Great Institutions in Cardiothoracic Surgery: The University of Minnesota

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With the loyal support of the chair of Surgery, Dr. Owen H. Wangensteen, the University of Minnesota cardiac surgery program led the way at the dawn of cardiac surgery when Dr F. John Lewis performed the first open heart surgery in the world using hypothermia while repairing an atrial septal defect on September 2, 1952. Soon after, Dr C. Walt Lillehei performed the first repair of a ventriculoseptal defect in the world using cross-circulation on March 26, 1954. Collaborating with Dr Richard DeWall in 1955, they developed the DeWall-Lillehei bubble oxygentor which was used at the University of Minnesota and many other centers worldwide for years to come, making open heart surgery safe and tractable. Dr Vincent Gott, a resident working in the laboratory of Lillehei, developed a method to treat complete heart block using ventricular pacing with a Grass physiological stimulator, and this led to a collaboration with Earl Bakken, founder of the Medtronic Corporation, to develop a temporary pacemaker. The program was fertile ground for many notable trainees, including Dr Norman Shumway, the "Father of Heart Transplant", and Dr Christiaan Barnard who performed the first heart transplant in the world. The collegial and forward thinking nature of the cardiac surgery program continues in the current training program today.

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Central Message

The University of Minnesota Cardiothoracic Surgery Program has a rich history and carries the tradition forward with the same values of collegial innovation on which it was founded by Dr C. Walt Lillehei and Dr Richard Varco.

A HISTORY OF INNOVATION IN CARDIAC SURGERY

The University of Minnesota was known for a fountain of innovation in cardiac surgery in the 1950s under the leadership of the chairman of surgery, Dr Owen H. Wangensteen (Fig. 1). Well known for his pioneering work in the management of bowel obstruction and surgical oncology, Dr Wangensteen was also skilled at ligation of the patent ductus arteriosus, which he learned from Dr Robert Gross in Boston. However, Dr Wangensteen saw the limitations of closed cardiac surgery and believed in the genius of his trainees in forging the way in open cardiac surgery, so he worked tirelessly to support their mission by encouraging research and risk taking in translation of findings from the bench to the bedside. Although disciplined and hard driving, "The Chief," as he was known by the surgical residents, he was also very open minded and never held back by tradition, cultivating the creative thinking and problem-solving abilities of residents and junior faculty members. Whenever he recognized a candidate with talent and ambition, he would ask them on the spot, "when can you start?" When he asked this of Dr C. Walt Lillehei (Fig. 2) who had just returned from serving in northern Africa and Italy in World War II in 1945, the answer was "today." With that, Lillihei embarked with his medical school classmate and good friend, Dr F. John Lewis (Fig. 3), on the ward and then in the laboratory before completing his chief residency.

CARDIAC SURGICAL PIONEERS

After recovering from surgery for lymphosarcoma (performed by Dr Wangesteen), Lillehei joined Lewis as a junior faculty member and the 2 set to work in their laboratories in the attic of the physiology building. Lillehei was pursuing cross circulation, a means of using an adult such as a parent to provide cardiopulmonary support for a child during open-heart surgery, while Lewis was focused on the use of hypothermia for protection during repair of intracardiac defects. Meanwhile, across the hall, a more senior member of the surgical faculty, Dr Clarence Dennis (Fig. 4), inspired by a visit to Dr John

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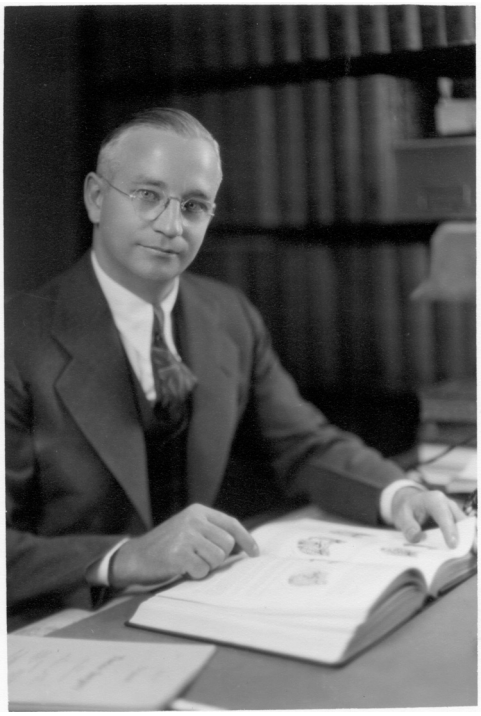

Figure 1. Dr Owen H. Wangensteen (1898-1981) was the chief of the Department of Surgery in the Medical School at the University of Minnesota from 1930-1967 (portrait circa 1945). *Courtesy* : University of Minnesota Archives, University of Minnesota—Twin Cities.

Gibbon Jr, in Philadelphia, was developing a pump oxygenator. Dr Dennis used the pump oxygenator in the first clinical use of a heart-lung machine to bypass circulation during surgery on the open heart in 1951.

In the operating room, Dr Richard Varco (Fig. 5), an adept surgeon and gifted educator, had developed a reputation as a skilled surgeon in patent ductus arteriosus ligation and performing the Blalock-

Figure 2. Dr C. Walt Lillehei (circa 1958). *Courtesy*: University of Minnesota Archives, University of Minnesota—Twin Cities.

Figure 3. Drs Richard L. Varco and F. John Lewis with the cooling equipment used to induce hypothermia during the world's first open-heart surgery (October 16, 1952). *Courtesy*: University of Minnesota Archives, University of Minnesota—Twin Cities.

Tausig shunt. From the midst of this thriving collaboration, Dr F. John Lewis emerged as the first surgeon in the world to perform open-heart surgery when he repaired an atrial septal defect using hypothermia on September 2, 1952. He was assisted by Drs Mansur Taufic, Richard Varco, and C. Walt Lillehei (Fig. 6). More complex defects were not amenable to repair using hypothermia because of limitations of time. However, cross circulation allowed more time to operate, and on March 26, 1954, Dr Lillehei assisted by his mentor Dr Varco, as well as Drs Morley Cohen and Herb Warden (the latter 2 working together on the parent), performed the first repair of a ventricular septal defect in the world using cross circulation by connecting the patients with tubing and a common milk pump

Figure 4. Drs Clarence Dennis and W. Harris showing the operation of the heart-lung machine for open-heart surgery (circa 1951). *Courtesy*: University of Minnesota Archives, University of Minnesota—Twin Cities.