Profiles in Cardiology

This section edited by J. Willis Hurst, M.D., and W. Bruce Fye, M.D., M.A.

Theodore Caldwell Janeway, Clinician and Pathophysiologist

JORDAN M. PRUTKIN, M.D., M.H.S.

Department of Medicine, Division of Cardiology, The University of Washington, Seattle, Washington, USA

Theodore Caldwell Janeway's studies on hypertension (Fig. 1), along with his active clinical practice, led to his development as a leader of academic medicine in the early twentieth century and culminated with his acceptance as the first full-time professor of medicine in the United States.

Janeway was born in New York City on November 2, 1872, son of the physician Edward Gamaliel Janeway who wrote the first description of the lesions on the palms and soles in endocarditis that now bear his name. He graduated with an A.B. from the Sheffield Scientific School at Yale University in 1892, part of the first class to have a rigorous premedical education.¹ He enrolled at the College of Physicians and Surgeons of Columbia University from which he graduated in 1895. He then served at St. Luke's Hospital in New York before joining the staff of St. Luke's and City Hospitals and the faculty of University and Bellevue Hospital Medical College, where his father was dean. In 1898 he married Eleanor C. Alderson and had five children: Eleanor, Edward, Agnes, Charles, and Francesca. Charles Janeway was later to become Physician-in-Chief of Boston Children's Hospital and his son, Charles Janeway, Jr., became a professor of immunology at Yale University.

As Janeway started his medical career he developed his distinctive style.

In appearance he was of slight, well-knit and alert figure with quick yet graceful movements. With a mobile expression, his face would light and his eyes sparkle with animation as he talked. His whole appearance, to the stoop of his shoulders, indicated the scholar combined with the man of wide public interests.²

He soon developed a lucrative private practice and active research career associated with his father. One newspaper stated that they were probably the best known physicians from the same family in the history of the country.³ He became a visiting physician at City Hospital on Blackwell's Island, and during this time he and the pathologist Hoerst Oertel instituted the first clinicopathologic conferences in New York, having learned about these from Richard Cabot through their meetings at the Interurban Clinical Club.⁴

Along with Harvey Cushing and George Crile,⁵ he was one of the first prominent supporters of the sphygmomanometer in the United States. He wrote that

...an instrument which so readily gives warning of the existence of high tension, which might otherwise be overlooked during hasty examinations, cannot be dispensed with. Our diagnostic methods are not yet so perfect that we can afford to pass by any reasonable addition to them.^{6(a)}

He noted that the measurement of blood pressure not only revealed physiologic dysfunction of the cardiovascular system, but also could be used prognostically to predict pathologic changes in the heart and blood vessels.⁷

Janeway's early research focused on determining the most accurate sphygmomanometer and a range of normal values for blood pressure.⁸ Previously, blood pressure had been measured by palpation, but he attempted auscultation with a stethoscope for more accurate measurement, writing.

Address for reprints:

Jordan M. Prutkin, M.D., M.H.S.
University of Washington
Division of Cardiology
Box 356422
Seattle, WA 98195, USA
e-mail: jprutkin@u.washington.edu

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FIG. 1 Theodore Caldwell Janeway. (Reproduced with permission of the Alan Mason Chesney Archive of the Johns Hopkins Medical Institutions).

I have been making some experiments on the tone and murmur produced in the brachial artery by known pressures, thinking that some information might thus be obtained. The results will be reported in a subsequent article. . . .⁸

Janeway did not publish these findings, and it was in 1905 that Korotkoff wrote a description of his eponymous sounds for auscultating blood pressure.⁹

In 1904, Janeway published *The Clinical Study of Blood-Pressure: A Guide to the Use of the Sphygmomanometer in Medical, Surgical, and Obstetrical Practice, with a Summary of the Experimental and Clinical Facts Relating to the Blood-Pressure in Health and in Disease*.⁶ This text was one of the first reviews of the research and clinical application of blood pressure measurement and was a strong influence on the acceptance of the sphygmomanometer. Described by William Osler as “admirably illustrat[ing] the application of physiological methods to bedside problems,”¹⁰ Janeway presented a review of the study of blood pressure up to that time, including descriptions of all the sphygmomanometers in current use. He then described his creation, the first portable sphygmomanometer that could measure systolic and diastolic blood pressure (Fig. 2):

The armlet is buckled on, overlapping the ends if the arm be small. . . . The finger ordinarily placed for palpating the pulse is then placed on the artery at the wrist. The other hand grasps the Politzer bag firmly

FIG. 2 The first portable sphygmomanometer, made by Janeway. Reprinted from Reference No. 6.

and raises the pressure until the pulse is obliterated, then releases it very slowly and steadily until it returns. This gives the systolic pressure. . . . Then carry the pressure a little higher and repeat. This time, after the pulse is detected, allow the pressure to fall 5 or 10 mm at a time until the lowest point of maximum oscillations of the manometer column is determined (for diastolic pressure).^{6(b)}

Janeway noted the pathophysiologic relationship of essential hypertension and left ventricular hypertrophy. He reasoned that the elevated blood pressure led to hypertrophy, with resultant poor forward blood flow and pulmonary edema and, eventually, was followed by right heart failure and generalized edema.⁷ He was also aware of the association of hypertension and renal insufficiency. In a study of patients seen by him or his father, 81% of those with systolic blood pressure over 200 mmHg had chronic renal disease.⁷ He later completed an analysis of 100 patients with systolic blood pressures over 170 mmHg, noting that 79 of them died with chronic kidney disease.¹¹ He theorized that the elevated blood pressure was necessary for blood to flow through sclerosed arteries in the kidney or other organs.¹²

He was one of the first to place a ligature around a renal artery to determine causes of hypertension, predating Harry Goldblatt by 20 years. His intention was to decrease the amount of kidney tissue that released the “renal factor” that caused hypertension.¹³ He showed that this maneuver did increase blood pressure in dogs;¹³ however, he did not follow up this report, and it was

left to Goldblatt to perform more rigorous studies detailing the effect of renal artery ligation on increased blood pressure.¹⁴

In 1907, Janeway joined the faculty of the College of Physicians and Surgeons as an associate in medicine and within two years became the Bard Professor of Medicine. There he built a reputation as a strong clinician, researcher, and teacher.¹⁵ He donated books from his personal collection to expand the library, recruited faculty and staff for teaching and clinical care, helped in the development of a clinical amphitheater, and expanded the research laboratories,¹ all the while maintaining an active consultation practice.

In 1914, he left New York to become Chairman of Medicine at Johns Hopkins University as the first full-time professor of medicine, completing teaching, research, and clinical care on a fixed salary while discontinuing his lucrative private practice. Initially, Janeway was content with his new position and the full-time system, as he planned the Hunterian Laboratory for Experimental Medicine, improved research facilities, established the Heart Station for cardiac evaluation, and obtained an endowment for the study of tuberculosis, while continuing his research on hypertension.¹⁶ However, after three years, the financial sacrifice of giving up his private practice weighed on him¹⁷ and he decided that he could not support his family any longer on his salary from the university.

Though some at Johns Hopkins did not want Janeway to leave as it may be seen as a failure of the full-time system,¹⁷ Janeway resigned as chairman and entered the medical services of the U.S. Army where he was appointed Assistant to the Surgeon General and Director of Research on Heart Disease during World War I. He maintained his residence and a private practice in Baltimore, Maryland, while he commuted to Washington, D.C. to work for the U.S. Army. In his new position he issued a report on how to do a proper cardiovascular examination and increased the number of physicians in the army familiar with heart disease so they could better assess the health of army recruits. While working for the army, he began studying why soldiers were developing infections even before they left for Europe, but he developed pneumococcal sepsis and after six days of illness, he died on December 27, 1917.

Janeway's research on hypertension had a strong influence on the acceptance of blood pressure evaluation as an important clinical measurement in office-based practice. He helped show that the sphygmomanometer did more than just the measure blood pressure but could also be used for the prediction of future renal and cardiac disease.

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