

ORIGINAL INVESTIGATIONS

# Target Organ Complications and Cardiovascular Events Associated With Masked Hypertension and White-Coat Hypertension

## Analysis From the Dallas Heart Study

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**CME Objective for This Article:** After reading this article, the reader should be able to: 1) identify the presence of masked hypertension (MH)

and white-coat hypertension (WCH); 2) discuss the relationship between MH and WCH and target organ complication and cardiovascular events; 3) discuss the prevalence of MH and WCH; and 4) discuss the upper limit of normal home blood pressure (BP).

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### ABSTRACT

**BACKGROUND** Multiple epidemiological studies from Europe and Asia have demonstrated increased cardiovascular risks associated with isolated elevation of home blood pressure (BP) or masked hypertension (MH). Previous studies have not addressed cardiovascular outcomes associated with MH and white-coat hypertension (WCH) in the general population in the United States.

**OBJECTIVES** The goal of this study was to determine hypertensive target organ damage and adverse cardiovascular outcomes associated with WCH (high clinic BP,  $\geq 140/90$  mm Hg; normal home BP,  $< 135/85$  mm Hg), MH (high home BP,  $\geq 135/85$  mm Hg; normal clinic BP,  $< 140/90$  mm Hg), and sustained hypertension (high home and clinic BP) in the DHS (Dallas Heart Study), a large, multiethnic, probability-based population cohort.

**METHODS** Associations among WCH, MH, sustained hypertension, and aortic pulsed wave velocity by magnetic resonance imaging; urinary albumin-to-creatinine ratio; and cystatin C were evaluated at study baseline. Then, associations between WCH and MH with incident cardiovascular outcomes (coronary heart disease, stroke, atrial fibrillation, heart failure, and cardiovascular death) over a median follow-up period of 9 years were assessed.

**RESULTS** The study cohort comprised 3,027 subjects (50% African Americans). The sample-weighted prevalence rates of WCH and MH were 3.3% and 17.8%, respectively. Both WCH and MH were independently associated with increased aortic pulsed wave velocity, cystatin C, and urinary albumin-to-creatinine ratio. Both WCH (adjusted hazard ratio: 2.09; 95% confidence interval: 1.05 to 4.15) and MH (adjusted hazard ratio: 2.03; 95% confidence interval: 1.36 to 3.03) were independently associated with higher cardiovascular events compared with the normotensive group, even after adjustment for traditional cardiovascular risk factors.

**CONCLUSIONS** In a multiethnic U.S. population, both WCH and MH were independently associated with increased aortic stiffness, renal injury, and incident cardiovascular events. Because MH is common and associated with an adverse cardiovascular profile, home BP monitoring should be routinely performed among U.S. adults. (J Am Coll Cardiol 2015;66:2159-69) © 2015 by the American College of Cardiology Foundation.

Home blood pressure (BP) monitoring has been endorsed in many hypertension guidelines as part of standard care to guide hypertension treatment, as it has been widely recognized that clinic BP may not accurately reflect out-of-office BP (1-3). The pattern of discordance between home and clinic BP can be divided into 2 major categories: white-coat hypertension (WCH; elevated office BP with normal ambulatory or home BP), or masked hypertension (MH; elevated ambulatory or home BP with normal office BP) (4). The cardiovascular (CV) prognosis of WCH is controversial. Although some studies have shown increased target organ damage and CV complications in patients

with WCH (5-7), others have demonstrated similar left ventricular mass (8) and prognosis when patients with WCH were compared with a normotensive population (9). MH was shown to be associated with an increased risk for CV events in multiple populations in Europe and Asia (5,7,10-13). However, these studies included few subjects of African descent, the racial/ethnic group with the greatest burdens of hypertension and hypertensive target organ damage. Furthermore, CV risks associated with WCH and MH differed depending on the presence or absence of antihypertensive treatment (5,6). Among the treated population, MH is proposed to represent inadequately treated hypertension, whereas patients with

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