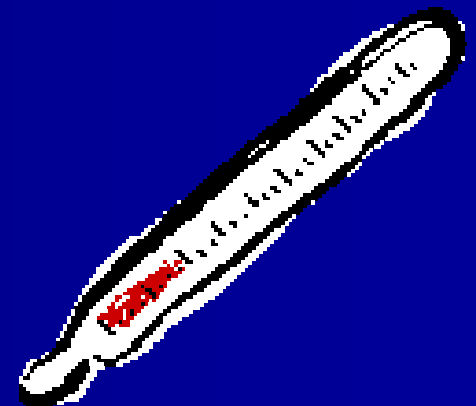
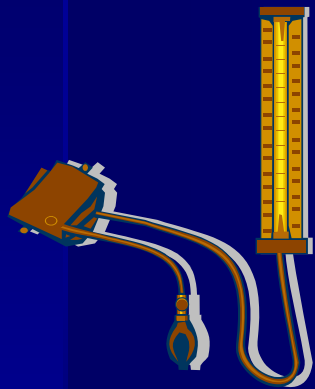


MERCURY

Alternative Medical Devices

**Primera Conferencia Latinoamericana
sobre la Eliminación del Mercurio en el
Cuidado de la Salud**

**Buenos Aires
3 de Agosto
2006**



**Peter Orris, MD, MPH, FACP, FACOEM
Professor & Associate Director**

SCHOOL OF PUBLIC HEALTH
people serving people

UIC University of Illinois
at Chicago



**Great Lakes Centers For
Environmental & Occupational Safety and Health
University of Illinois at Chicago
School of Public Health
World Health Organization Collaborating Center**



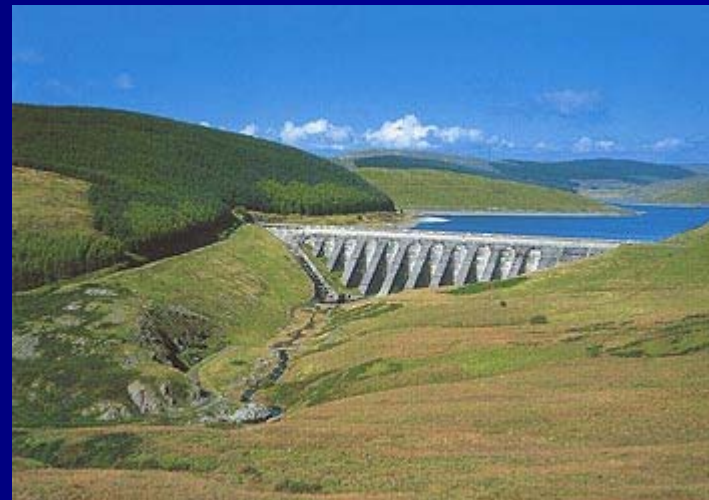
WORLD HEALTH ORGANIZATION

Mercury in Health Care

POLICY PAPER

August 2005

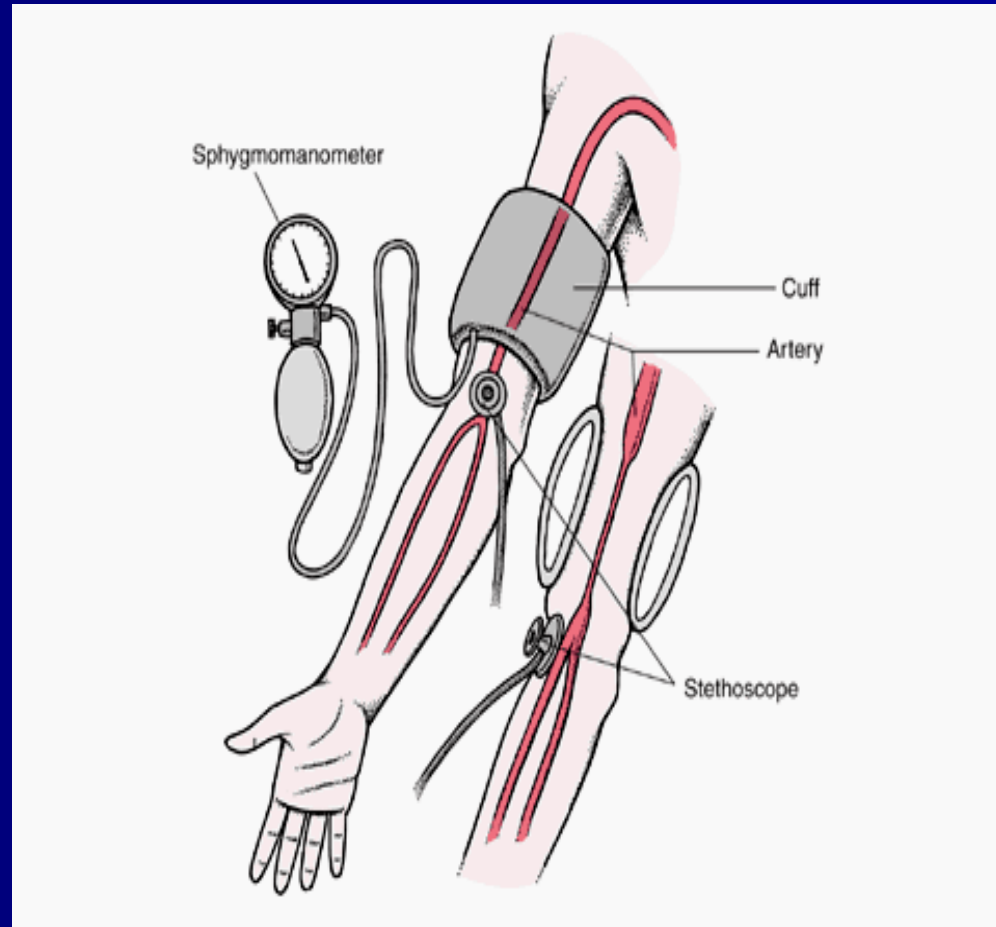
- **The largest amount of mercury is used in mercury sphygmomanometers (80 to 100g/unit)**
- **The largest mercury reservoir in the health-care setting.**



Recommendations for Blood Pressure Measurement in Humans

American Heart Association Council on
High Blood Pressure Research

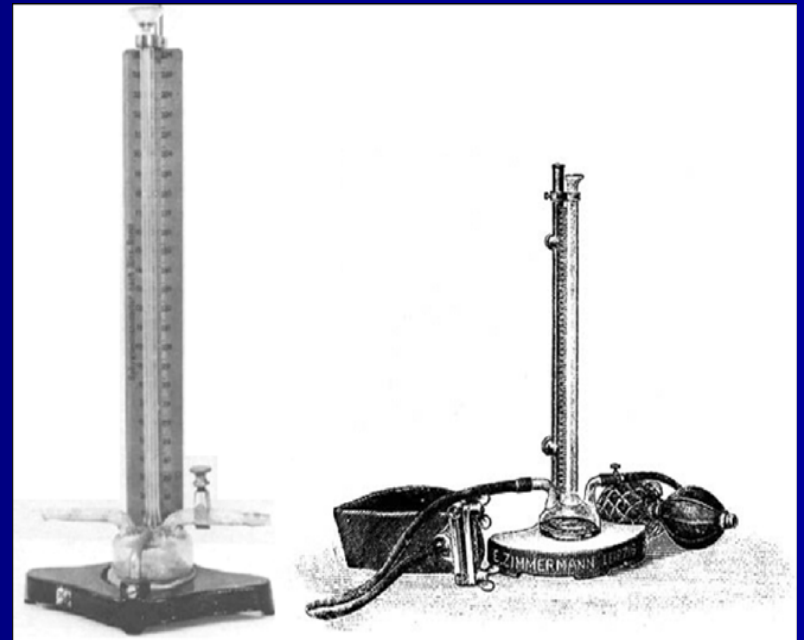
Accurate measurement of blood pressure is essential to classify individuals, to ascertain blood pressure related risk, and to guide management.



Recommendations for Blood Pressure Measurement in Humans

American Heart Association Council on High Blood Pressure Research

It is surprising that nearly 100 years after it was first discovered, and the subsequent recognition of its limited accuracy, the Korotkoff technique for measuring blood pressure has continued to be used without any substantial improvement.



Recommendations for Blood Pressure Measurement in Humans

American Heart Association Council on High Blood Pressure Research

The gold standard for clinical blood pressure measurement has always been readings taken by a trained health care provider using a mercury sphygmomanometer and the Korotkoff sound technique, but there is increasing evidence that this procedure may lead to the misclassification of large numbers of individuals as hypertensive and also to a failure to diagnose blood pressure that may be normal in the clinic setting but elevated at other times in some individuals.



The experiences of using mercury free blood pressure equipment in the Swedish health care sector.

by Kemi & Miljö AB for the Swedish Chemicals Inspectorate.
1992

Since 1992 thermometers and other measuring instruments containing mercury may not be commercially manufactured or sold in Sweden.

All heads of department of clinical physiology in Swedish hospitals were contacted and asked to report their experiences from the phase out of mercury in blood pressure equipment.



The experiences of using mercury free blood pressure equipment in the Swedish health care sector.

by Kemi & Miljö AB for the Swedish Chemicals Inspectorate.

The following experiences of using mercury free blood pressure equipment were found:

- There were only positive experiences reported from the phase out of mercury in the most wide spread equipment called sphygmomanometers, which today is complete.
- No negative medical, practical or economic experiences were found from the phase out of mercury containing sphygmomanometers.
- There are no problems in diagnosing any condition.



Are Aneroid Sphygmomanometers Accurate in Hospital and Clinic Settings?

Vincent J. Canzanello, MD; Patricia L. Jensen, RN; Gary L. Schwartz, MD

Background: The aneroid sphygmomanometer is commonly used for the indirect measurement of blood pressure despite significant concerns about its accuracy. Although the mercury sphygmomanometer is highly accurate, there are concerns about the environmental toxicity of mercury. In response to various external pressures to become essentially mercury free, the Mayo Clinic, Rochester, Minn, has replaced many mercury sphygmomanometers with aneroid devices. Since 1993, a maintenance protocol has been in place to ensure proper function and accuracy of these devices.

Conclusion: Aneroid sphygmomanometers provide accurate pressure measurements when a proper maintenance protocol is followed.

Arch Intern Med. 2001;161:729-731

Accuracy of aneroid sphygmomanometer blood pressure recording compared with digital and mercury measurements in **Brazil**

Gill G, Ala L, Gurgel R, Cuevas L.
Liverpool School of Tropical Medicine, UK.

- Digital, mercury and aneroid blood pressure measurements were carried out in 400 South American adults.
- There was slight under-reading of the aneroid instrument (hypertension prevalence 30%, compared with 32% for digital and mercury)
- Its robustness and simplicity makes it a suitable alternative to mercury machines in tropical field conditions.



How Well Do Clinic-Based Blood Pressure Measurements Agree with the Mercury Standard?

Jennifer W. Kim, et. al.

Duke University School of Medicine, Durham, NC, USA

RESULTS:

- Overall, clinic-based readings overestimated the mercury readings, with a mean overestimation of 8.3mmHg for SBP and 7.1mmHg for DBP.
- Based on the clinic-based measure, 21% of patients were misdiagnosed with uncontrolled hypertension.

CONCLUSIONS:

- Health professionals should be aware of this potential difference when utilizing clinic-based BP values for making treatment decisions and/or assessing quality of care.

Accuracy of the pressure scale of sphygmomanometers in clinical use within primary care

Andrew J. Coleman, Stephen D. Steel, Mark Ashworth,
Sarah L. Vowler and Andrew Shennan

- 45 general practices within Lambeth, Southwark and Lewisham.
- A total of 279 sphygmomanometers.
- Calibrated using an accurate electronic reference pressure sensor.



Accuracy of the pressure scale of sphygmomanometers in clinical use within primary care

Andrew J. Coleman, Stephen D. Steel, Mark Ashworth,
Sarah L. Vowler and Andrew Shennan

RESULTS:

- 17.9% (50 out of 279) of all surveyed devices gave errors exceeding the ± 3 mmHg threshold.
- 53.2% (33 out of 62) of aneroid devices were found to be reading in error by more than ± 3 mmHg compared with
- 7.8% (16 out of 217) of the combined population of mercury and automated devices.
- Significant differences in the performance of specific models of aneroid, mercury and automated devices were also identified.

CONCLUSION:

- A service model for improving the accuracy of blood pressure monitoring in primary care needs to take into account the current proliferation of pressure scale errors in these devices, the lack of uptake of regular checks and the poor quality of some of the devices currently in use.

Automated blood pressure measurement in routine clinical Practice

Martin G. Myers

University of Toronto, Toronto,
Ontario, Canada

Results:

- The mean initial automated reading (mmHg) taken with the observer present ($162 \pm 27/85 \pm 12$) was similar to the mean manual blood pressure taken in duplicate ($163 \pm 23/86 \pm 12$).
- Both values were higher ($P < 0.001$) than the mean of the next five readings taken with the automated recorder when the patient was resting quietly alone ($142 \pm 21/80 \pm 12$).
- Women exhibited a greater fall in blood pressure

Conclusions:

- Use of an automated blood pressure recorder can eliminate some of the white-coat effect associated with readings taken by a mercury sphygmomanometer.

Automated non-invasive blood pressure devices: are they suitable for use?

Andrew J. Sims, Julian A. Menes, Derek R. Bousfield, Christopher A. Reay and Alan Murray

Results:

- 86 companies were found to be actively involved in the supply of 158 different models of automated non-invasive blood pressure device.
- 54 devices for use on the arm and 62 for use on the wrist
- We received responses for 61% of the main category arm and wrist devices and 80% of these provided claims for CE marking.
- Inconsistencies were found between claims for diagnostic suitability and claims for clinical validation.

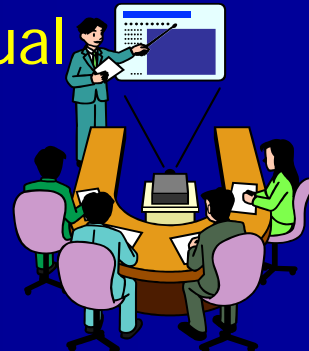
Conclusions:

- A majority of models available on the European Union market were not validated by clinical trial to one of the recognized protocols

Recommendations for Blood Pressure Measurement in Humans

American Heart Association Council on High Blood Pressure Research

- The use of mercury is declining, and alternatives are needed.
- Aneroid devices are suitable, but they require frequent calibration.
- Hybrid devices that use electronic transducers instead of mercury have promise.
- The oscillometric method can be used for office measurement,
- Only devices independently validated according to standard protocols should be used, and individual calibration is recommended.



Recommendations for Blood Pressure Measurement in Humans

American Heart Association Council on
High Blood Pressure Research

Summary and Recommendations:

That regulatory agencies should establish standards to ensure the use of validated devices, routine calibration of equipment, and the training and retraining of manual observers.

DETAILED STUDY OF NON-MERCURY ALTERNATIVES AS AN ENVIRONMENTAL ATTRIBUTE

U.S. Army Corps of Engineers Baltimore District
January 2005

TABLE 4-3: SUMMARY OF MERCURY ALTERNATIVES

Product Category and Type	Alternatives Available	Cost and Technical Comparison
MEDICAL PRODUCTS		
Sphygmomanometers (blood pressure monitors)	Aneroid (mechanical dial) sphygmomanometer	Cost: \$50-\$80 for wall model (adult) and \$30-\$35 for portable model (adult), compared with \$60-\$70 for standard mercury sphygmomanometer. Accuracy comparable to mercury. Requires
	Electronic sphygmomanometer	Cost: approximately \$2,000. Accuracy comparable to mercury. Commonly used where long-term continuous monitoring is needed, such as intensive care.



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Validated Blood Pressure Monitors List

Latest News

INDEX

[Automatic Digital Blood Pressure Devices](#)

(for Clinical use and also suitable for home/self assessment)

[Automated Blood Pressure Devices](#)

(for Clinical use)

[Aneroid Sphygmomanometers](#)

(for Clinical use)

[Ambulatory Blood Pressure Monitors](#)

- Oscillometric mode

[Ambulatory Blood Pressure Monitors](#)

- Auscultatory mode

[Manual Blood Pressure Devices](#)

(for Clinical use)

[Blood Pressure Devices For Use In Special Cases](#)

(eg. Pregnancy)

[Devices of Questionable Validity](#)

[Archive of discontinued blood pressure monitors](#)

Statement to Manufacturers

If manufacturers have published evidence in the literature of their blood pressure devices having passed the BHS protocol or International protocol, and the device is not listed on our site and you would like it to be, please contact us at ;

BHS Information Service:

Jackie Howarth

BHS Administrative Officer
Clinical Sciences Building, Level 5, Leicester Royal Infirmary,
PO Box 65, Leicester, LE2 7LX
Tel: 07717 467 973

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- Both mercury and aneroid sphygmomanometers have been in use for about 100 years, and when working properly, either gives accurate results.
- Aneroid sphygmomanometers provide accurate pressure measurements when a proper maintenance protocol is followed.





WORLD HEALTH ORGANIZATION

Mercury in Health Care

August 2005

POLICY PAPER

- It is important to recognize that no matter what type of blood pressure measurement device is used both aneroid and mercury sphygmomanometers must be checked regularly in order to avoid errors in blood pressure measurement and consequently the diagnosis and treatment of hypertension.

