Response to the Advisory Statement From the Council for High Blood Pressure Research of the American Heart Association Advocating Retention of Mercury Sphygmomanometers

To the Editor:

The editorial entitled “Mercury Sphygmomanometers Should Not be Abandoned: An Advisory Statement From the Council for High Blood Pressure Research, American Heart Association”1 highlights an important issue, which was also the subject of a recent editorial from the Working Party on Blood Pressure Measurement of the British Hypertension Society in the British Medical Journal.2 Though there are differences between the European and American stances on this issue, there is no doubting the common goal on both sides of the Atlantic, namely, to improve the accuracy of blood pressure measurement. It may be helpful to this common cause to examine the considerations that have influenced expert opinion in the European Union and the USA.

First, there is the issue of mercury. The American view is that because there have been few reported cases of mercury toxicity in clinical practice, “mercury instruments are approved and are legal devices in this country, and we believe they should remain so.”1 In Europe, concern with mercury toxicity is focused not on healthcare workers, in whom instances of mercury toxicity are indeed rare, but rather on the disposal of mercury, which is a major threat to the environment.2-4 Mercury is a toxic substance, and there is mounting pressure from environmentalists to have it banned from use in hospitals. In Scandinavian countries and The Netherlands, the use of mercury is no longer permitted. In the rest of Europe, the move to ban mercury from clinical use has been resisted on the grounds that the once common alternative, the aneroid sphygmomanometer, becomes inaccurate with use and should not, therefore, be substituted for the mercury instrument.2 However, the reluctance of servicing personnel to handle mercury because of the danger of toxicity is forcing the pace of change with the unsatisfactory consequence of mercury sphygmomanometers being replaced without due consideration being given to the accuracy and performance of the alternative device.

The concern expressed by American experts about the accuracy of automated alternatives for the mercury sphygmomanometer is shared by their European colleagues, who have been urging manufacturers to develop suitable automated devices for clinical use.5 Slow though manufacturers have been in responding to an obvious market, there are now 3 automated devices6-9 that fulfill the criteria of the protocols of the British Hypertension Society10 and the Association for the Advancement of Medical Instrumentation,11 and others are in the pipe-line. Two of these devices—the A&D UA-767X and the Omron HEM-705CP7,12 which were designed for self-measurement of blood pressure—have been adapted for hospital use, and the Omron HEM-705CP is being used in the large multicenter Anglo-Scandinavian Cardiac Outcome Trial (ASCOT).13

However, having an accurate automated alternative to the mercury sphygmomanometer begs another question. Does automated sphygmomanometry have the potential to give more accurate blood pressure measurements than those of the conventional auscultatory technique? The European answer would be in the affirmative simply because conventional measurement is an inaccurate technique, which, as the American statement acknowledges, requires training and re-training; automated devices can remove observer error and terminal digit preference while also providing printouts of the measurement with the date and time of the measurement and digital out-put that can be stored and plotted.2 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.2,14 The American recommendation would appear to be contrary: “the general use of mercury manometers as the instrument of choice” is encouraged, but only “until other instruments are better validated.”1 The 2 opinions are not irreconcilable: the European view is that at long last we may now have validated alternatives to the mercury sphygmomanometer,2,14 whereas the American view is that this stance is premature.1

Leaving aside the issue of accuracy of automated devices, there are other factors that merit consideration. The American statement rightly draws attention to the fact that electronic sphygmomanometers have not been subjected to use in the variety of clinical circumstances that pertain in busy hospitals.1 The European view cautions that “the advent of accurate automated devices, however welcome, is not without problems. . . Oscilometric techniques cannot measure blood pressure in all situations, particularly in patients with arrhythmias, such as rapid atrial fibrillation, but there are also individuals in whom these devices cannot measure blood pressure for reasons that are not always apparent.”2 There is also considerable concern about trusting algorithmic methods, which are so “zealously guarded by manufacturers” that they refuse to divulge how individual algorithms function.2

Two other relevant issues were raised in the British Medical Journal editorial but not in the American statement.1 First, there may be more to the conventional auscultatory technique than meets the eye; the Riva-Rocci/Korotkoff technique may possess “that mystique peculiar to the clinical relationship, which is sensed by doctors and nurses and appreciated by patients.” Could it be this, the editorial asks, that makes clinicians so unhappy at having to relinquish the acquired skill inherent in the Riva-Rocci/Korotkoff technique, which for all its inaccuracies may possess subtle virtues “important in establishing the rapport from which a successful clinical relationship between doctor and patient may develop.”12 This may or may not be the case, but it would seem reasonable for manufacturers of blood pressure measuring equipment to provide an electronic equivalent to the mercury column, so that the conventional auscultatory technique can live on. Indeed 3 such devices have been developed, though none has, as yet, been subjected to independent validation (Accusphyg, Accoson, and TNO, personal communications, 2001).

The other issue discussed in the British Medical Journal editorial is replacement of the millimeter of mercury as the unit of measurement with the kilopascal. This issue—though perhaps not as relevant in the USA, which has been slow to adopt Système International (SI) units—will have profound international implications and is therefore worthy of deliberation.15 If in the course of some short time, the mercury sphygmomanometer disappears, the mainstay of the medical argument for retaining the millimeter of mercury as a unit of measurement, namely, that we measure what we see, will also disappear. There is then no scientific (as distinct from a clinical) argument against its replacement with the kilopascal. This issue, which remains high on the scientific agenda, will come to the fore when the mercury sphygmomanometer goes. In fact, the debate might be said to have begun with MacGregor16 suggesting (with tongue in cheek, I suspect) that we should do away with both the millimeter of...
mercury and the kilopascal and return to the units used by the Reverend Stephen Hales over 250 years ago, inches (or centimeters) of blood.

In conclusion, Europe is preparing for changes in clinical sphygmomanometry. A number of European Union countries have banned mercury, and even those that will not resort to banning mercury, such as the UK, are advocating a policy of removing mercury sphygmomanometers from clinical medicine. The Medical Device Agency has stated: "Although at present no ban has been imposed on the use of medical devices containing mercury in the UK, it is recommended that consideration is given to the selection of mercury-free devices where appropriate." If mercury sphygmomanometers are to be phased out, then European and American opinion would be at one in insisting that they are replaced with devices that have been independently validated against the relevant protocols. Consideration should also be given to utilizing to the full the capabilities of contemporary technology by having automated devices provide blood pressures in both millimeters of mercury and kilopascals so that users become familiar with the latter units. Finally, the medical and nursing professions, which constitute the clinical market for the product, are concerned that this transition may create confusion in the minds of clinicians and their patients if implemented now. For the present, we suggest we focus our educational efforts on the major change in blood pressure measurement recommendations to clinicians.

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Response
The authors are grateful for the response from Prof O’Brien that represents the European viewpoint on this important issue of blood pressure measurement. We are particularly pleased to see so much common ground for our positions. Indeed, we agree on the common goal of improving “the accuracy of blood pressure measurement.”

Our major area of disagreement is in the timing of the transition from the current standard of the mercury manometer. We are not as convinced that new instruments are currently available that can replace the mercury manometer in accurate measurements of blood pressure. Prof O’Brien points out that there are available instruments that have passed current testing guidelines by the British Hypertension Society and the Association for the Advancement of Medical Instrumentation. However, it is our view that these current standards of validation are arbitrary and not based on sound evidence. Standards that ensure accuracy across a broad range of patients, blood pressures, and clinical situations are needed before widespread use. Again, we feel further research regarding validation of nonmercury instruments is needed before abandoning mercury manometers.

We are also concerned with timing of your call for a transition in measurement units from mm Hg to the kilopascal. We are concerned that this transition may create confusion in the minds of clinicians and their patients if implemented now. For the present, we suggest we focus our educational efforts on the important issue of systolic blood pressure control and focus our research efforts on validation of blood pressure instruments. We suggest getting these issues straight before suggesting another major change in blood pressure measurement recommendations to clinicians.

We look forward to seeing how our mutual efforts will resolve these difficult issues related to blood pressure measurement.

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