The measurement of blood pressure in developing countries

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Blood Pressure Monitoring 2005, **10**:11–12

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One of the consequences of the adoption of a Western lifestyle is an increased prevalence of hypertension, and it has been estimated that cardiovascular disease is likely to become the leading global cause of death and disability in the very near future [1]. According to the World Health Organization (WHO) there are 600 million people in the world with hypertension, which accounts for 7 million deaths annually [2]. The rates of control of hypertension are nothing to be proud of, even in countries with the most advanced economies. In the US, we top the list, with approximately 30% of hypertensives controlled to less than 140/90 mmHg [3]. In countries like Egypt and China the control rates are much lower – 8 and 5% [4]. The problem is particularly acute in rural areas: in 1991 the awareness of hypertension was 36% in urban areas in China, but only 14% in rural areas. The corresponding control rates were 4 and 1% [4]. The low awareness rates in less developed countries mean that greater emphasis needs to be placed on screening than in the developed world, where most people have had their blood pressure checked at some stage in their lives. The accurate measurement of blood pressure is therefore of critical importance in developing countries no less than elsewhere. In the United States and Europe there has been considerable debate as to how blood pressure should be measured in routine clinical practice. This has been triggered by the imminent banning of mercury, which will soon result in the demise of the standard technique for measuring blood pressure that has been used virtually unchanged for the past 100 years. Indeed, given the inaccuracies of the auscultatory technique as routinely used, it is perhaps surprising that it has not happened sooner. Most of the debate has been on whether aneroid or oscillometric devices should be preferred.

The Committee convened by the WHO has made some sensible suggestions, which present an interesting challenge to the manufacturers of such devices [5]. There is widespread agreement that measurements made by human observers using the auscultatory techniques, while hallowed by time, are on their way out. There are several advantages of automated readings, which in practical terms can only be obtained by the oscillometric method at the present time. First, they eliminate observer error and bias such as terminal digit preference, and second, they provide the opportunity to obtain multiple readings, both of which enable a more accurate estimate of the patient's true blood pressure. The down side is that currently available devices may have significant errors in some patients, even if they have passed standard validation protocols [6]. Nevertheless, on balance the benefits of the oscillometric method may be said to outweigh the negative aspects.

Using an automated device implies that it will be electronic, at least in part. Such devices need power, and they need to be portable, if they are to be used in screening in rural areas. Battery-operated devices could be a problem in some countries, where the availability of batteries may be limited, and where there is a risk that the batteries may be removed and used for radios. However, the power requirements of electronic devices need not be high, particularly if the inflation and deflation of the cuff is performed manually. Wind-up radios are available in third world countries, and there is no reason why the electricity needed to operate the electronic detection and display of blood pressure readings should not be generated in the same way. Wind-up chargers are also available for cell phones, which are making big inroads in developing countries where the infrastructure of telephone cables is often lacking. Solar power is another possibility. The technology for this is already inexpensive and well developed, and radios with combined wind-up and solar power can be purchased through the internet for less than $30. With high volume production, it would seem reasonable for a blood pressure monitor to be sold at a similar price.

The device would need to be very durable. One of the problems with aneroid devices is that they operate with a delicate mechanical spring, whose accuracy may change over time, particularly if they are dropped or subjected to extremes of temperature. An electronic device would not need to have any moving parts other than the winding mechanism, which could be very robust. Recalibration is usually not an issue with electronic devices – either they work or they don't. The part that is most sensitive to drift over time is the electronic transducer, but these are typically stable over time.

The huge market for a cheap and reliable blood pressure monitor should pose an interesting challenge to potential manufacturers, and economies of scale equating high volume with low cost make it a realistic expectation that

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there will soon be inexpensive and reliable monitors that will not only be widely used in developing countries, but also in more affluent parts of the world.

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