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Willem Kolff: Honoring a pioneer of modern dialysis

Willem Johan Kolff, MD, PhD, consummate inventor, doctor, researcher, and professor, died February 11 at his home in Newtown Square, Penn. Dr. Kolff saved millions of lives with his creation of the artificial kidney, which evolved into today's kidney dialysis machine. The Dutch-born doctor was 97.

"Dr. Kolff's accomplishments underscore the power of one. He identified unmet needs and thought big," said Lynda Szczech, MD, chair of the ASN Dialysis Advisory Group and associate professor of medicine at Duke University Medical Center. "His contributions were not just a piece of the pie, as so many of us strive to contribute. Dr. Kolff provided the pie plate and crust that are the vital supports for every nephrologist who follows him."

Dr. Kolff believed that technology and machines could advance medicine and treat disease. In 2002, he received the Albert Lasker Award for Clinical Medical Research for his development of kidney dialysis. Dr. Kolff was the lead designer of the first mechanical heart implanted in a human and a major contributor to the surgical pump oxygenator, now known as the heart-lung machine, which made open-heart surgery possible for the first time. He also invented the intra-aortic balloon pump to help prevent heart failure. Other inventions—such as an artificial ear and eye—were implanted in a few people, but were not successful enough to be mass produced.

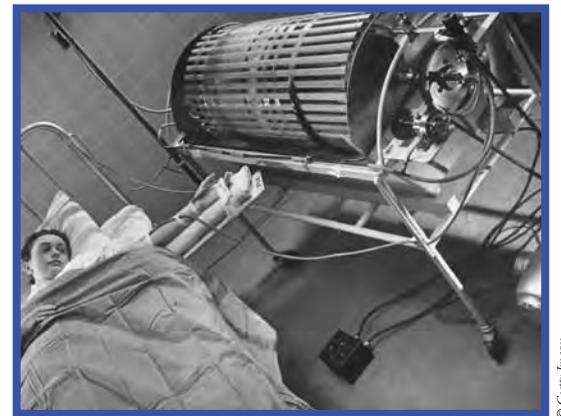
Dr. Kolff began designing the artificial kidney at the University of Groningen in 1938, but moved to a small-town hospital to continue his work after Germany invaded The Netherlands during World War II. Dr. Kolff theorized that if a machine could replace the failing kidney for a few days to weeks, filtering out acid and waste materials from the blood, then the kidney tissue could regenerate and function again.

Using the restricted resources available during the war, Dr. Kolff created the first kidney machine from laundry tubs, a wooden drum, metal, a semipermeable sausage casing, and an electric motor. He filled the casing with blood, expelled the air, added the kidney waste product urea, and shook up the device in salt water. Small molecules of urea passed through the casing into the wa-

ter, while the larger blood molecules stayed put.

Dr. Kolff's first several patients lived only a few days on the machine, but in 1945, the artificial kidney helped a woman live for seven more years. Dr. Kolff's improved machine worked well enough to treat acute kidney failure and end stage renal disease.

"As a pioneer in nephrology, Dr. Kolff has enabled us to save countless lives. I am grateful to Dr. Kolff for expanding the options I can offer my patients with end stage renal disease," said Mary (Tessie) Behrens, MD, chair of ASN's Practicing Nephrologists Advisory Group and a physician at Mid-Atlantic Nephrology Associates, PA, in Maryland. Today, more than 200,000 people in the United States in need of dialysis are living because of Dr. Kolff's



A patient is dialyzed using one of Kolff's first rotating drum artificial kidneys.

invention or a modification of it.

Dr. Kolff immigrated to the United States in 1950, where he worked at the Cleveland Clinic Foundation. Later, at the University of Utah, Dr. Kolff mentored Dr. Robert Jarvik, and together they created the Jarvik-7 artificial heart. Over the years, Dr. Kolff mentored many other pioneers in the artificial organ field.

Throughout his long and industrious career, Dr. Kolff held numerous distinguished titles, such as director of the Institute for Biomedical Engineering; professor emeritus of internal medicine, surgery, and bioengineering at the University of Utah; and founding member of the American Society of Artificial Internal Organs. He received more than 12 honorary doctorate degrees from universities worldwide and more than 120 international awards. He also wrote several books and published hundreds of papers and articles.

Dr. Kolff is survived by his five children, 12 grandchildren, and six great-grandchildren. ●