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Hypertension

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This brief review recounts how systolic hypertension came to be recognized as an important determinant of cardiovascular disease, beginning with the publication of a Framingham data-based article in the *American Journal of Cardiology* in April 1971.

Systolic Versus Diastolic Blood Pressure and Risk of Coronary Heart Disease

The Framingham Study

by Kannel, Gordon and Schwartz (1)

ABSTRACT

A comparison of the contribution of systolic versus diastolic blood pressure to risk of coronary heart disease and the role of mean arterial pulse pressure and systolic lability have been examined prospectively in 5,127 men and women during 14 years of biennial follow-up studies.

Similar gradients of risk of subsequent coronary heart disease were observed whether persons were classified by their systolic or diastolic pressure, and no "safe" or critical level could be identified. Assessment of the net effect of each, employing discriminant analysis, indicated a stronger association of systolic than diastolic pressure with risk of coronary heart disease. Neither the systolic and diastolic pressure measurements in combination nor the pulse pressure and the mean arterial pressure measurements alone discriminated better than the systolic measurement alone. Systolic lability did not predict incidence of coronary heart disease independently of the associated level of blood pressure.

There was a trend of declining relative importance of diastolic and a corresponding increase in the importance of systolic pressure with advancing age. Only in those under 45 was diastolic pressure predominant. The level of casually obtained blood pressure was a good predictor of coronary heart disease. The current practice of assessing the importance of blood pressure at all ages largely on the basis of diastolic pressure and the commonly held view concerning the innocuous nature of an elevated level of systolic pressure in the elderly requires reevaluation.

Originally published in *American Journal of Cardiology*, April 1971

From the University of Vermont, College of Medicine, Burlington, Vermont.

Review

SYSTOLIC HYPERTENSION AS A CV RISK FACTOR—HAS IT FINALLY BEEN ACCEPTED?

In 1971 Kannel, Gordon and Schwartz published a paper showing systolic blood pressure to be a better predictor of coronary heart disease than diastolic pressure (1). That

50th Anniversary Historical Article

INTRODUCTION

In this edition of the Journal, we release the third in a series of reviews of influential articles that have been previously published in ACC journals, including the *American Journal of Cardiology* (from 1958 to 1982), and *JACC* (from 1983 to the present). The publication of these articles is only one aspect of the ACC's 50th anniversary commemoration, which highlights 50 years of leadership in cardiovascular care and education. The articles are intended to encourage reflection on the remarkable progress made in cardiovascular medicine over time, as well as to acknowledge the amazing prescience of some early investigators in anticipating and, in many cases, later guiding developments in their field.

The working group responsible for selecting these articles and asking reviewers to write editorials solicited suggestions from the ACC's clinical committees and individual members.

The group achieved consensus fairly easily, including whom the group should ask to prepare the accompanying editorials. We initially drew up a list of 14 general areas to cover in this series, but later found that there are several major areas of modern cardiology, prominently molecular cardiology, in which the truly landmark articles have, alas, not yet been published in *JACC*. Therefore, the working group decided not to categorize by subject, but instead, to concentrate on the most important articles.

The working group, a task force of the Subcommittee for the Commemoration of the ACC 50th Anniversary, owes a great deal to Ms. May A. Roustom and the efficient and tireless staff at Heart House for facilitating this project. We also wish to thank all who suggested articles and, most important, the authors who prepared reviews for their willingness to contribute their time and wisdom.

Influential Articles in JACC Working Group

Sharon A. Hunt, M.D., F.A.C.C.
Rick A. Nishimura, M.D., F.A.C.C.
H.J.C. Swan, M.D., Ph.D., M.A.C.C.
Michael J. Wolk, M.D., F.A.C.C.

paper was the beginning of a change in attitude towards systolic hypertension which for years had been considered physiologically insignificant.

Now, 28 years later, systolic pressure is given more emphasis than diastolic pressure (2) and the importance of the latter is at times trivialized (3). Twenty-eight years seems a long time for a concept to become firmly established and one wonders why, particularly since the 1971 paper was based on Framingham data which have formed the basis of most of our principles of preventive cardiology. This is not the first time hypertension has been slow to be accepted as a health problem and it seems to have chronic ill luck in that regard (ill luck for patients) of being slow in becoming accepted as an abnormality carrying significant risks for premature cardiovascular morbidity and mortality. Twenty-eight years may be a long time, but it is substantially less than the 59 years from the 1913 report by Janeway of the fatal complications of hypertension (4) and the 1972 beginnings of the National High Blood Pressure Education Program (NHBPEP) which successfully promoted hypertension as a major public health problem highly responsive to medical treatment.

Between 1913 and 1972 lots of things happened which were finally responsible for putting hypertension on the list of diseases that respond favorably to treatment and that doctors should treat. First, hypertension had to be recognized as a serious, though often symptomless, illness. There were some long term follow-up reports, but the most compelling evidence came from insurance data. These were published in 1925 (5) and 1940 (6), but most doctors were not impressed. This lack of interest may have reflected a lack of effective treatment. The few doctors who did recognize hypertension as a serious public health problem looked for therapies and early treatments, which gave some relief to the few patients who received them, such as lumbodorsal sympathectomy, low sodium diets and pyrogen therapy.

The breakthrough came in 1951 when drugs became available that were orally active and had long-term effectiveness. The patients that were treated at first were those with severe diastolic hypertension. Diastolic hypertension was the focus of attention because these people died young. Systolic hypertension received no real attention because it was found mostly in old people who, unlike today, were not expected to live long lives. Actually, systolic pressure was thought to increase as a natural process of aging so doctors simply disregarded it; it was the young and middle-aged people with severe diastolic hypertension that concerned them.

Although the successful drug treatment of malignant hypertension was impressive to the few doctors responsible (7,8), it was the results of the VA Cooperative Trials that were decisive in changing public policy (9,10). They showed without question that treating diastolic blood pressures of 104 to 129 mm Hg protected against

development of strokes, cardiac failure and worsening hypertension. These were the data that sparked development of the NHBPEP which through a broad based public and professional education program has been responsible for striking decreases in deaths from strokes and heart attacks.

All this time nobody but a few thought anything about systolic hypertension. Some had tried (11,13) going back as far as 1927 (11), but the data were disregarded; doctors were too preoccupied with the need to treat diastolic hypertension.

By 1971 doctors had learned to respect data from the Framingham study. After all it had clearly delineated the many risk factors for coronary heart disease and doctors, with varying degrees of enthusiasm, were prescribing low fat diets, urging weight loss and using drugs to control diabetes and hyperlipidemia, advising smoking cessation and treating hypertension. Yet, apparently as much as they respected the multiple risk factor basis for coronary heart disease, they were not ready to accept systolic hypertension as a better predictor of coronary heart disease than diastolic hypertension. Also, the drugs available in the 1970s were thought not to be effective in lowering systolic blood pressure.

Slowly a change in attitude came as systolic hypertension was found to be more important than diastolic pressure in strokes, heart failure and peripheral vascular disease (14). Furthermore, a 1988 longitudinal study of the 317,871 men who had been screened for the Multiple Risk Factor Intervention Trial (15) confirmed the findings of the Framingham study. Thus, evidence supporting systolic hypertension as an important determinant of cardiovascular disease became almost impossible to ignore. A sign of this change in attitude is the Fifth Report of the National Committee on Detection, Evaluation and Treatment of Hypertension (JNC 5) (16) which by 1993 had included systolic blood pressure in the classification of blood pressure giving it equal billing with diastolic pressure. Another important report was that of the Systolic Hypertension in the Elderly Program (SHEP) (17) which showed that systolic blood pressure could be decreased significantly by chlorthalidone and, if necessary, the addition of atenolol and that this reduction protected against strokes and other complications of hypertension.

How are doctors responding to this challenge 28 years and much more evidence later? We do not know for sure, but we do know that 10 years ago New Jersey cardiologists did not treat isolated systolic hypertension as often as did internists and family physicians (18). But that was 10 years ago and one can hope that a cavalier attitude towards systolic hypertension has generally been discarded.

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