

Historical Perspective

Historical perspective of The American Association for Thoracic Surgery: John W. Kirklin, MD (1917–2004)

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Figure 1. Dr John Kirklin circa 1950 (photo courtesy of the Mayo Clinic).

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Our specialty lost a living legend on April 21, 2004—John Webster Kirklin. He served as the 59th president of The American Association for Thoracic Surgery and was editor of *The Journal of Thoracic and Cardiovascular Surgery* from 1987 to 1994.

When Dr Kirklin gave the Caldwell lecture at Harvard University in 1967, Dr Robert Gross,¹ a world famous heart and pediatric surgery pioneer himself, introduced him and commented, “Dr Kirklin is widely regarded as the dean of American surgery today.” In 1998 William Roberts, MD,² editor of the *American Journal of Cardiology*, stated, “John Kirklin is the greatest scientific cardiac surgeon of the century and his contributions will continue to be influential many decades after he is gone.” In his book about C. Walton Lillehei, *King of Hearts*, Wayne Miller³ refers to Dr Kirklin in the 1970s as “arguably the best practicing open heart surgeon anywhere. He was one of cardiac surgery’s most accomplished researchers, a scientist whose mind was sometimes compared, flatteringly, to a computer.”

Formative Years

John Kirklin was born on August 5, 1917, in Muncie, Indiana. When he was 10 years old his family moved to Rochester, Minnesota, because his father, Dr Byrl R. Kirklin, was recruited to the Mayo Clinic as their first director of radiology. His father eventually became professor of radiology there and served as president of the American Roentgen Ray Society in 1937.

John Kirklin attended the University of Minnesota and was the student manager of the Golden Gophers varsity football team all four of his undergraduate years. He graduated in 1938 first in a large class, summa cum laude.¹ He attended medical school at Harvard University, graduated first in his class of 150, and was awarded the degree of MD, magna cum laude.¹ Dr Elliott Cutler, professor and chairman of the department of surgery at the time, wrote, “This is the brightest medical student I have ever seen.”¹ Dr Kirklin did an internship at the University of Pennsylvania from July 1942 through April 1943.

When Dr Kirklin trained during World War II, the internships were abbreviated from 1 year to 9 months. He started his residency at the Mayo Clinic in April 1943 and served until June 1944. He was inducted into the Army in July 1944 as a medical officer. Three months later, he received training in neurosurgery and continued serving in that specialty throughout his military tour, which lasted until August 1946. Dr Kirklin finally completed his surgical training at the Mayo Clinic in October 1950 and remained there as a surgeon. He had also spent 6 months under Dr Robert Gross at the Children’s Hospital, Boston, Massachusetts, from July 1948 until January 1949. Dr George Hallenbeck, a former chairman of the Department of Surgery at the Mayo Clinic, told me that in the 1950s, Dr Kirklin and he also served as Mayo’s pediatric surgeons. (Hallenbeck said his own training for this surgical



Figure 2. Dr John W. Kirklin with 6 physicians who had either trained or were in the process of training in cardiothoracic surgery at UAB. *Left to right standing:* Al Pacifico, John Kirklin, Nicholas Kouchoukos, and Donald Doty; *sitting:* George Bilbrey, Jr., Robert Karp, and Monte Phillips (Photograph taken in 1970. Courtesy of Dr Humberto Ravelo.)

specialty came mainly from reading his copy of Dr Gross' textbook, *The Surgery of Infancy and Childhood*.)

Heart Surgery Pioneer

Dr Kirklin became interested in cardiac surgery during his freshman year at Harvard Medical School after attending a lecture by Dr Robert Gross, who had been the first surgeon to successfully close a patent ductus arteriosus only months before. Dr Kirklin recalled that, in the years that followed, he would sit down with his colleagues and fill up notebooks "about how we would fix the inside of a heart if we could get there. We couldn't, of course, but being young, you dream!"⁴ In 1952, while on the staff at the Mayo Clinic, he decided to pursue research on the development of a heart-lung machine. He investigated and visited the groups working intensely with mechanical pump-oxygenators, which included John Gibbon in Philadelphia and Forest Dodrill in Detroit, among others. After his visits, he persuaded the leadership at the Mayo Clinic to let him build a pump-oxygenator similar to the Gibbon machine, but somewhat different. By the winter of 1954–1955, he had 9 surviving dogs out of 10 cardiopulmonary bypass runs. His team decided that they were ready to proceed with intracardiac repairs in humans. Eight children were selected. The decision was made to do all 8, even if the first 7 died. This clinical trial had been approved by the governance of the Mayo Clinic. The first case involved closure of a ventricular septal defect, which was performed successfully in March 1955. Four of the first 8 patients survived.⁵

Thus, in March 1955, Dr Kirklin started the open heart program at the Mayo Clinic. He was the first in the world to

perform a successful series of open heart operations (ie, more than one) using a heart-lung machine, which made him a founder of open heart surgery (Figure 1).

Dr Al Pacifico, a former chief of cardiothoracic surgery at the University of Alabama, Birmingham (UAB) and a long-time associate of Dr Kirklin, recently commented on him during that early period. "Can you imagine going to work and having somebody die on you every third day? I think it takes a very extraordinary person who can withstand that and make something positive of it."⁶ His surgical results gradually improved during that year and the years to follow.

With the advent of techniques to support the circulation and oxygenate the blood, using either the cross-circulation technique of Dr C. Walton Lillehei or the modified Gibbon-IBM heart-lung machine of Dr John Kirklin, the cardiac teams of the University of Minnesota and the Mayo Clinic led the way and did many of the first intracardiac repairs for a number of commonly occurring congenital heart defects.⁷

In July 1960, Dr Kirklin was promoted to professor of surgery and from January 1964 through September 1966 served as chairman of the Department of Surgery at the Mayo Clinic and Mayo Graduate School of Medicine.

UAB

Dr Kirklin was recruited to UAB and became chairman of the Department of Surgery and chief of the Division of Cardiothoracic Surgery there in September 1966. Besides having his heart surgery service at the University Hospital, he also had a general and vascular surgery service at the Veterans Hospital.

In 1982, he relinquished his title of chairman of the Department of Surgery, which was required when he reached the age of 65 years. He continued to operate as a cardiac surgeon and kept the title of chief of the Division of Cardiothoracic Surgery until about the age of 70. In 1989, at the age of 72, he stopped operating, but remained active with computers, patient information systems, and medical records at UAB. In about 2000, he stopped coming in to work.

Dr Kirklin received numerous important awards over the years. He authored or coauthored more than 700 medical and scientific articles. Many of these papers dealt with improving operative techniques and outcomes, assessing perioperative and long-term risk factors, and better understanding the pathophysiology of cardiopulmonary bypass.

He generally called people by their proper names. His speech was articulate. He had command of a significant vocabulary, but generally did not display its extent except when appropriate or when sensing that he was being tested or challenged. He was a very strict taskmaster. Many of the surgical faculty emulated him in one way or another, but rarely did any of them challenge him. While I was a resident, he sometimes referred to us as "lads," and at times his definition of this term also extended to junior faculty such as Bob Karp, Nick Kouchoukos, and Al Pacifico, who had also been his residents (Figure 2).

Old Work Week

As of July 2003, the 80-hour work week went into effect for all residencies in the United States. In comparison to this "new work week," residents on Dr Kirklin's cardiac surgery service were required to be in the hospital on call every other night and were lucky to get home on our nights off by 6 or maybe 7 PM. Routine morning rounds started at 4:00 AM. We had to call him at home each morning to go over his patients at exactly 6:00 AM.

Brown Book Becomes Blue

While he was at the Mayo Clinic, Dr Kirklin began developing a written list of Do's and Don'ts for residents on his heart surgery service. According to one of the UAB faculty who had worked under Dr Kirklin at the Mayo, it was little more than a one-page handout at that time. When I did my first rotation on his cardiac surgery service in early 1971, I was issued a loose-leaf book with a brown cover, but now the Do's and Don'ts had extended to many pages. That "brown book" kept growing, and eventually he made the decision to purchase a number of three-ring loose-leaf binders with blue covers to accommodate the additions. These were the type that can be bought at an office supply store, and that is how the famous "blue book" was established. By this time, it was basically a well-organized recipe book on the way Dr

Kirklin did business, so to speak, on his service. The sections were referred to as PMPs or Patient Management Protocols. You might compare it to the play book for the Green Bay Packers. One of the reasons he used to cite for its existence was that everything in it was written logically, thoughtfully, and in a clear mind when one had time to reflect and check on references. He would say, for example, that at night when you were tired, you probably were not making the best decisions.

"Show Me the Data"

You would never, or course, intentionally deceive Dr Kirklin. In fact, if you intentionally gave him false information on one of his patients, it likely would cost you your job as a resident. Because of the "almighty" pyramid system, you could be replaced in a nanosecond.⁸ You never, ever blew smoke or embellished information that you gave him. He loved to say "*Show me the data,*" and you would have to supply him with the scientific facts or articles to support your claim. If those facts did not support what you had told him, he would make sure you knew about it, and sometimes it could be quite embarrassing. He taught you to question others, particularly when their comments did not seem to be quite right, and to ask for references, data, or the source of that information.

The Legacy

Dr Michael E. DeBakey, perhaps best known for pioneering many operations for the treatment of various diseases of the aorta, recently commented: "It was the clinical application of the heart-lung machine that made John Kirklin one of the world's pioneers in modern heart surgery."⁹

In addition, Dr Kirklin's legacy includes his pioneering work in heart surgery as well as many contributions in operative technique, patient care, and better understanding of the pathophysiology of cardiopulmonary bypass. He has given us a current standard textbook in cardiac surgery.¹⁰ He trained and directed the training of several generations of surgeons, including his son, Jim, the current professor and chief of Cardiothoracic Surgery at UAB. He was more responsible than anyone else for putting UAB on the national and world map as a place to obtain first-class medical care. His published results of various operations often set the bar at a new height for others to obtain or surpass. Perhaps his biggest contribution was to bring law, order, discipline, and science to this new emerging field of medicine.

Currently an estimated 1 million cardiac operations are performed each year worldwide with the use of the heart-lung machine. In most cases, the operative mortality is quite low, approaching 1% for some operations. Little thought is given to the pioneers who made all of this possible. I believe we have witnessed the passing of a giant. Dr Kirklin's

response would probably be, "There are imprecisions lurking in such a superlative."

References

1. Gross RE. Introduction of the Caldwell Lecturer, 1967. *Am J Roentgenol Radium Ther Nucl Med.* 1968;102:251-2.
2. Roberts WC. John Webster Kirklin, M.D.: A conversation with the editor. *Am J Cardiol.* 1998;81:1027-44.
3. Miller CW. King of hearts: Times Books. Random House; New York: 2000. p. 241.
4. Stephenson LW, Rodengen JL. John Kirklin's inspiration: how we would fix the inside of the heart. In: State of the heart: The practical guide to your heart and heart surgery, Write Stuff Enterprises; Fort Lauderdale [FL]: 1999. p. 24-5.
5. Kirklin JW. The middle 1950s and C. Walton Lillehei, *J Thorac Cardiovasc Surg.* 1989;98:823.
6. Velasco A. Pioneer in heart surgery dies at 86. Birmingham News. 2004 Apr 23.
7. Stephenson LW. History of cardiac surgery. In: Cohn LH, Edmunds LH Jr, editors. Heart surgery in the adult, 2nd ed. McGraw-Hill Medical Publishing Division; New York: 2003. p. 15 (Table 1).
8. Stephenson LW. John W. Kirklin: reminiscences of a surgical resident, *J Card Surg.* 2004;19:367-74.
9. Pearce J. John W. Kirklin is dead at 86: innovator in cardiac surgery. New York Times. 2004 Apr 30.
10. Kouchoukos NT, Blackstone EH, Doty DB, Hanley FL, Karp RB. Kirklin/Barratt-Boyes cardiac surgery. 3rd ed. Churchill Livingstone; Philadelphia: 2003.