Home Blood Pressure Measurement: A Review

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ABSTRACT

Hypertension, the leading global risk factor for early mortality, cannot be detected or treated without accurate and practical methods of blood pressure (BP) measurement. Although home BP measurement has considerable popularity among patients, the lack of evidence needed to assure its place in modern clinical practice has hindered its widespread acceptance among physicians. This paper demonstrates that home BP measurement is more accurate than conventional clinic and ambulatory monitoring BP measurement and can be used effectively in clinical practice. On the basis of the data from different studies, it can be concluded that home BP measurement is an improvement over conventional clinic BP measurement. Home monitoring of BP is a convenient, accurate, and widely available option and may become the method of choice when diagnosing and treating hypertension. A paradigm shift is needed in BP measurement as evidence-based medicine suggests that clinic BP measurement should only be used for screening purposes.

Keywords: Blood Pressure, Blood Pressure Determination, Home Blood Pressure Measurement, Hypertension, Medical Technologies

INTRODUCTION

A few risk factors account for a large contribution to global loss of healthy life. Overall, 26% of the worldwide adult population had high BP i.e. hypertension (clinic BP ≥ 140 mmHg systolic and/or 90 mmHg diastolic) in 2000 and 29% are projected to have this condition in 2025 (Kearney, et al. 2005). Hypertension has been identified as the third most important cause for global burden of disease and as the leading global risk factor for mortality, accounting for over 7 million deaths yearly (Ezzati et al., 2002). The risks of high BP are not only limited to those with severe hypertension, as there is a continuous relationship with cardiovascular risk even throughout the normal range of usual BP (down at least as far as 115/75 mmHg). Lowering of the systolic BP by only 10 mmHg, or lowering the diastolic BP by only 5 mmHg would, in the long term, be associated with a lower risk (about 40%) of stroke death and a lower risk (about 30%) of death from ischemic
heart disease or other vascular causes throughout middle age (Lewington et al., 2002).

BP, however, cannot be prevented, detected, treated and controlled without accurate and practical methods of measurement. If proper methods are not used, inexact BP measurement can lead to poor diagnostic accuracy, unnecessary costs and therapy, and poor medical treatment. Despite several limitations, measurement of BP has until recently occurred primarily at the physician’s office using a stethoscope and a conventional mercury sphygmomanometer. The technological advances during the past decade have provided novel options for measuring BP, such as home monitoring, which is becoming increasingly popular world-wide (Burton, 2006).

One of the reasons why home BP measurement has not received widespread acceptance in the minds of physicians, despite its considerable popularity with patients, is a lack of evidence needed to assure its place in modern clinical practice. This paper is planned to provide physicians and researchers with evidence that home BP measurement can be used effectively in clinical practice, and that it offers clear benefits compared with conventional clinic measurement.

HISTORY OF HOME BP MEASUREMENT

The standard method of indirect measurement of BP is based on the principle of arterial occlusion and BP detection by various techniques, the first of which was palpation, described by Scipione Riva-Rocci in 1896. In 1905, Nikolai Korotkoff improved Riva-Rocci’s method when he recognized that by placing a stethoscope over the brachial artery at the cubital fossa, distal to a Riva-Rocci cuff, tapping sounds could be heard as the cuff was deflated, caused by blood flowing back into the artery. Korotkoff concluded correctly that the appearance of the tapping sounds coincided with systolic BP and the disappearance of the sounds with diastolic BP (Korotkoff, 1905). The method of BP measurement invented by Korotkoff quickly received wide recognition and became a standard medical procedure. His technique has truly stood the test of time as it has been used for more than a century with practically no alterations (Booth, 1977).

Brown was the first to report that BP measured in the home was lower than that recorded by a doctor (Brown, 1930). Ayman and Goldshine proposed the concept of “self BP measurement” in 1940 and also concluded that BP measured at home was lower than clinic BP. They have also suggested that home BP monitoring was useful for (1) instructing the patients about their chronic diseases, (2) teaching physicians about the natural course of the disease and about factors that affect the disease, (3) learning the prognosis of disease, and (4) increasing the precision of determining the effectiveness of treatment, as all of these hypotheses are slowly being proved correct (Ayman, 1940).

MEASUREMENT OF HOME BP

Devices and Validation

Automated BP measuring devices are at present most commonly based on the oscillometric technique and on the use of stable electronic transducer. This implies that these devices quite accurately measure mean BP corresponding to the point of maximal oscillation of cuff air pressure during cuff deflation, and then calculate systolic and diastolic BP values. The latter procedure is carried out through proprietary algorithms, different for different devices and usually not made available by manufacturers. For this reason, the accuracy of the systolic and diastolic BP readings yielded by any of these systems has to be checked against conventional measurements performed in highly standardized conditions, according to one of the available protocols endorsed by American and/or European Hypertension Societies (Booth, 1977; Brown, 1930; Ayman, 1940; Micke, 1997). The need for such a validation comes from...
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