

Guide for
ELIMINATING MERCURY
from **Health Care**
Establishments



Toward a Health Care Sector that Promotes Healthy Environments for All

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About the Mercury-Free Health Care GLOBAL Initiative

The WHO-HCWH Global Initiative is a component of the UNEP Mercury Products Partnership, which is led by the United States Environmental Protection Agency.

The Objective of the WHO-HCWH Global Initiative to Substitute Mercury-Based Medical devices is to:

By 2017, phase out the demand for mercury-containing fever thermo-meters and sphygmomanometers by at least 70% and to shift

the production of all mercury-containing fever thermometers and sphygmomanometers to accurate, affordable, and safer non-mercury alternatives.

Short-term Objective #7 of the Initiative sets out to: Develop and globally distribute a training module focused on substituting mercury-based medical devices. This Guide sets out to meet that objective.

www.mercuryfreehealthcare.org

INTRODUCTION

Health Care Without Harm is an international coalition of more than 440 members in 52 countries that works to transform the health care sector so that it is no longer a source of harm to human health and the environment.

We collaborate with doctors, nurses, hospitals, health care systems, professional associations, NGOs, governments and international organizations to promote the development and implementation of safe and environmentally healthy practices, processes and products in the health care sector.

HCWH's areas of work include sustainable health care waste management, green building, reducing health care's climate footprint, and the substitution of hazardous chemicals used in hospitals with safer alternatives.

In this context, Health Care Without Harm has worked for more than a decade on every continent to substitute mercury-based medical devices with safer, accurate and affordable alternatives.

Together with the World Health Organization, we are leading a Global Initiative to substitute mercury-containing thermometers and blood pressure devices with safe, accurate and affordable alternatives by at least 70% around the world by 2017. (For more information, visit www.mercuryfreehealthcare.org)

To date, this effort has yielded significant success. In the United States today, it is virtually impossible to purchase a mercury thermometer, while 30 percent of the population lives in states where mercury blood pressure devices (sphygmomanometers) are either banned or severely restricted. In Europe the EU has banned mercury thermometers and is considering similar restrictions for sphygmomanometers.

Similar policies are emerging in dozens of developing countries. Argentina and the Philippines are both implementing national policies to substitute mercury-based medical devices. The public health systems of several mega-cities, including Delhi, India and Mexico City are making the switch. State or Provincial-run health care systems such as Sao Paulo and Santa Catarina in Brazil, and Kwa Zulu Natal in South Africa are phasing out mercury-based medical devices. Hospitals and health systems in countries ranging from Chile to Nepal to Thailand to Tanzania are piloting mercury-free health care.

(see: http://www.noharm.org/lib/downloads/mercury/Toward_the_Tipping_Point.pdf)

In order for mercury elimination to be sustained over time and expanded to ever more health care establishments, Health Care Without Harm has created this guide to be used as a simple, useful tool for implementing mercury-elimination programs in hospitals.

The order of the steps in this guide is merely for the purposes of orientation. Each hospital can begin the process at whichever step they find most convenient and of course adapt each step to fit their reality or specific circumstances.

The guide comes with materials that can be used as models, adapted, modified or employed however the hospital group sees fit. Most materials come in print version, and all can be found online and/or on the CD or data key sometimes included with the guide.



By substituting mercury in the health care sector

with **ACCURATE, AFFORDABLE and SAFE ALTERNATIVES**, we can:

- 1** Reduce mercury emissions from health care by progressively replacing its use.
- 2** Promote health care sector leadership in the global reduction of mercury emissions.
- 3** Promote the adoption of healthy public policies with regard to mercury.



5 STEPS for ELIMINATING MERCURY from the HEALTH CARE SETTING

In order to implement the replacement of mercury-containing supplies and equipment in hospitals, we have found that the following steps are useful for optimizing resources, systematizing and documenting the experience and enabling the process to be replicated in other, similar establishments.

1 CREATE A MERCURY-ELIMINATION TASK FORCE



Bring together the key stakeholders in the hospital community

Since mercury is found in so many different areas of a hospital, it requires the effort of a task force to take charge of and guarantee its effective elimination.

The group must have the support of hospital management and should consist of representatives from various units of the hospital, including: nurses, administration, purchasing, waste, hygiene and safety, maintenance medical and dental areas.

2

Have hospital management sign a Pledge or Letter of Commitment to PHASE-OUT MERCURY



Signing a pledge, letter, statement or broad policy directive is a way a health care establishment can express its commitment to mercury elimination. This is an important step because, even though it may not be legally binding, a pledge or other similar act reflects the hospital's commitment and provides the necessary backing to the hospital staff who carry out the activities that mercury elimination entails.

In this regard, such a pledge should guarantee the means for implementing the replacement of mercury-containing supplies and devices.

Materials Provided

- (1) Model Letter of Commitment
-

3

CONDUCT A MERCURY INVENTORY



Conduct a situation assessment and inventory of equipment, instruments and waste products that contain mercury.

This step describes the procedures and measures to identify materials that contain mercury, to quantify them and to determine their location in the hospital.

This step also aims to assess the mercury situation in the hospital at the time of project implementation. This not only entails finding out where and how much mercury there is, but how spills are handled, and where mercury waste is disposed of. The more precise the information in this stage, the more accurate training and implementation actions will be in the future.



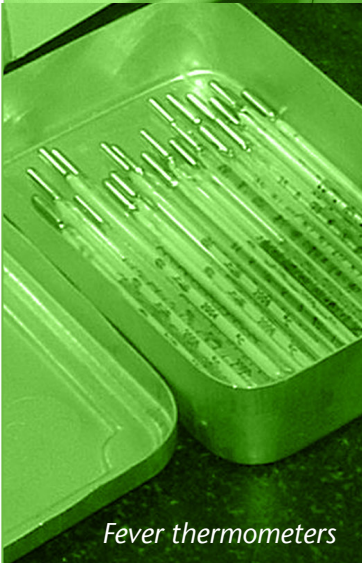
Mercury sphygmomanometers

Conducting an inventory allows for an assessment of the initial mercury situation in the hospital (prior to starting the actual program) in order to identify and quantify medical devices, chemical reagents, electrical parts, dental amalgams and other sources of mercury in the hospital.

As part of the inventory, a data base should be established quantifying the amount of mercury identified, the instruments that contain it and the areas where it is found; all devices in the institution that contain this toxic metal should be labeled (thermometers, sphygmomanometers, dental amalgam, fluorescent tubes, energy-saving bulbs, antiseptics, vaccines, switches, thermostats, etc.).

A detailed account of the quantities of mercury-containing supplies or instruments in use, in stock, in repair, in storage as obsolete equipment, should be compiled, and segmented by area or sector of the hospital. Any waste products containing mercury that are stored inside the hospital should also be accounted for.

A detailed account of mercury-containing supplies or instruments should be compiled



Fever thermometers

All areas of the hospital should be surveyed, including those where the instruments are used directly, as well as those for repairs or storage of obsolete equipment.

This stage should also inventory existing programs, standards for procedure and practices currently in place for handling supplies that contain mercury (cleanup of small spills, segregation and storage within the hospital, purchasing policy, training of personnel, etc.).

In the case of thermometers, which break easily and are routinely replaced, it is important to ascertain the number purchased per month and/or per year. This information will provide an important complement to the "snapshot" provided by the inventory.

To assess how waste is handled, a survey such as the one attached can be provided to personnel. Alternatively, key sectors can be interviewed to determine how each case is handled.

Materials Provided

- (1) Tool for eliminating mercury in the health care establishment
- (2) Table listing hospital devices that contain mercury
- (3) Inventory sheet for items that contain mercury in health care establishments
- (4) Model Questionnaire to account for number of thermometers and blood pressure monitors
- (5) Survey on current handling of mercury
- (6) Risk Perception Survey



Esophageal Dilators

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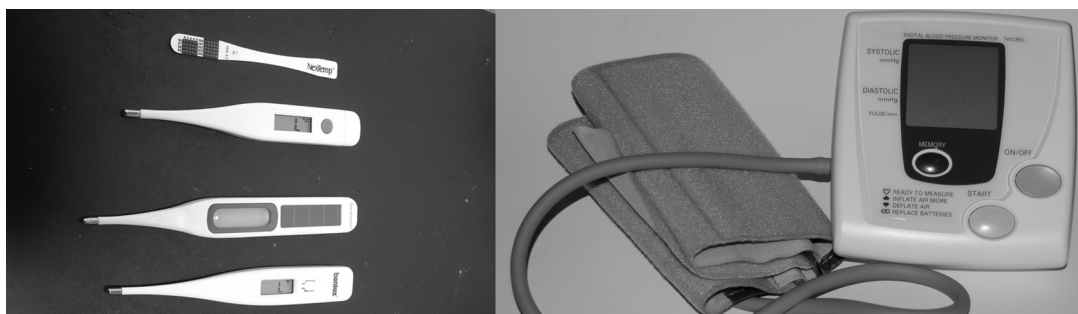
DEVELOP A MERCURY-SUBSTITUTION PROGRAM



Establish a multi-pronged program for eliminating mercury in the hospital or health care establishment

Once the inventory and prior situation analysis have been carried out, this program will allow the health care facility to begin the process of substitution. To move forward, we suggest the following key steps.

- 1 Replace thermometers and blood pressure devices with safe, accurate, affordable alternatives and adopt a mercury-free purchasing policy.



TECHNICAL CONSIDERATIONS

Adhere to Technical Specifications:

Adhere to HCWH recommendations on technical specifications for digital thermometers and blood pressure devices in order to procure quality supplies.

Battery Supply:

In order to keep digital thermometers functioning, there must be a guarantee of battery supply in due time and manner. Batteries should preferably be mercury-free (note: the amount of mercury in a button cell battery used to power a digital thermometer is significantly smaller than the amount of mercury found in a mercury thermometer).

OTHER TECHNICAL CONSIDERATIONS

Disposable digital thermometers are not recommended. It is important to follow the instructions provided by each manufacturer to guarantee the useful life of the instrument. The hospital should standardize and publish the procedure for the correct use of digital thermometers.

(Note: the World Health Organization is currently in the process of developing guidelines for the selection of non-mercury devices. The HCWH recommendations in the Step Four Annex mirror early drafts of those guidelines, and while not endorsed by WHO, can serve as interim guidance for hospitals and health systems).

ECONOMIC CONSIDERATIONS

Conduct a Cost Comparison: In most countries, hospitals are saving money over time by substituting mercury thermometers and sphygmomanometers.

To do a proper cost comparison between mercury-containing devices and the alternatives, keep in mind the initial cost of Hg-free thermometers and blood pressure monitors vs. the ongoing cost of replacing mercury thermometers, which break regularly. The cost of the calibration of different types of blood pressure devices and mercury spill clean-up costs should also be taken into account.

Other factors to be considered are the final, safe disposal of mercury as a hazardous waste, the environmental consequences from the metal's emissions and health impacts.

CREATE A PURCHASING POLICY

To institutionalize the switch to mercury-free devices, a policy should be created to stipulate that only mercury-free devices should be purchased. The policy should stipulate the technical specifications of these devices.

Supplies with mercury should be excluded from purchase catalogs, while mercury-free supplies and equipment should be included in purchase catalogs. Providers should be informed of the purchasing policy. A market analysis and assessment should be done, identifying local suppliers and/or importers of the mercury-free alternatives.

OTHER CONSIDERATIONS

Patients and Mercury Thermometers:

Where it exists, discontinue the practice of sending mercury thermometers home with families who have newborn babies or any other patients.

Other Mercury-Containing Devices:

After replacing clinical thermometers and blood pressure devices, it is recommended that a health care facility undertake an analysis and set a timeline for progressive replacement of remaining mercury-containing supplies and instruments. For instance:

- Label all devices in the institution that contain mercury (switches, thermostats, etc.) and create a plan to replace them with mercury-free alternatives.
- Identify medicines that contain mercury and include them in the schedule for replacement and/or labeling.
- Whenever possible, identify cleaning products that contain mercury.

Materials Provided

(1) List of alternative, mercury-free devices

(2) Recommended specifications for digital thermometers for medical/clinical use for taking body temperature, and for sphygmomanometers

(3) Comparison chart. Cost-Benefit ratio between mercury and digital thermometers. São Luis Hospital, San Pablo, Brazil

(4) Cost comparison chart for mercury vs. digital thermometers. Posadas Hospital, Buenos Aires, Argentina

(5) Instructions for cleaning digital thermometers and list of mercury-free thermometers used for taking body temperature

(6) NOTES ON SELECTING MERCURY REDUCTION ACTIVITIES <http://www.gefmedwaste.org/downloads/NOTES%20on%20Selecting%20Mercury%20Reduction%20Activities.pdf>

2 Establish Mercury Waste Management and Storage Program.

A policy and program to manage, segregate and store mercury waste should be developed and implemented as mercury-based medical devices are being substituted in a hospital.

In low-income settings, it may not be possible to obtain mercury decontaminant solutions or adopt a comprehensive approach to clean-up and storage, but some effort is better than no effort at all.

Facilities should implement a phased plan to upgrade mercury management. This plan should begin with awareness-raising and policies to prevent dumping of mercury from broken sphygmomanometers and thermometers in domestic waste. This should be followed by simplified procedures that recover as much spilled mercury as possible while minimizing exposure of health workers and patients. Temporary storage arrangements should be developed that take into consideration worker health and safety. Priority should be given to aspects of the plan that have the most impact.

The features of this plan should include:

STORAGE

- The hospital should provide an adequate physical space for transitional storage of mercury waste produced by the establishment.
- The hospital should create and make known the standard procedure to follow for appropriate storage.
- Adequate final disposal or treatment of the waste should be promoted, avoiding incineration of the waste.
- A selective battery collection program should be put into practice so that batteries are treated and disposed of properly.
- HCWH strongly recommends against the recycling, importing and/or exporting of mercury, as well as the manufacture of instruments that contain it.

SPILLS

As a hospital transitions away from mercury, the facility should be prepared to manage spills in any area of the hospital where mercury-containing devices are used. Each health care facility should develop its own procedures to clean up spills according to what is practical and available while maximizing protection for patients and health workers.

The institution of proper procedures and staff training, along with the deployment of mercury spill kits can prepare a facility for mercury spill management. Although mercury spill kits are commercially available, a spill kit can be made by putting together a number of inexpensive items and storing them in a marked box or portable container.



Materials Provided

(1) Transitional storage of mercury waste:
A Basic Overview

(2) Clean Up of Mercury Spills:
A Basic Overview

(3) Guidance on the Cleanup, Temporary or Intermediate Storage, and Transport of Mercury Waste from Health Care Facilities—
Issued by the UNDP-GEF Global Health Care Waste Project.

<http://www.gefmedwaste.org/downloads/Guidance%20on%20Cleanup%20Storage%20and%20Transport%20of%20Mercury%20from%20Health%20Care%20July%202010.pdf>

3 Training and Education

Plan for ongoing training of health care personnel and awareness-raising and information for the community. Surveys on perceived mercury-risk can be carried out with all hospital personnel to identify training needs and define the contents for training sessions.

Emphasis can be given to broadening knowledge about the toxicity of mercury, its impact on health and the environment, the correct way to handle small spills, segregation and transitional storage of mercury waste.

Materials Provided

- (1) World Health Organization Policy
 - (2) Frequently asked questions and aspects to keep in mind
 - (3) Information sheet, Fluorescent Lights
 - (4) HCWH position on the use of Thimerosal in vaccines
 - (5) PPT Presentation of materials for training, workshops, etc., (digital version only)
 - (6) Video on Mercury Vapors (digital version only)
 - (7) Pediatric exposure to mercury (digital version only)
 - (8) Toward the Tipping Point: WHO-HCWH Global Initiative to substitute Mercury-Based Medical Devices in Health Care (digital version only)
 - (9) Global movement for mercury-free health care (digital version only)
 - (10) Video on The Dangers of Mercury (digital version only)
-



5

POST IMPLEMENTATION EVALUATION



Re-evaluate hospital plans and document progress towards eliminating mercury, identify obstacles, share experiences with other health care establishments.

An annual evaluation should be carried out to show the results from the first stage of the program and allow for new adjustments and changes based on the data collected. Periodic monitoring should be established according to individual hospital criteria.

FINAL Considerations

As more and more health care facilities substitute mercury-based medical devices for accurate, safe and affordable alternatives, the health sector is playing a leadership role in addressing this important global environmental health problem.

In order to insure that the success of one hospital helps move mercury substitution and efforts for a more sustainable health sector forward more broadly, health professionals, hospitals and health care systems should consider the following actions:

- 1 Promote public policies-- at the state/provincial, national & international levels-- for eliminating mercury in the health care sector and in general.
- 2 Work to eliminate the incineration of all waste generated by health care establishments.
- 3 Prohibit the donation and/or acceptance of supplies that contain mercury, as well as their importation and exportation.
- 4 Address other environmental health issues related to the health sector, including sustainable health care waste management, climate adaptation and mitigation, chemical substitution, green buildings.



This booklet is available online at www.noharm.org/lib/downloads/mercuryguide.pdf

This Guide was originally developed by Health Care Without Harm Latin America (Salud sin Daño).

HCWH wishes to acknowledge the following individuals for their participation in the development of this guide: Maria Sol Aliano, Maria della Rodolfa, Faye Ferrer, Silvia Ferrer, Jorge Emmanuel, Jamie Harvie, Josh Karliner, & Veronica Odriozola

Guide for
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Establishments

A N N E X E S

2 MODEL LETTER OF COMMITMENT

Toward mercury-free healthcare. Commitment to the elimination of mercury and items that contain it.

Whereas:

Hospitals and health centers are an important source of mercury emissions into the environment, and this sector can do something to address this.

Elemental mercury and mercury compounds are hazardous to human health and the environment;

The mercury used in hospitals is a potential source of exposure for patients, personnel and the general population;

The World Health Organization’s policy on mercury in the healthcare sector states that plans must be put in place for short-term reduction in the use of mercury-containing equipment and its replacement with safer alternatives;

The Hospital in the city of, as a healthcare institution committed to ensuring the health of its patients, personnel and the community, hereby adopts this commitment to progressively reduce and ultimately eliminate the use of products that contain mercury.

Specifically, the hospital agrees to carry out the following measures to make this institution a model of environmental responsibility by replacing mercury and devices that contain it.

- [1] Carry out a mercury audit to identify uses and sources in our institution.
- [2] Investigate and identify the devices and products that can be immediately replaced with mercury-free alternatives.
- [3] Cease purchasing mercury-containing equipment if non-harmful alternatives exist. Develop and implement a “Mercury-Free Purchasing Policy” and let suppliers know about the new policy in order to work together to procure mercury-free alternatives.
- [4] Replace equipment and products that contain mercury with safe equipment whenever possible.
- [5] Develop and implement a segregation program for mercury waste as mercury substitution is implemented (in cases where there are still no alternatives available the program should seek adequate final disposal, avoiding incineration).
- [6] Inform hospital staff about the health and environmental consequences of mercury use in the healthcare sector. Inform the public about our concern for the environment and community health, and about the measures taken to eliminate the mercury we release into the environment.
- [7] Do a cost assessment of a “Mercury Management Program,” including the costs associated with proper cleanup of spills, hygiene and safety, collection and treatment of mercury waste.
- [8] Support policy and legislative initiatives carried out to establish mandatory standards of progressive reduction in the use of mercury by the healthcare sector.

This commitment reflects our interest in reducing the use of mercury and mercury emissions into the environment.

In the city of

.....
(date)

Dr.....
Director
..... Hospital

3

TOOL FOR ELIMINATING MERCURY IN A HEALTH CARE ESTABLISHMENT

Once your establishment has made a commitment to eliminating mercury, it is important to begin the process of taking inventory of items and equipment that contain mercury. We suggest following the steps included in the "Guide for Eliminating Mercury from Healthcare Establishments," starting with replacing the products and equipment that have readily available alternatives and that are most widely used in the establishment. It is for this reason that we recommend that you begin by replacing thermometers, sphygmomanometers and gastrointestinal tubes that contain mercury.

The following is a list of products and equipment that usually contain mercury in healthcare establishments. Although the list is not exhaustive, it contains the principal items that contain mercury in healthcare establishments.

THERMOMETERS

Body temperature thermometers
 Clerget sugar test thermometers
 Heating and cooling system thermometers
 Incubator thermometers
 Water bath thermometers
 Minimum/maximum thermometers
 Armored thermometers

SPHYGMOMANOMETERS

Gastrointestinal catheters or tubes
 Cantor catheters or tubes
 Esophageal dilators (bougie tubes)
 Feeding catheters or tubes
 Miller-Abbot tubes

DENTAL AMALGAM

BATTERIES IN MEDICAL DEVICES

Alarms
 Blood analyzers
 Defibrillators
 Hearing aids
 Meters
 Monitors
 Pacemakers
 Pumps
 Scales
 Telemetry transmitters
 Ultrasound
 Ventilators

BATTERIES IN NON-MEDICAL DEVICES

LAMPS

Fluorescent
 Germicidal
 High-pressure sodium, mercury vapor
 Ultraviolet

THERMOSTATS (NON-DIGITAL)

THERMOSTAT PROBES IN ELECTRICAL EQUIPMENT

PRESSURE GAUGES

Barometers
 Manometers
 Vacuum gauges

CHEMICAL AND PHARMACEUTICAL PRODUCTS THAT MAY CONTAIN TRACES OF MERCURY AS A CONTAMINANT OR AS AN ADDITIVE:

- Contact lens solutions and other ophthalmic products containing thimerosal or phenylmercuric nitrate
- Diuretics with mersalyl and mercury salts
- Early pregnancy test kits containing mercury preservatives
- Merbromin/water solution
- Nasal spray with thimerosal, phenylmercuric acetate or phenylmercuric nitrate
- Vaccines with thimerosal (mainly haemophilus, hepatitis, rabies, tetanus, influenza, diphtheria and pertussis vaccines)

CLEANERS AND DEGREASERS W/ CAUSTIC SODA OR CHLORINE CONTAMINATED WITH MERCURY

Acetic acid	Hematology reagents
Antibody test kits	Hormones
Antigens	Immunoelectrophoresis reagents
Antiserum	Negative control kits
Buffer solutions	Phenobarbital reagent
Calibration kits	Phenytoin reagent
Calibrators	Positive control kits
Diluents	Potassium hydroxide
Enzyme Immunoassay kits	Rabbit serum
Enzyme tracers	Shingella bacteria
Ethanol	Sodium hypochlorite
Extraction enzymes	Urine analysis reagents
Fixatives (B5, Zenker's)	Wash solutions

3 MERCURY IN HOSPITAL DEVICES

How much mercury is there in hospital equipment?

Many hospitals ask this question so as to prioritize the mercury-reduction efforts and also to be able to understand the potential for mercury release in the event of a spill.

The following table shows an estimate of mercury content. Variations may exist by model and manufacturer.

Table 1.
Mercury in Medical Devices
Compiled by Bill Ravanese of Health Care Without Harm

Medical Device	Approximate amount of mercury
Clinical thermometers	0.5 - 1.5 g
Lab thermometers	3.0 - 4.0 g
Portable and wall-mounted blood pressure units (sphygmomanometers)	110 - 200 g
Maloney or Hurst bougies (esophageal dilators) ^{1,2}	One tube may contain up to 1361 g of mercury
Cantor tubes ¹	54 - 136 g
Miller-Abbott tubes ¹	136 g
Dennis tubes ¹	136 g
Foley catheter ¹	68 g

1. Information from the Medical Device Reporting System (MDR) of the US Food and Drug Administration (FDA). MDRs are reports of life-threatening medical device failures.

2. Maloney or Hurst bougies are approximately 75 cm long with diameters ranging from 0.5-2 cm. They are commonly found in operating rooms, gastrointestinal labs and endoscopy departments.

Table 2.
Mercury in Building Products
Compiled by Todd Dresser of Burlington, Massachusetts Health Board, USA

Building Product	Approximate amount of mercury
Fluorescent light bulbs	10 - 50 mg per tube, depending on size and model
High intensity discharge lamps	10 - 250 mg
Thermostats	3 g per switch (some units as many as 6 switches)
Mercury switches including mechanical /tilt switches, contact switches	3.5 g per switch
Flow meters	Frequently around 5 Kg
Flame sensors	3 g
Gas regulators and meters	Old gas meters contain approximately 2 - 4 g mercury

3

MODEL QUESTIONNAIRE

SURVEY OF NUMBER OF THERMOMETERS, BLOOD PRESSURE MONITORS

General Information:

Name of Establishment:

Person in charge of survey:

Date:

A. How many mercury thermometers are there in your establishment (counting those in use and any in stock)?

With mercury:

In use: In Stock:

To be discarded:

Do you use non-mercury thermometers?
How many?

Digital (compact electronic) thermometers:

Electronic thermometers:

Tympanic infrared thermometers:

Temporal artery infrared thermometers:

Galinstan thermometers:

Phase-change (dot matrix) thermometers:

Liquid crystal(thermochromic) thermometers:

Others:

Can you indicate how many mercury thermometers you have acquired in recent years?

2006: 2007:

2008: 2009:

2010:

How many mercury sphygmomanometers are there in your establishment (counting those in use and any in stock)?

In use: In Stock:

To be discarded:

Do you use non-mercury sphygmomanometers?

How many?

What type?

Aneroid (mechanical dial) sphygmomanometer:

Aneroid (digital readout) sphygmomanometer:

Oscillometric sphygmomanometer:

If you use mercury sphygmomanometers, can you indicate how many you have acquired in recent years?

2006: 2007:

2008: 2009:

2010:

Does your establishment have a published, updated and well-known procedure for cleaning up mercury spills? Yes | No

B. Mercury Column Sphygmomanometers in need of maintenance, repair or evaluation for retirement are handled by a specific area: Yes | No

Amount of mercury used by maintenance department for repair per year:

Amount:

Does the maintenance department comply with minimum safety conditions⁽¹⁾ for maintenance of mercury sphygmomanometers? Yes | No

⁽¹⁾ Minimum safety conditions are understood to mean environmental and personal protection measures, as specified in the written protocol and understood by operators and those trained in protection measures.

3 QUESTIONNAIRE ON HANDLING OF MERCURY INSIDE THE ESTABLISHMENT

HANDLING OF SMALL MERCURY SPILLS

- 1) If a mercury thermometer breaks
 In this event you: Yes No
- a) Open the windows for ventilation
- b) Evacuate the area
- c) Don't do anything

- 2) Do you tell anyone about the broken thermometer? Yes No
- Cleaning personnel
- Section chief
- A colleague
- I don't tell anyone

If you do try to resolve the problem, do you take any of the following steps? Please mark how you proceed with an x.

- 3) You pick up the broken glass and discard it in:
- a. The sharps container
- b. The bag for infectious waste
- c. Common trash
- d. Down the drain
- e. Others. Please explain.

- 4) Mercury is spilled on the floor. In this situation you:
- a. Sweep it up
- b. Vacuum it up
- c. Wipe it up with paper
- d. Leave it as is
- e. Others. Please explain.

IF YOU DID NOT CHOOSE OPTION D), ANSWER THE FOLLOWING

- 5) Where do you dispose of the mercury?
- a. The sharps container
- b. The bag for infectious waste
- c. The common trash container
- d. Wash or flush it down the drain
- e. Others. Please explain.

Thank you very much for responding. If you'd like to add anything or expand on any issue, feel free to do so below.

RISK PERCEPTION SURVEY

What do you know about mercury?

Do you know which supplies used in your hospital or healthcare establishment contain mercury? Please name them.

Are you aware of the toxic effects of mercury on health? Yes | No

If you answered Yes, please describe them briefly.

How much mercury does a thermometer contain approximately?

- a) 1 gram b) 10 grams c) 20 grams

How many mercury thermometers are there in your sector or area of service?

How many thermometers break per day in your area of service?

What do you do when a thermometer breaks?

- a) Leave it on the floor.
- b) Sweep it up and discards the remnants in the black bag.
- c) Put it down the drain.
- d) Others: please describe

4

LIST OF ALTERNATIVE, MERCURY-FREE DEVICES

CONTAINS MERCURY	ALTERNATIVE
Thermometers	Mainly digital or electronic
Blood pressure monitors	Mainly aneroid (mechanical dial or digital)
Thermostats	Electronic
Fluorescent tubes	Bulbs with low Hg content
Batteries	Mercury-free/rechargeable batteries
Amalgam dental fillings	Glass ionomer/composite/resin fillings
Manometers	Electronic
Gastrointestinal tubes	Tubes w/ tungsten weights

HCWH recommended basic specifications for mercury free fever thermometers and blood pressure devices (sphygmomanometers).

FEVER THERMOMETERS

- Approved by the office in charge of the matter in each country.
- Battery preferably mercury-free. With useful life guarantee of 200 hours continuous functioning⁽¹⁾.
- Maximum error permissible: +/- 0.15 °C between 32°C and 42°C. Guarantee must be provided that thermometers are acquired from manufacturers who abide by internationally recognized independently certified testing techniques and protocols in order to provide a product that offers the required accuracy.
- Digital clinical thermometers should conform with European Standard EN12470-3:2000+A1:2009 and/or international standard ASTM E1112-00.
- Phase change (or so-called dot matrix) thermometers should conform with ASTM E825-98.
- Tympanic infrared (ear) thermometers should conform with European Standard EN 12470-5:2003 and/or ASTM E1865-98 (reapproved 2009).

- Temporal artery infrared thermometers should conform with ASTM E1865-98 (reapproved 2009).
- One-year guarantee from the day of purchase.
- Preferably not disposable.
- Protective sheath or hard case.
- Automatic shut-off.
- Resistant to use of disinfectants available in healthcare establishments.

- (1) Specify battery features used by thermometers, with documentation attached as proof.
- (2) If there is an equivalent certification system in your country, its seal should be a mandatory guarantee of quality and calibration.

SPHYGMOMANOMETERS

- Approved by the office in charge of the matter in each country.
- The protocols of the Association for the Advancement of Medical Instrumentation (AAMI) and the British Hypertension Society are the most widely accepted. Devices that have passed this or similar tests should be used in practice.
- The European Society of Hypertension Working Group on Blood Pressure Monitoring has developed an International Protocol that is easier to perform. The recommendations include lists of recommended aneroid sphygmomanometers, automated blood pressure devices for clinical use in hospitals, oscillatory automated blood pressure devices, oscillatory automated blood pressure devices for self-measurement at the upper arm and at the wrist, and ambulatory blood pressure monitoring devices that have been validated using the AAMI and BHS protocols.
- Non-automated non-invasive sphygmomanometers using an aneroid manometer should conform with international standard ANSI/AAMI/ISO 81060-1:2007.
- Automated non-invasive (medical electrical) sphygmomanometers should conform with international standards ANSI/AAMI/ISO 81060-2:2009 and ANSI/AAMI/EC 80601-2-30:2009.

4

COMPARISON CHARTS

COMPARISON CHART: COST-BENEFIT RATIO BETWEEN MERCURY AND DIGITAL THERMOMETERS São Luis Hospital, San Pablo, Brazil

Figures in U.S. \$ converted from Brazilian Reais.

DIGITAL DEVICES					
	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
Initial investment	9,412				
Annual maintenance	2,630	3,892	3,892	3,892	3,892
Total cost adjusted 12% for inflation	12,040	17,381	23,360	30,054	37,560
MERCURY DEVICES					
Annual maintenance	5,923	5,923	5,923	5,923	5,923
Total cost adjusted 12% for inflation	5,923	12,559	19,991	28,314	37,637
NET DIFFERENCE	6,125	4,829	3,377	1,751	69
ANNUAL SAVINGS after Year 5					\$2,031

COST COMPARISON CHART FOR MERCURY THERMOMETERS VS. DIGITAL THERMOMETERS Posadas Hospital, Buenos Aires, Argentina

Costs of Mercury vs. Digital Thermometers
The experience of Posadas Hospital,
Buenos Aires, Argentina

APRIL - JUNE 2006
Before Mercury Replacement

	Total Thermometers	Cost Per Unit in US\$ equivalent	TOTAL COST
Mercury Thermometers	3152	\$1.33	\$4,192
Digital Thermometers	0	\$4.00	0
TOTAL	3152		\$4,192

APRIL - JUNE 2007
As Digital Thermometers are Introduced

	Total Thermometers	Cost Per Unit in US\$ equivalent	TOTAL COST
Mercury Thermometers	335	\$1.33	\$445
Digital Thermometers	188	\$4.00	\$752
TOTAL	523		\$1,197

**TOTAL SAVINGS
FOR 3 MONTHS**

U.S. \$2,995

4

INSTRUCTIONS FOR CLEANING DIGITAL THERMOMETERS

- ! Do not submerge thermometer in a jar of alcohol or clean it under a running faucet.

Clean the area from the tip up about 5 cm with gauze or cotton dampened with warm (not hot) soapy water or 70% isopropyl alcohol before and after every use; be sure to dry the thermometer well before using it.

LIST OF MERCURY-FREE THERMOMETERS FOR TAKING BODY TEMPERATURE

- 1 A battery-run digital thermometer can be used to take underarm or rectal temperature.
- 2 Digital thermometers with solar batteries are also available (the small cell is charged by solar energy). They last up to 96 hours without light.
- 3 Plastic-band thermometers are devices that are placed on the forehead and easy to read as fever indicator. They are not as accurate as digital thermometers.

NOTE:

Another glass thermometer available is the galinstan thermometer (galinstan is a mixture of three metallic elements: gallium, indium and tin). However, Health Care Without Harm does not recommend it since there have been no independent studies that can assure that the materials used in this thermometer are innocuous to the environment and health, and furthermore, it can break just as often as mercury thermometers do.

4

TRANSITIONAL STORAGE OF MERCURY WASTE: A Basic Overview

Handling consumer products containing mercury or mercury-contaminated waste requires workers to follow procedures for handling toxic waste, with special attention to the characteristics and dangers associated with mercury. In particular, the danger associated with hard-to-detect mercury vapor and its great potential for dispersal.

The following are general guidelines for handling, collecting, transitional storage and transport of \ mercury waste:

- [1] Comply with municipal, provincial or national regulations regarding the proper containment, packaging, labeling, inspection and monitoring during storage for handling mercury waste.
- [2] Have written procedures and responsibilities on hand, including small spills response.
- [3] Sites designated for storage of drums with collected mercury must be properly marked and far from vulnerable areas.
- [4] They must be placed on cement flooring in a specially adapted site or in a separate, walled area of infrequent use, with locked fence.
- [5] Protected from rain, flooding, theft and/or unauthorized opening.
- [6] Drums must have simple design, size and standard material, with sealing material specifications.
- [7] Containers/drums must be rust-resistant and strong to prevent breakage during handling, transport and storage.
- [8] Drums must be of stainless steel or polyethylene like those used for hazardous waste, with interior previously lined with thick polyurethane fabric. Broken and/or obsolete medical products with mercury must be placed in drums along with mercury collected from small spills. Thermometers must be discarded inside their protective sheath in airtight thermoplastic drums.
- [9] Drums must follow labeling protocol: "Hazardous Waste - Mercury"
- [10] Protocol for opening and adding mercury waste, protective equipment, monitoring, etc.
- [11] There must be 1-2 trained people in charge of opening and adding mercury waste.

For more detailed information please see:

Guidance on the Cleanup, Temporary or Intermedicate Storage, and Transport of Mercury Waste from Healthcare Facilities -

Issued by the UNDP-GEF Global Health Care Waste Project

<http://www.gefmedwaste.org/downloads/Guidance%20on%20Cleanup%20Storage%20and%20Transport%20of%20Mercury%20from%20Health%20Care%20July%202010.pdf>

4

CLEANUP OF SMALL MERCURY SPILLS: A Basic Overview

ITEMS NEEDED

- 4 or 5 hermetic Ziploc bags
- Trash bags (at least 2 mm thick)
- Plastic container with lid that seals (for example, 33 mm film canisters)
- Latex gloves (or nitrile if available)
- Paper towels
- Cardboard strips
- Dropper or syringe (without needle)
- Sticky tape (around 30 cm)
- Flashlight
- Sulfur or zinc powder



CLEANING INSTRUCTIONS

- [1] Remove all jewelry from hands and wrists so that mercury cannot combine (amalgamate) with precious metals. Change into old clothes and shoes that can be thrown out if contaminated.
- [2] Ask everyone in the cleanup area to leave the area. Close the door of the affected area. Shut down the inside ventilation system to prevent dispersal of mercury vapors.
- [3] Mercury can be cleaned from the following surfaces: linoleum, ceramic and other smooth surfaces. If the spill occurs on rugs, curtains, upholstery or other like surfaces, these contaminated items must be thrown out following the guidelines below. Cut and remove only the affected portion of the contaminated rug for disposal.
- [4] Wear rubber, latex or nitrile gloves. Use a respirator or face mask designed to protect against mercury vapors, if available.
- [5] If there is broken glass or sharp objects, carefully pick them up. Place all broken objects in an unbreakable plastic jar or bottle with a tight lid. Close the bag and label it.
- [6] Locate all mercury beads. Use the cardboard to pick up small mercury balls. Make slow movements to keep mercury controllable. With the room darkened, take the flashlight and shine it at a low angle as close as possible to the floor and look for the reflection of the any beads of mercury that may remain stuck to the surface or in small depressions.

Note: Mercury can move a surprisingly long distance on hard, flat surfaces, so be sure to inspect the entire room when doing this job.
- [7] Use the dropper or syringe to collect or draw up the mercury beads. Slowly and carefully transfer the mercury to an unbreakable plastic container with a lid, such as a plastic film canister (avoid using glass). Place the container in an airtight Ziploc bag. Be sure to label the bag.
- [8] After cleaning up the larger beads, use sticky tape to pick up the smaller, hard-to-see beads. Be sure to label the bag after consulting with environmental authorities in your area.

4

CLEANUP OF SMALL MERCURY SPILLS:

(Continued)

[9] **OPTIONAL STEP.**
 If you wish, you may use sulfur powder, available commercially, to absorb the mercury droplets that are too tiny to see at with the naked eye. Using sulfur has two effects:

(1) it makes the mercury easier to see by staining it brown; and

(2) it bonds the mercury to make removal easier and suppresses undetected mercury vapors.

NOTE:

Sulfur powder can leave dark stains on fabrics. When using sulfur powder, do not breathe close to the powder, since it can be mildly toxic. In addition, you should read and understand all information regarding product handling before using it.

[10] Place all materials used in the cleanup, including the gloves, in a trash bag. Place all the mercury drops and discarded objects in the bag. Close it and label it.

[11] Contact the person in charge of maintenance at your hospital for a proper final disposal of the mercury waste in accordance with local laws and based on feasibility. In the absence of specific regulations, collect waste from mercury spills in weather-resistant steel drums.

[12] Remember to keep the spill area well ventilated with fresh air (open windows and fans on) for at least 48 hours after cleanup. If anyone shows symptoms of illness, seek medical attention immediately.



Do not use a vacuum under any circumstances to clean up the mercury.

The mercury vapor could be dispersed around the room where the spill took place.



(Modified from US EPA
<http://www.epa.gov/epaoswer/hazwaste/mercury/spills.htm>)

For more details see:

Guidance on the Cleanup, Temporary or Intermediate Storage, and Transport of Mercury Waste from Healthcare Facilities - Issued by the UNDP-GEF Global Health Care Waste Project.

<http://www.gefmedwaste.org/downloads/Guidance%20on%20Cleanup%20Storage%20and%20Transport%20of%20Mercury%20from%20Health%20Care%20July%202010.pdf>

4

FREQUENT QUESTIONS AND ASPECTS TO KEEP IN MIND

Is it alright for digital thermometers to get wet?

They must not get wet.

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How should digital thermometers be cleaned?

Usually with cotton soaked in 70% alcohol.

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Don't digital thermometers use batteries that contain mercury?

Yes, most digital thermometers available on the market take batteries that contain mercury. However, there are a few points worth clarifying on this issue. To begin with, the amount of mercury in clinical thermometers is at least 80 times greater than that in batteries. Second, the breakage rates for glass thermometers are greater than those for batteries replacement and, therefore the metal's impact on the environment would be greater in the case of thermometers.

Finally, business are slowly beginning to emerge that aim to eliminate or reduce the use of mercury in batteries. In fact, mercury-free button batteries are already available in other parts of the world. Therefore, if this path is followed, and to the extent that there is continued advocacy for products that do no compromise public and environmental health, it will merely be a matter of time until this problem ceases to exist.

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Are digital thermometers equally accurate?

Yes, digital thermometers that conform to international standards have the degree of precision required in medical care.

As is the case with most products (with or without mercury), their accuracy depends on manufacturing quality and technique. Standards organizations like ASTM International have developed protocols to help the healthcare community to identify accurate alternatives. It is imperative that the healthcare sector and governments guarantee that the thermometers acquired from manufacturers abide by the independently certified ASTM testing techniques and protocols or other internationally recognized procedures for providing a product with the required level of accuracy.

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Do digital thermometers have to be calibrated?

Yes, the manufacturer recommends having the precision of the temperature sensor tested every two years by an authorized laboratory.

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How should used batteries be disposed of?

The proper environmental management of batteries must begin with the choice of a quality product. Batteries with a "mercury-free" label are recommended. Battery disposal must be in accordance with the local regulations in effect in each jurisdiction. Find out at the time of purchase if the used batteries can be returned for the manufacturer to handle their final and safe disposal.

4

FLUORESCENT LIGHTS

Hospitals generate a considerable quantity of burnt-out or broken fluorescent lights, so the adoption of measures for their proper disposal is a top priority to eliminate mercury emissions from this source.

On this particular issue, Health Care Without Harm takes the position of choosing more energy-efficient light bulbs even if they contain mercury among their components. However, given the toxic nature of this metal, it is especially important to consider how these supplies will finally be disposed of.

The optimum alternative is Extended Producer Liability (EPL). This means that, once the product's life cycle is concluded, the company that originally provided the product is ultimately responsible for it and its potential environmental impact, and must ensure that the product is handled appropriately. Developing a product return program forces producers to take responsibility for the final disposal of their products, thus incorporating increased consideration for the environment into their design. Taking back products places the burden for the entire life cycle of products on the manufacturer.

While this may be the fairest alternative, it is actually not a policy that is easily adopted by companies. Therefore, while working to promote EPL, it is important to ensure that hazardous waste is treated accordingly in terms of risk to the environment and public health. This requires consultation with the proper government organizations or authorities in charge of waste management as to the options available for treatment and disposal.

When replacing fluorescent lights, select high efficiency lights with low mercury content. The final objective is for companies to offer light bulbs with high-energy yields, but that are also free of toxic substances. It is therefore imperative to keep insisting that they work to reduce the quantity of mercury or other dangerous substances used in manufacturing their products.

4

HEALTH CARE WITHOUT HARM

POSITION ON THIMEROSAL IN VACCINES

Vaccination programs provide important public health benefits. Health Care Without Harm (HCWH) recognizes that the continuity and ongoing development of essential vaccination programs are key to achieving global public health. We also recognize the importance of responding to concerns about Thimerosal in vaccines.

Thimerosal contains a kind of organic mercury called ethylmercury, used in vaccines as a preservative. Methylmercury, another kind of organic mercury, is a potent developmental neurotoxicant. Although not as thoroughly studied, ethylmercury is similar enough to methylmercury and has properties sufficient to raise legitimate concerns about its impact on the developing brains of children who are exposed to thimerosal in vaccines.

- [1] HCWH supports a precautionary approach regarding the use of thimerosal in vaccines, based on available scientific information.
- [2] Despite the lack of conclusive scientific evidence of harm from thimerosal, enough plausible concern has been raised to justify reformulating vaccine preparations so that they do not require thimerosal.
- [3] This conclusion is justified because organic mercury is a neurodevelopmental toxicant and there are viable alternatives to vaccine formulation without sacrificing safety or efficacy.
- [4] Regulators, public health officials and pharmaceutical companies have recognized this and moved to phase-out thimerosal use in the US and in several European countries.
- [5] Such phase-outs, by switching to single-dose vaccines that do not require thimerosal as a preservative, are positive steps, but do not address the broader problem of multi-dose vaccine preparations in developing countries, where thimerosal use continues.
- [6] In this regard, viable options for the delivery of multi-dose vaccines in developing countries should be developed as a matter of priority. This effort should be led by the World Health Organization, with participation from other intergovernmental agencies, national governments, pharmaceutical companies, international NGOs and foundations.