Consequences of banning mercury and the cuff controversy

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Banning mercury

Mercury will be banned from clinical use in the near future because it is a toxic, persistent and bio-accumable substance, many tons of which are distributed throughout the world to hospitals and countless individual doctors and little of which is returned for disposal. It finds its way back into the environment through evaporation, in sewage or in solid waste, most seriously damaging the marine environment, and it accumulates in soil and in sediments thereby entering the food chain [1]. Signatories of the 'Final Declaration from the Third International Conference on the Protection of the North Sea' have resolved to reduce environmental mercury to 'levels that are not harmful to man or nature before the year 2000' [1].

One of the consequences of the impending ban on mercury is that authoritative bodies, government health agencies and purchasing authorities have been reluctant to make recommendations and give guidance to doctors and the public. Rather it falls upon bodies such as The Working Group on Blood Pressure Monitoring to evaluate practice and make recommendations. The result, however, of this ambivalence is that hospitals and doctors may replace mercury sphygmomanometers by unreliable and inaccurate devices, such as aneroid sphygmomanometers, which become inaccurate with use and should not, therefore, be substituted for the mercury instrument [2]. Many automated devices have had a poor record for accuracy, but, an automated device, the Omron HEM-705CP [3], recently satisfied the stringent criteria of the validation protocols of the British Hypertension Society [4] and the Association for the Advancement of Medical Instrumentation [5].

The passing of mercury sphygmomanometers should not in itself be a cause for concern. In fact, it might be argued that the sooner we rid ourselves of an inaccurate technique, on which we base so many important decisions of management, the better. This is not to blame the mercury sphygmomanometer, which is a most reliable instrument, but rather to impugn the most fallible part of the whole procedure, the human observer [1]. Automated devices can remove observer error and provide in addition a printout of the measurement with the date and time of the measurement, or the measurement can be stored for display in a computer program.

Replacing the millimetre of mercury by the kilopascal

Banning mercury from clinical use raises another issue of importance for clinical medicine. The Système International unit for pressure is the kilopascal. However, replacing the millimetre of mercury by the kilopascal

has been postponed until such time as there is a suitable alternative to the mercury sphygmomanometer [1]. If the millimetre of mercury is no longer the unit of measurement for blood pressure, the mainstay of the medical argument for retaining the millimetre of mercury as a unit of measurement, namely that we measure what we see, will also disappear.

Solving the cuff controversy

However accurate we strive to make devices for self-measurement of blood pressure, there will remain one inherent inaccuracy, namely that induced by miscuffing. Self-measurement of blood pressure is largely dependent on occlusion of the arm (or wrist) by a cuff and, in common with measurement in clinical practice, the technique is prone to the inaccuracy induced by miscuffing, whereby a cuff containing a bladder that is either too long or too short relative to arm circumference is used [6].

A review of the literature on the century-old controversy relating to the error that can be introduced into measurement of blood pressure measurement by using a cuff with a bladder of inappropriate dimensions for the arm for which it is intended has shown that miscuffing is a serious source of error that must inevitably lead to incorrect diagnosis in practice and erroneous conclusions in research into hypertension [6] There is unequivocal evidence that either too narrow or too short a bladder (undercuffing) will cause overestimation of blood pressure and there is growing evidence that too wide or too long a bladder (overcuffing) causes underestimation of blood pressure. Undercuffing in clinical practice has the effect of overdiagnosing hypertension and overcuffing leads to hypertensive subjects being diagnosed as normotensive. Either eventuality has serious implications for the epidemiology of hypertension and clinical practice. Several approaches have been used over the years to cope with the difficulty of mismatching; these have included the application of correction factors, using a range of cuffs, or cuffs containing a variety of bladders, and using a cuff that would encircle the majority of arms [6]. Recently A.C. Cossor & Sons Ltd. (London) have manufactured an adjustable cuff, which can be applied to all arms regardless of arm circumference (personal communication).

References

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