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Home Blood Pressure As an intervention to Control Hypertension

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Out-of-office monitoring of the blood pressure (BP) can provide unique information that may be of help both for making treatment decisions and for evaluating the response to treatment (1). The mainstay for the justification of out-of-office BP monitoring is that there is steadily increasing and substantial evidence that both ambulatory and home BP measures give a better prediction of risk when compared with office BP (2-7). This has been shown in studies that utilized ambulatory BP measurements (1-3) as well as those that used home (or self) monitoring of the BP (4-6). In general, when there is a discrepancy between the office BP and the out-of-office BP, the risk follows the latter more closely. Thus, patients with white coat hypertension (high office BP, and normal out-of-office BP) are at relatively low risk (2,4), while patients whose out-of-office BP is higher than anticipated from the office BP are at relatively high risk (3, 8). Even in treated hypertensive patients, a high out-of-office BP is a marker for increased risk.

Using self-monitoring of the BP to empower patients to participate more proactively in their own hypertension management and to improve control rates has been an attractive goal of research for some time now (9,10). This goal is reasonable considering that approximately half of patients with hypertension in the US are not controlled on therapy, a problem particularly compelling in younger people and Hispanics (11).

One means to advance the utility of home- or self-monitoring of the BP has been to incorporate it into 'self-management' programs in which the patient takes an important role in the evaluation, reporting, and treatment of their hypertension, particularly when on anti-hypertensive therapy. In a 12-month study in England (Telemonitoring and Self-Management In the Control of Hypertension or TASMINH2 trial) (10), uncontrolled hypertensive patients on 1 or 2 antihypertensive medications who were randomly assigned to self-management of the BP that incorporated telemonitoring of home BPs to a primary care physician had a resultant systolic BP that was 5.4 mmHg lower than a usual care group. It is likely that the improvement in BP control in the TASMINH2 study (10) was due to

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increased titration or substitution of antihypertensive medications by patients with the advice of their primary doctors. The study was an important advance in our understanding of the utility of self-management and home BP monitoring in clinical practice but was limited by its lack of minority patients, complex hypertensives on 3 or more antihypertensive drugs, and the duration of follow-up.

In this issue of the *Archives*, Bosworth and co-workers have reported new results from a randomized clinical trial evaluating long-term BP control in a diverse and moderately complex hypertensive patient population that utilized 2 different types of home BP monitoring interventions alone and in combination versus usual care (12). One of the interventions used a behavioral approach that provided expert nurse clinicians to advocate a number of non-pharmacologic measures and improve compliance based on uncontrolled home BP values. The other intervention was a medication management approach in which physicians recommended medication changes based on uncontrolled home BP values. The interventions were triggered when 2-week home BP values exceeded 135/85 mmHg (or if diabetic, in excess of 135/80 mmHg). Hypertension control rates were moderately better at 12 months in patients who underwent either behavioral or medical management, but these control rates were attenuated at the 18-month endpoint. The combination of the two interventions was the most successful with a 10% improvement in hypertension control rates compared to the usual care group at 18 months. A *post hoc* sub-group analysis according to baseline hypertension control showed larger reductions from baseline in the clinic BP at 18 months in those with inadequate baseline BP control versus those whose baseline BP control was adequate. In the inadequate baseline BP subgroup, the medication management group induced reductions from baseline of $-7/-4$ mmHg while in the combination of behavioral and medication management group decreases were $-8/-6$ mmHg versus the usual care group. In contrast, no benefit was observed in the behavioral management treatment group in those individuals with inadequate BP control at baseline (0.3/1.1 mmHg).

The findings in the study should clearly be of interest to practitioners, and certain features of the nurse telemedicine intervention could potentially be imported into primary care practices. As noted above, the authors suggest that the most impressive results associated with the nurse telemedicine interventions occurred in those individuals who had inadequate control of BP prior to entering the program. However, it should be made clear that the original inclusion of patients in this study required a 1-year average of clinic BPs $> 140/90$ mmHg while the *post-hoc* definition of inadequate baseline control was based on duplicate BPs obtained by a research assistant in a non-practice environment. The research BP was a more stringent criterion than the 1-year clinic BP average because just 41% of the study population met the 'inadequately controlled' criteria based on BPs taken by the research assistant. That fewer patients meet both criteria is not surprising because research staff BPs are often not associated with the same level of 'white-coat effect' observed with a treating physician (13). Hence, it may not be practical or prudent to limit an intervention to just those individuals considered inadequately controlled at baseline, when identification of such individuals would be difficult to make by the primary care practitioner. Further, the authors did not provide clinical characteristics of the patients with inadequate control of BP at baseline according to researcher BPs versus those who were controlled.

The results of the behavioral intervention on BP control in the study by Bosworth and colleagues are disappointing. Collectively, a large effort was made by the nurse clinicians to improve BP control rates, and while this type of intervention was effective in a previous 24-month study by the same investigative group (14), results failed to be sustained after 12 months in the present trial. In contrast, combining the behavioral management with antihypertensive therapeutic advice was associated with the maintenance of a moderate effect in the entire population for up to 18 months. Thus, it appears that to reduce the

negative effects of clinical inertia and patient non-compliance that prevent the control of BP, a multi-pronged approach will be required. The cost of the combined intervention was estimated at \$1153 for 18 months, an amount that could be justified if a large enough proportion of patients achieved enough improvement in BP control to ultimately lead to a reduction in strokes, congestive heart failure, and other cardiovascular events in patients with uncontrolled hypertension.

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