

Ambulatory and Home Blood Pressure Measurement Complementary Rather Than Competitive Methods

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See related article, pp 22–28

Clinic (office) blood pressure (BP) measurement has a well-established role in medical practice and is the standard on which most of the literature is based. However, clinic BP has several important limitations, including the potential for inadequate or misleading estimates of a patient's true BP status and suboptimal prediction of cardiovascular risk. Particularly relevant is the concern that clinic BP measured with standard techniques may not provide a representative estimate of an individual's usual BP outside the medical setting. Out-of-office BP assessment takes 2 forms at the present time, self (or home) BP measurement (SBPM) and ambulatory BP monitoring (ABPM). These 2 techniques have attracted considerable attention in recent years because of the potential for better classification of hypertensive status compared with office BP. SBPM devices allow for repeated measurements outside the medical environment, and their use has been recommended by several international guidelines.^{1,2} ABPM is currently considered the gold standard for the correct diagnosis of hypertension on the grounds that the ambulatory BP provides extensive information on several BP parameters other than the average BP, including BP variability, the morning BP surge, BP load, and the nocturnal fall in BP.³ However, it should be noted that all of the clinical guidelines still focus on the importance of the mean ambulatory BP for clinical practice, and all of the other parameters are still considered experimental. ABPM is not widely available in primary care practice and is considered most helpful when self-measured BP is within borderline values. According to most authorities, self-BP measurement should be used as an initial step to evaluate the out-of-office BP^{1–3} and, thus, used as a screening procedure that should lead to an ABPM for confirmation. However, it is not well known whether this strategy is appropriate because ambulatory BP and self-measured BP may provide different and complementary clinic information. Indeed, several studies have shown that these 2 measures do not have a high correlation⁴ and that disagreement in the diagnosis of hypertension between the 2 methods is not uncommon.⁵

Only 2 studies have compared the prognostic value of ABPM with that of SBPM within the same population, the

Pressioni Arteriose Monitorate E Loro Associazioni (PAMELA) Study⁶ and the Ohasama Study.⁷ In this issue of *Hypertension*, Hara et al⁷ investigated the usefulness of ambulatory, home, and clinic BP measurements to predict subclinical cerebrovascular diseases in the general population from Ohasama. They found that 24-hour, daytime, and nighttime ambulatory BPs and home BP were closely associated with the risk of silent cerebrovascular lesions and carotid atherosclerosis, whereas clinic BP was not. However, when home and one of the ambulatory BPs were simultaneously included in the same regression model, each of the ambulatory BP values remained a significant predictor of silent cerebrovascular lesions, whereas home BP lost its predictive value. In agreement with most published reports, mean nighttime ambulatory BP had a better prognostic accuracy than 24-hour or daytime BP. In contrast, home BP was more closely associated with the risk of carotid atherosclerosis than any of the ambulatory BPs. These results led the authors to conclude that the clinical significance of ABPM and SBPM for predicting target organ damage may differ for different target organs. Although the reasons for the differential association of ambulatory BP and home BP with the 2 measures of target organ damage are not readily apparent, these data indicate that both pressures may be equally important for stratification of the cardiovascular risk. Previous studies showed some differences in the relationship of ambulatory BP and self-measured BP with organ damage but no evidence of any systematic difference in favor of one or the other out-of-office pressure.⁸ Inconsistencies in the literature may depend on the number of readings used to compute self-measured BP, which, in some studies, was only measured twice, thereby favoring a better relationship of target organ damage with ambulatory BP. A strength of the study of Hara et al⁷ is the large number of BP readings (mean: 49) used to calculate home BP, which was comparable to that collected during the 24-hour recordings (mean: 44). This ensures that the different associations with measures of organ damage were not attributed to a different number of readings used to calculate the 2 pressures and suggests that the 2 methods have a supplementary, rather than a competitive, role in the assessment of hypertensive patients. The above data are in keeping with those obtained in the PAMELA Study.⁶ In that prospective study, the risk of cardiovascular death showed a progressive increase in the patients with a selective clinic BP elevation, a selective out-of-office BP elevation, and elevation in both clinic and out-of-office BP. The progressive increase in mortality from the entirely normotensive to the entirely hypertensive group occurred regardless of whether the above conditions were identified based on clinic versus ambulatory or clinic versus home BP. In addition, selective elevation in home versus ambulatory BP or vice versa also carried an increased risk. Indeed, in the

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PAMELA Study, each BP elevation (of clinic, home, or ambulatory BP) carried an increase in risk of mortality that added to that of the other BP elevations. The practical implications of the Ohasama and PAMELA studies are that out-of-office BP values should be collected more frequently than is recommended by current guidelines and that home BP is not a surrogate for ambulatory BP, because both pressures add prognostic information to each other. Ambulatory and home BP share an important common feature, that is the absence of the white-coat effect. On the other hand, it should be emphasized that they are also characterized by important differences. Home BP is measured under strictly standardized conditions of environment, posture, and activity, whereas ambulatory BP is measured in freely moving subjects involved in their usually variable daily activities and includes BP measured during sleep. It is, thus, not surprising that these 2 methods are not completely interchangeable with one another.

Clinic BP remains a mainstay for the assessment of the hypertensive patient. Unfortunately, in the study by Hara et al,⁷ the same methodologically rigorous criteria used for out-of-office BP were not applied to clinic BP, which was the mean of only 2 measurements. Before making a diagnosis of hypertension and initiating antihypertensive treatment, multiple clinic readings at ≥ 2 visits should be obtained. Indirect evidence suggests that standardized office measurements recorded by well-trained personnel at multiple visits may achieve the same results as ambulatory BP. The importance of collecting many clinic readings for a better definition of the individual risk has been demonstrated in several studies. In the Hypertension and Ambulatory Recording VEnetia Study (HARVEST), when baseline ambulatory BP was compared with the mean of a few clinic readings taken at baseline, the prediction of development of sustained hypertension during the following 5 years was greater for ambulatory than for clinic BP.⁹ However, if the mean of 18 clinic readings obtained during the first few months of observation was used, the prediction was greater for clinic BP. Fagard et al¹⁰ demonstrated that ambulatory BP did not explain the variance in left ventricular mass in addition to the variance explained by clinic BP if the mean of 10 clinic readings taken during 2 visits was used. In the Multiple Risk Factor Intervention Trial, Pearce et al¹¹ compared ambulatory BP with clinic BP based on the mean of 10 measurements performed at >5 visits. These authors found high correlations between ambulatory and office BPs ($r=0.83-0.90$ and $0.76-0.79$ for systolic and diastolic BP, respectively) and concluded that ABPM is unlikely to improve the estimation of usual BP beyond that achievable by careful, repeated measurements of clinic BP. The prognostic value of clinic BP in the prediction of cardiovascular risk was highlighted by the PAMELA Study, which showed that a BP elevation in clinic BP carries an increase in risk of mortality that adds to that of out-of-office BP elevations.⁶ Thus, each of the 3 pressures, clinic, self-measured, and ambulatory, provides independent contribution to cardiovascular risk.

Today, several methods for measuring BP are available, including resting BP in the office by physicians or nurses using traditional sphygmomanometry; clinic measurement by automated stationary devices; self-measurement at home; and

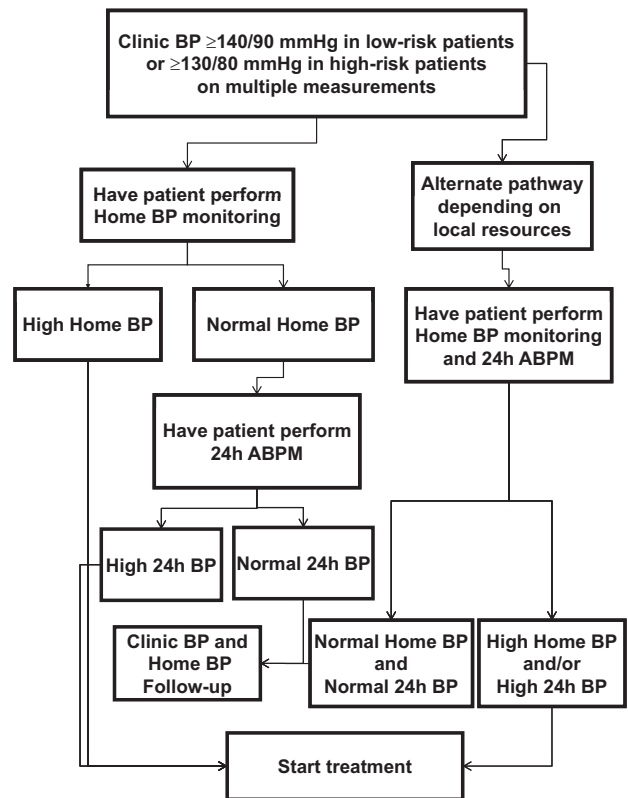


Figure. Use of self/home blood pressure (BP) monitoring and ambulatory blood pressure monitoring (ABPM) for the diagnosis of hypertension needing antihypertensive treatment in clinical practice. According to the proposed flowchart, the 2 out-of-office pressures are equally important for decision making. Thus, treatment should be started in patients with high clinic BP and either high home BP or high ambulatory BP.

measurement by ABPM devices. Each approach has its advantages and limitations. Thus, obtaining information on clinic, self-measured, and 24-hour BP may represent the optimal clinical procedure (Figure). The choice of ABPM or SBPM is not thus a question of respective diagnostic accuracy but rather one of availability of the technique, characteristics of the patients, and cost. Although cost differs from country to country, ABPM is more costly than SBPM and is not covered by social security in all countries. However, cost of devices is reducing quite significantly, and strategies for removing cost of reporting through computer-generated reports are under way. Whenever possible, it is advisable that clinic, home, and ambulatory BPs are all used for the diagnosis and management of hypertension.

Disclosures

None.

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