



## CLINICAL ISSUES IN HYPERTENSION

Canadian Coalition for High Blood Pressure Prevention and Control  
Coalition Canadienne pour la Prévention et le Contrôle de l'Hypertension Artérielle

# Automation: Blood Pressure Devices for the Office

What do you need to know about automated blood pressure measurement and devices in your office?

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**B**lood pressure (BP) measurement is the most common diagnostic procedure performed in the outpatient clinic.<sup>1</sup> Until recently, doctors had to measure BP by stethoscope and cuff, combined with a mercury or aneroid (dial-type) sphygmomanometer. The currently available, accurate, fully automated devices for the clinic (Figure 1) may lead to better hypertension management and may save time. In a “head-to-head” comparison of readings from one automated device with those taken by a hyperten-

sion nurse specialist who was well trained in proper BP measurement, there was 92% agreement in the diagnosis of hypertension.<sup>2</sup>

### *What is the benefit of automation?*

The “casual” BP readings so common to clinical practice<sup>3</sup> do not correlate well to target organ damage. Common reasons for this lack of correlation are typically related to the person or method used in taking the BP reading.<sup>4</sup> For example, the accuracy of the manual method depends on the need to:

- deflate the cuff at an appropriate rate,
- avoid rounding errors or digit bias,
- have good hearing and vision,
- take precautions to avoid an auscultatory gap, and
- take more than one reading.



Figure 1. Automated blood pressure monitor for clinic use.



Table 1

### Minimum patient instructions for seated-position automated reading

- Remain seated with back supported
- Remain silent
- Do not cross legs
- Keep arms relaxed and still, with cuffed arm supported

Using high-quality automated devices will avoid most, if not all, of these problems.

Certain automated devices can take multiple BP readings without the presence of health-care professionals. The clinic personnel merely attach the cuff, position the patient, and ensure the patient understands how to activate the device and follow the few simple rules for good BP measurement (Table 1). Depending on the device used, as few as one, or as many as six readings will be taken automatically. Automated readings taken in the absence of clinic personnel have been shown to be comparable to ambulatory readings.<sup>5</sup> When multiple automated readings are taken outside of the normal treatment setting, the so-called “white-coat effect” (*i.e.*, the elevation of a patient’s BP readings caused by being in a physician’s office or presence)

Table 2

### Patient preparation for blood pressure reading

At least 30 minutes before reading, patient should avoid:

- Cold exposure
- Meals
- Caffeine consumption
- Smoking

Advise patient to:

- Empty bladder and bowel in advance
- Wear a sleeveless shirt, or loose-fitting sleeved clothing

appears to be reduced significantly, especially when compared to patients’ responses to a hypertension specialist.<sup>6</sup>

## *Automated devices for the clinic*

Automated BP-measuring devices fall into four broad categories:

- home use,
- community use,
- clinic use, and
- ambulatory measurement.

A new Web site (see “Net Readings” box) is dedicated to providing reliable information on BP devices in all of these

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Table 3

### Recommended techniques for automated blood pressure reading

- Have the patient rest at least 5 minutes before taking any readings
- Use an accurate and validated device
- Use the correct cuff size relative to the patient's arm circumference
- Centre the cuff on the (brachial) artery according to the indicator printed on the cuff
- Support the patient's arm with the cuff at the level of his/her heart
- Measure blood pressure in both arms initially. If a consistent pressure difference between the two is found, use the arm with the higher reading in subsequent readings

categories.<sup>7</sup> Information on this site shows which devices have been independently validated and can be recommended for use according to standardized clinical testing protocols. Canadian hypertension guidelines<sup>8</sup> recommend only those automated devices that have been independently validated using either the Association for the Advancement of Medical Instrumentation (AAMI) standard,<sup>9</sup> the British Hypertension Society (BHS) protocol,<sup>10</sup> or the European Society of Hypertension International Protocol.<sup>11</sup>

### *What are the limitations?*

Whether BP is measured automatically or manually, it will be affected by factors relating to the patient, method, and device. All patients who come to the clinic for assessment of hypertension must be pre-

### Take-home message

- Certain automated devices can take multiple BP readings without the presence of health-care professionals.
- Automated BP-measuring devices fall into four categories: use in the home, community, or clinic, and ambulatory measurement.
- Before purchasing a device, make sure you learn how to verify its calibration. At a minimum, device accuracy must be checked annually.
- Make sure the device has been approved by the AAMI, BHS, or International Protocol.
- Whether BP is measured automatically or manually, it will be affected by factors relating to the patient, method, and device.

pared for their reading (Table 2). The Canadian Hypertension Education Program (CHEP) makes these measurement guidelines available either online (diagnosis, assessment, and followup slide set are available for download via the Canadian Hypertension Society Web site), or through regular publication.<sup>8</sup> Basic rules are listed in Table 3.

### *Special patient groups*

Arrhythmia presents a special challenge to BP measurement. When BP is taken manually in patients with arrhythmia, many extra readings must typically be taken to ensure reliable results. Arrhythmias can cause errors in automated device readings as well. Some manufacturers claim their



devices can compensate for this problem, but this is an area that needs further study and independent corroboration.

Not all automated devices have been tested in special patient groups. In some special cases, automated devices have been tested, but the results are not accurate.

Automated devices that are recommended for clinical use in general populations may not give accurate readings in pregnant women (especially in pre-eclamptic patients), children, and obese or frail adults. The accuracy in such special populations must be determined by appropriate studies of each device. For these reasons and others, clinicians may not want to abandon manual BP measuring methods completely.


Automated devices for general clinic use may not be appropriate for use in areas where there is a high risk of explosion due to the presence of combustible gases (*e.g.*, during surgery) or where high levels of electromagnetic radiation are present.

## What can the physician do?

Whatever method of clinic BP measurement is chosen, the onus is on the health-care professional to ensure the equipment is calibrated and functioning properly. Before purchas-

ing a device, learn how to verify its calibration. Some user manuals provide detailed instructions on how to check an automated device against an accurate manual device.

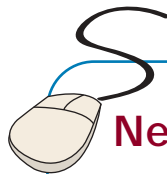
Although modern automated devices are robust, they can be damaged or may lose accuracy. At a minimum, device accuracy needs to be checked at least once per year.<sup>10</sup> Any time a device is dropped or damaged, or if it produces readings that are suspect, its calibration must be checked. If the device is out of calibration, return it for servicing. Replace any damaged parts before using the device on patients.

Using an accurate automated BP-measuring device has the potential to provide quality BP readings and make more efficient use of clinic time. This will aid clinicians by affording more opportunities to take BP readings, thus helping in the diagnosis and management of patients. 

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## Net Readings

1. dabl® Educational Trust  
[www.dableducational.com](http://www.dableducational.com)
2. Canadian Hypertension Society  
[www.chs.md](http://www.chs.md)



## BP Devices

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