A self-guiding flow-directed catheter was developed which permitted catheterization of the right side of the heart and pulmonary artery without the use of fluoroscopy and with minimal complications. The addition of multiple sensors has allowed for the quantitative measurement of cardiac function. This development has permitted the application of quantitative cardiac catheterization procedures to the management of the critically ill. [The SC citations indicates that this paper has been cited over 610 times since 1970.]

H. J. C. Swan
Department of Cardiology
Cedars-Sinai Medical Center
and
Department of Medicine
University of California
School of Medicine
Los Angeles, CA 90024

November 9, 1981

Therefore, the techniques would have to be modified.

"In the fall of 1966, I was watching the sailboats in Santa Monica Bay and conceived the idea that a sail or parachute combined with a highly flexible catheter would be the ideal mechanism to flow-guide a catheter into the central circulation. In discussing the potential fabrication of such a device, the experience of Edwards Labs with the Fogarty embolectomy catheter provided a solution, although, in retrospect, a parachute type device could have had important advantages. When the first batch of catheters actually arrived, I brought them over to my animal laboratory, where my most recent recruit to the then infant division of cardiology, William Ganz, was finishing an experiment on the measurement of ventricular volume, using the dilution principle. I placed the first of the flotation catheters in the right atrium of a dog and inflated the guidance balloon, whereupon the catheter and the balloon immediately disappeared from the field of view. After recognizing that the balloon had not burst, we were able to demonstrate consistent passage to the pulmonary artery within one to two beats after inflation of the guidance balloon. The device worked. The point was proven.

"From there, we took it to the catheterization laboratory and then to the CCU, where the contributions of many, including a then resident in medicine, George Diamond, allowed us to report on the first 100 bedside catheterizations in August 1970. The addition of multiple pressure ports, a thermistor for measurement of cardiac output by the thermodilution principle, and electrodes for atrial and ventricular sensing and pacing represented a natural series of additional applications.

"In 1970, my colleagues and I developed the balloon flotation catheter to investigate the clinical syndromes of ischemic heart disease. The broad application in the field of hemodynamic monitoring and the management of hundreds of thousands of patients was a secondary objective. The frequency of citation is related to the wide acceptance of a practical technique which permits the measurement of basic physiological data in a clinical setting. Recent work in this field has been published by me and N. L. Pace."