. C. Mark Bazzell (1959- ), and Dr. Bhargavi Gali (1967- ) joined, and Drs. Kamath, Torsher, Berge, and Strickland, all from the department of anesthesiology, left the service.

Although never static, the number of anesthesiologists in the critical care service has remained relatively constant during the last 5 years. In 1998, the directorship of this service rotated back from Dr. Narr to Dr. Peters, and Dr. Harrison was appointed chair of the division of intensive care and respiratory therapy within the department of anesthesiology. Currently, 30 consultants rotate through the units of the critical care service, of which 13 are anesthesiologists. Four full-time consultant positions are available for these anesthesiologists to work in critical care, and in addition, one full-time consultant position is available to support the activities of the respiratory therapists. Subspecialization within the CCS has now occurred. Currently, at Saint Marys Hospital, the anesthesiologists (Fig.

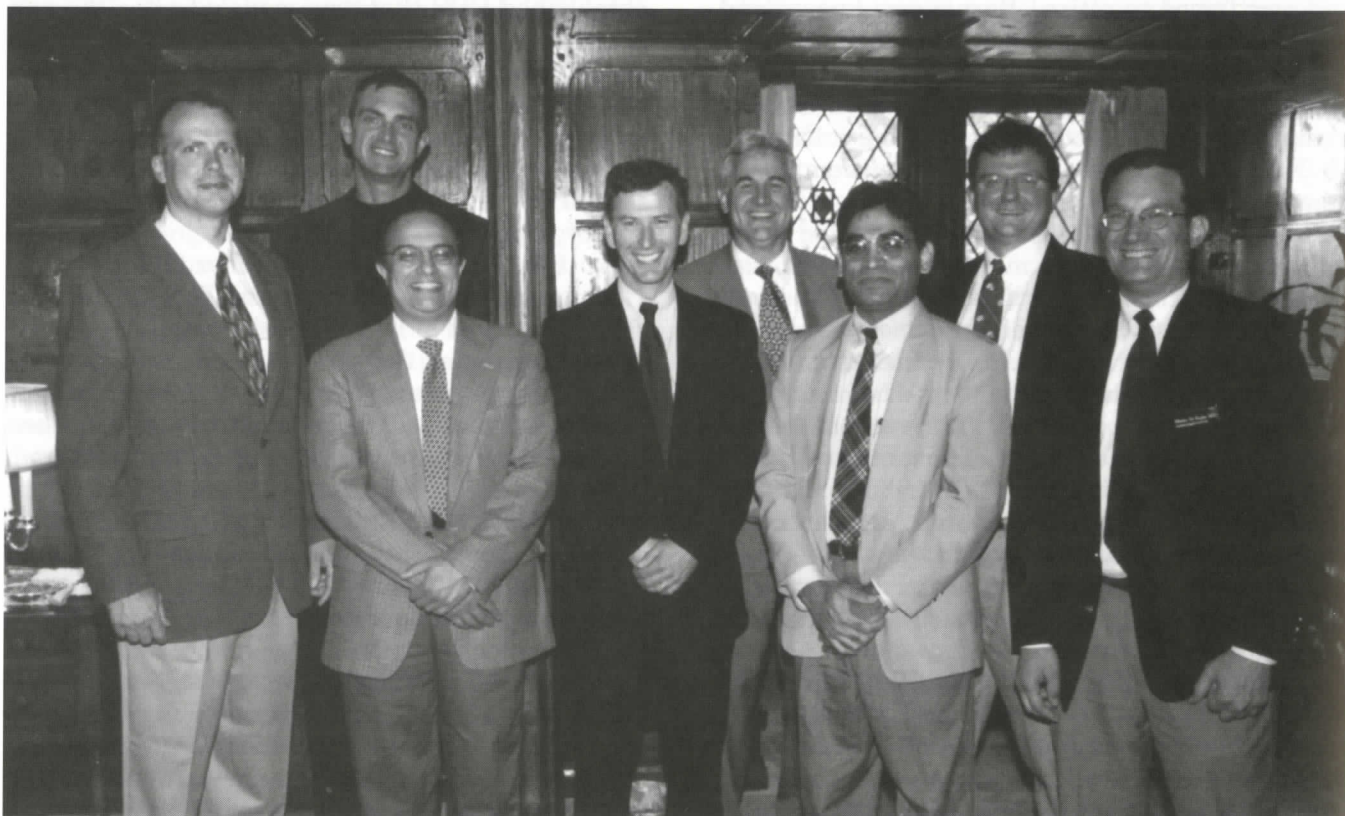


Fig. 18. Group photo of critical care anesthesiology consultants taken in May 1999 at a dinner honoring a return visit by Dr. Edmund G. Carton. Shown *left to right* are Drs. Daniel Brown, Michael Murray, Gurinder Vasdev, Edmund Carton, Barry Harrison, Matthew Kumar, Laurence Torsher, and Martin DeRuyter.



18) are responsible for providing this service to the vascular and thoracic surgery and neurosurgery intensive care units. Anesthesiologists still share responsibility for jointly directing the Methodist intensive care unit with colleagues from the division of pulmonary and critical care medicine & internal medicine. Anesthesiologists continue to have an educational responsibility to medical students, residents from the departments of anesthesiology, internal medicine and surgery, and CCS fellows drawn from the department of anesthesiology and internal medicine. In 1997, Dr. Murray's book entitled *Critical Care Medicine; Perioperative Management* was published and has become a standard text in this discipline.

Many clinical advances have been made in the care of critically ill patients. The last decade in particular has seen improvements in our ability to monitor vital signs of these patients, both in terms of obtaining information about physiologic variables in a less invasive fashion and being able to monitor them on a more continuous basis. The recent developments in point-of-care laboratory determinations, which bring the laboratory to the patient's bedside, should continue as well. Dramatic changes also have occurred in the treatment of various disease entities seen in the intensive care unit associated with the better understanding of the underlying pathophysiology. For example, the ventilatory support provided to patients with acute respiratory distress syndrome has dramatically changed in recent years. Simultaneously, with such innovations, improvements have occurred in the ability to provide appropriate nutrition to critically ill patients and to prevent iatrogenic infections.

Generations of physicians and nurses involved in critical care have been concerned about the distress that many patients experience while in this environment, and although improvements have been made over the years, progress is still needed in this area. The ability to relate disease severity and outcome has been helpful in patient management and quality assurance.

Currently, research by anesthesiologists in the CCS is focused on two areas. Drs. Murray and Harrison are leading the group examining the acute respiratory distress syndrome, while Drs. Plevak and Findlay continue to be involved in research directed at improving the care of patients who have undergone liver transplantation. Dr. Hubmayr from the division of pulmonary and critical care medicine & internal

medicine is conducting research at a molecular level examining alveolar cellular injury, and Dr. Gay from the same division is continuing his research into modalities for performing noninvasive respiratory support.

## 6. Conclusions

Since its inception, dramatic changes have occurred in the practice of critical care at the Mayo Clinic Rochester. Patients have undoubtedly benefited from these changes. Simultaneously, the multidisciplinary practice has been replaced by increasing subspecialization within this field of medicine. Third-party reimbursement issues are now prominent. Although, anesthesiologists with their training have much to offer in this discipline, their future involvement may be in jeopardy because they are not defined traditionally as primary care physicians. Many anesthesiologists in the CCS at the Mayo Clinic are board-certified both in internal medicine and in anesthesiology, which helps negate this perception. Organized anesthesiology at the institutional and national levels needs to support its members who wish to be involved in critical care. Dr. Murray has been active in this endeavor. In addition to being the initiators of this service at the Mayo Clinic, the anesthesiologists involved in it have made many valuable contributions. Intensive care should be supported by all anesthesiologists.

## 7. Post Note

This account of the department of anesthesiology's involvement in intensive care at the Mayo Clinic is based on interviewing people and reviewing the available records. In the care of patients, innumerable consultants and residents from almost every discipline at the Mayo Clinic have assisted the critical care service. To them and the superb nurses that work in the intensive care units, the respiratory therapists, dietitians, social workers, laboratory technicians and others involved in this activity, a tremendous gratitude is owed. Above all, thanks must be given to all the patients who allowed us to participate in their care. I trust that the events that unrolled in this story are accurately portrayed, but if there are errors, despite this chapter being reviewed by others, they are unintentional.

*Peter A Southorn*