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Goodbye mercury? Blood pressure measurement and its future

The mercury sphygmomanometer, which has served medicine well for more than a century, is now under attack from two directions. First, mercury devices are being phased out of healthcare systems for ecological reasons. Second, electronic blood pressure machines have become widely available and offer certain advantages—not least, the opportunity to assess patterns of blood pressure behaviour by repeated measurements.¹ After the advent of automated devices for use in healthcare settings, inexpensive machines for home blood pressure monitoring reached the market.² If the enthusiasts are right, home monitoring will become a vital part of the diagnostic and management algorithm for hypertension—especially with the increasing burden of hypertension and the likely benefits of good detection, monitoring, and control.³ According to He and MacGregor,⁴ achievement of a target systolic blood pressure of 140 mmHg could reduce stroke by 28–44% and ischaemic heart disease by 20–35% (depending on age). In the UK alone this would translate into postponement of some 125 600 deaths each year.

How do we say goodbye to mercury sphygmomanometers? Clearly we need to be sure that the alternatives are reliable, and several of the electronic devices have now been validated for use in hospitals and primary care—some fully automated (and thus avoiding observer bias), others requiring the old techniques of auscultation. In this editorial we focus on the portable devices that allow ambulatory blood pressure monitoring or self measurement at home. Though the accuracy of the machines and methods used by patients at home may sometimes be doubted, these techniques allow mean values to be calculated from multiple readings and give a better idea of how blood pressure behaves in ordinary life. This brings us to the use of blood pressure devices by patients. On p. 111 of this issue, Professor Wong and his colleagues⁵ report an investigation of automated blood pressure devices used by hypertensive patients (usually on their own initiative) in Hong Kong. They found that the patients' self-measurements agreed only poorly with

readings from a mercury sphygmomanometer, especially for diastolic blood pressures. Moreover, when the patients were asked how they used the machines, only a small proportion showed a good grasp of proper technique. This series was too small to allow conclusions on whether some categories of device are less reliable than others, though there is already good reason to mistrust machines that measure blood pressure in the forearm. An important factor in reliability, irrespective of device, is the way the machines are operated. Wong, who practised for a long time in the UK, does not think the findings would be very different in western centres. Protocols for the validation of electronic blood pressure machines have been provided by the British Hypertension Society, and some devices perform much better than others.⁶ However, machines provided in non-medical settings such as shopping malls or the workplace may not come under the Society's eye. On the plus side, one study showed that employees who used a workplace device for weekly blood pressure measurement showed significant improvements in lifestyle behaviours including smoking, exercise and sodium intake;⁷ and, in another, hypertensive patients who checked their blood pressure in retail stores made healthcare decisions based on the readings obtained.⁸ On the minus side, no clinician would feel comfortable recommending use of a machine that might under-read diastolic pressures or over-read systolics,⁹ with the associated dangers of false reassurance and false alarm.

What of the devices for home blood pressure monitoring? Home measurements can be useful for identifying and eliminating the white-coat effect—the hypertensive response of some patients to a healthcare worker. Moreover, in any patient, because they can provide a large number of readings, they may offer a more accurate picture than clinic blood pressures. The results of long-term home monitoring enable a clinician to assess and deal with variations in blood pressure. Also, home monitoring may be useful for evaluating the effects of antihypertensive therapy in clinical trials and for improving adherence to treatment.^{11–13} It should be noted that oscillometric techniques are unsuitable in some patients with arrhythmias, though accurate measurements can be obtained in stable atrial fibrillation.¹⁴

As Wong concludes in his paper, automatic blood pressure machines should nowadays come into the conversation whenever a patient is diagnosed as hypertensive. Moreover, existing patients might reasonably be asked

whether they possess such a machine and, if so, be encouraged to come and have it checked against the clinic machine (which we presume to be an approved model). Although the mercury sphygmomanometer is quietly disappearing, it will still be needed for validation purposes—and possibly in some clinical circumstances too.¹³ Perhaps we should not be saying ‘goodbye mercury’ but ‘we’ll meet again sometimes’.

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