

The ABCs of Mercury Reduction

A how-to manual for
designing, implementing and monitoring
mercury reduction in your hospital



"El saber de mis hijos
hará mi grandeza"

The ABCs of Mercury Reduction: A how-to manual for designing, implementing and monitoring mercury reduction in your hospital

This workbook is a collaborative effort of
The University of Massachusetts Lowell, USA
The Institute for Development of Production and the Work Environment (IFA), Quito, Ecuador
The University of Sonora, Hermosillo, Mexico

Welcome!

This workbook can be found online at
<http://www.sustainableproduction.org/MercuryProject.resources.php>

Thank you for visiting our Program's website and its mercury reduction resources. These materials are being developed with funding from the U.S. EPA, over the period of June 2009 to May 2011. The workbook is one element of a package of materials available on this website to support international mercury reduction efforts. This document is a work in progress - coming soon are additional educational materials and support tools. Please check back often. Comments may be sent to Catherine_Galligan@uml.edu.

Spring 2010



"El saber de mis hijos
hará mi grandeza"

Table of Contents

Acknowledgements	i
Introduction & Overview	1
Organizational Steps	2
I. Developing organizational capacity: guidance to training and implementation.....	3
II. Baseline assessment of policies and practices.....	6
III. Quantifying mercury use – the whys and hows of doing a mercury inventory	9
IV. Prioritizing and developing action plans.....	11
V. Implementing action plans	12
VI. Post-implementation assessment	13
VII. Special Topics.....	14
A. Mercury Spill Clean Up	14
B. Management of Mercury Containing Waste	14
Appendices: tools & resources.....	15
Appendix I: Toolkit for Developing Organizational Capacity	15
I-1 Matrix of training and review meetings for mercury reduction	15
I-2 Guidance notes for mercury reduction training - government and non-gov't stakeholders.....	15
I-3 Guidance notes for mercury reduction training – hospital staff.....	15
I-4 Sample PowerPoint presentation #1	15
I-5 Sample PowerPoint presentation #2.....	15
I-6 Bowling Green State University Mercury Vapor Experiment (video).....	15
Appendix II: Toolkit for Baseline Assessment of policies and practices	15
II-1 How to identify mercury policies in your hospital.....	16
II-2 Sample mercury policies for hospitals	16
II-3 Walk-through Interviews and Assessment (worksheet).....	16
II-4 Sample summary report	16
II-5 Sample database record.....	16
II-6 List of national and local mercury regulations and policies - Mexico.....	16
II-7 List of national and local mercury regulations and policies - Ecuador.....	16
Appendix III: Toolkit for Quantifying Mercury Use (Mercury inventory)	16
III-1 Mercury Inventory worksheet.....	16
III-2 Sample completed mercury inventory worksheet.....	16
III-3 Record sheet for inventory process.....	16
Appendix IV: Toolkit for Prioritizing and Developing Action Plans	16
Appendix V: Toolkit for Implementing Action Plans	16
V-1 Replacing Mercury Thermometers with Digital Thermometers (Fact sheet).....	16
Appendix VI: Toolkit for Post-implementation Assessment.....	16
Appendix VII: Toolkit for Special Topics	16
VII-1 How to prepare a spill kit	16
VII-2 Mercury spill clean up (EPA).....	16
VII-3 Mercury Quick Facts: Cleaning up Mercury Spills in Your House & (Spanish) Datos basicos sobre el mercurio: Limpieza de los vertidos de mercurio en su hogar (EPA/ATSDR)	16
VII-4 Dental: Mercury Hygiene Guidance & (Spanish) Recomendaciones para la Higiene de Mercurio (FDI).....	16
VII-5 Dental: Best Management Practices for Amalgam Waste (ADA).....	16
VII-6 Brochure: How to Clean Up a Small Mercury Spill & (Spanish) Cómo limpiar un pequeño vertido de mercurio (based on EPA/ATSDR and ME DPH documents).....	16

VII-7 Mercury Waste Labels (4" x 3.33"; to attach to waste containers): Caution: Waste Mercury & Caution: Spill Cleanup. (Spanish) Precaución Residuos de Mercurio & Precaución: Limpieza del Derrame.....16

Acknowledgements

Development of this workbook was funded by the U.S. EPA under the Cooperative Agreement X8-83415501, Mercury Reduction/Elimination in Hospitals in Latin America. The work commenced in June 2009 and was carried out by the **Lowell Center for Sustainable Production (LCSP) at the University of Massachusetts Lowell**, in partnership with the **Institute for the Development of Production and the Work Environment (IFA)** in Quito, Ecuador and the **University of Sonora, Department of Chemical and Biological Sciences** in Hermosillo, State of Sonora, Mexico.

The workbook is modeled on the U.S. Centers for Disease Control and Prevention (CDC) workbook for occupational injury prevention, *Workbook for Designing, Implementing, and Evaluating a Sharps Injury Prevention Program*, 2008. We thank the CDC for their well-developed and high caliber workbook, which streamlined our efforts and allowed development of this EPA-funded mercury workbook in a timely and efficient manner. The CDC workbook is available online <http://www.cdc.gov/sharpssafety/>.

Thank you to the following collaborators and reviewers of this document:

Rossy Alvarez, Sc.D.
University of Sonora (UNISON)
Hermosillo, Sonora, Mexico

Mary Arce MSc
University of Sonora (UNISON)
Hermosillo, Sonora, Mexico

Mabeth Burgos-Hernandez, Sc.D.
CESUES
Hermosillo, Sonora, Mexico

Catherine Galligan, MSc
University of Massachusetts Lowell
Lowell, MA

Homero Harari, MSc
University of Massachusetts Lowell
Lowell, MA

Raul Harari, MD
Institute for the Development of Production and
the Work Environment (IFA)
Quito, Ecuador

Pia Markkanen, Sc.D.
Research Professor, Department of Work
Environment
University of Massachusetts Lowell
Lowell, MA

Ellie McCann
U.S. Environmental Protection Agency (EPA)
Washington, DC

Margaret Quinn, Sc.D., CIH
Professor, Department of Work Environment
University of Massachusetts Lowell
Lowell, MA

Introduction & Overview

Introduction

Mercury is a persistent, bioaccumulative and toxic material (PBT). Exposure to elemental mercury in hospitals from spills or broken equipment, such as mercury-containing fever thermometers and blood pressure cuffs, is a serious problem for employees, patients and visitors. Waste mercury is also a concern for the global environment, as it can easily escape through the air, water and solid waste streams. Exposure to mercury is preventable through the careful choice of non-mercury medical products and through the methodical control of equipment or devices where mercury cannot be easily eliminated.

Another important aspect is that in many countries and regions, mercury is regulated by occupational and environmental policies including national laws, standards, rules and norms. Even if your location does not have mercury regulations at present, it is likely to in the future as international mercury reduction efforts expand further.

This workbook will guide you through a systematic, hospital-wide approach for education, assessment, and improvement of mercury-containing products and the practices related to mercury in your institution. It is based on a model of continuous improvement so that the workbook is appropriate for healthcare institutions at all different levels of experience in their mercury reduction efforts.

Methodology

The workbook uses a participatory strategy for mercury reduction and alternatives assessment that integrates environmental and human safety and health. What “participatory” means is that it actively engages all groups that are affected by a change.

The strategy recognizes that a rigid focus on one aspect of a problem, such as addressing only the environmental characteristic of a mercury product or practice, will not generate solutions that are sustainable over the long term. Instead, a successful mercury reduction program will consider how all the pieces come together: the hospital’s policies and practices, environmental characteristics of products, and how products are selected, used, maintained and disposed of in the hospital. The procurers and users of mercury devices are key players, to ensure that the necessary functions and pertinent characteristics are satisfied with any replacement products.

Pia: Move to section IV: For example, it is unrealistic to think that a \$0.30 mercury fever thermometer that might go home with a patient can be replaced with a \$10.00 digital thermometer, no matter how “perfect” the digital thermometer might be. It is equally unrealistic to think that an inaccurate but low cost digital thermometer is a viable alternative. Solutions need to consider many real-world aspects, including: how the products are used, what characteristics are critical, what alternative products are available locally, and the benefits and shortcomings of each of the alternative products.

The workbook will take you through the following series of logical steps. Tools and resources found in the Appendices will provide additional guidance.

- Developing organizational capacity to conduct mercury reduction
- Conducting a baseline assessment of mercury policies and practices
- Quantifying mercury use in the hospital
- Prioritizing and developing action plans
- Implementing action plans

- Conducting a post-implementation assessment

How to Use the Workbook

The workbook contains a step-by-step plan to help you develop safe practices related to mercury, systematically remove mercury-containing products from your facility, carefully manage mercury devices that cannot be immediately replaced, and monitor the progress of the effort. The information in the workbook sections can be used to

- Plan, launch and maintain a new mercury reduction program
- Enhance or build upon current activities in an ongoing program

The principles may also be applied to other pollution prevention or safety & health activities in your facility.

For those responsible for a hospital-wide mercury reduction effort, the workbook lays out a comprehensive strategy for the program. For teams working on a specific element of the hospital's program, each workbook section is designed so that it can be used as a stand-alone unit. The tools and factsheets included in the appendices complement the workbook sections and provide guidance.

Target Audience

The audience for this information includes hospital administrators, department managers, clinicians, hospital staff, members of hospital committees and work teams, and individuals who are involved in mercury handling. Different sections of the workbook will be useful to different members of the hospital team, and sample forms and worksheets may be adapted to your specific needs.

Organizational Steps

The following sections describe organizational steps that comprise an effective mercury reduction program:

- I. Develop organizational capacity: guidance to training and implementation
- II. Baseline assessment
- III. Quantifying mercury use
- IV. Prioritizing and developing action plans
- V. Implementing action plans
- VI. Post-implementation assessment

I. Developing organizational capacity: guidance to training and implementation

Key points

- Establish a multidisciplinary leadership team for mercury reduction
- Launch the project within the hospital
- Create an institution-wide program
- Involve senior-level management

Toolkit resources for this Activity

- Matrix of training and review meetings for mercury reduction (Appendix I-1)
- Guidance notes for mercury reduction training – government and non-government stakeholders (Appendix I-2)
- Guidance notes for mercury reduction training – hospital staff (Appendix I-3)
- Sample PowerPoint presentation #1 (Appendix I-4)
- Sample PowerPoint presentation #2 (Appendix I-5)
- Link to video: Bowling Green State University Mercury Vapor Experiment (Appendix I-6)

What is organizational capacity? It is the infrastructure or the basic, underlying framework needed to carry out the mercury reduction program in your institution. This section provides the guidance for commencing the program.

The proposed model is an institution-wide program in which the responsibility is held jointly by members of a leadership team focused on mercury reduction. Representation of staff from across disciplines ensures that needed resources, expertise and perspectives are involved. The responsibility and authority for program coordination should be assigned to an individual with appropriate organizational and leadership skills. Representation from senior-level management is important to provide visible leadership and demonstrate the administration's commitment to the program. The team should also include persons from clinical and laboratory department who use mercury devices, as well as staff members with expertise in infection control, employee training, environmental services, procurement/materials management, and waste handling.

Launch the Project

One of the first steps in a mercury reduction effort is to launch the project within the hospital. This is typically one or several meetings with hospital employees to communicate the hospital's commitment to mercury reduction. In some cases, it will be combined with a broader commitment to mercury reduction and will include speakers from outside the hospital, such as a regional or international program.

The launch meeting will convey the following points:

- Welcome
- Overview of the meeting’s purpose and agenda
- The problem with mercury
- The hospital’s commitment to mercury reduction
- Endorsement of the project by speakers within and/or external to the hospital
- Next steps

After the launch meeting has taken place, the management-endorsed Mercury Reduction Leadership Team will be formed and will take responsibility for the mercury reduction project.

Setting up a Mercury Reduction Working Group

A mercury reduction working group is comprised of individuals from different areas of the hospital working together to eliminate mercury and to foster a culture of continuous improvement. The team leader should be someone with management responsibility who can ensure that the project is fully implemented. The team should include representation from all relevant departments and people who have a passion for and understanding of the focus on mercury reduction. This team is responsible for managing the mercury reduction project within the hospital by overseeing the execution of Steps II-VI in this manual.

Why is a diverse team beneficial?

- A facility-wide team that is looking at the whole picture can spot opportunities and can anticipate and provide effective solutions to obstacles.
- Diverse perspectives of members from different departments can challenge current practices and promote innovative solutions. A team can work together to create pilot projects.
- If each department is part of the process, there will be greater buy-in to changes in practices and products
- A dedicated team can motivate the purchasing and other departments to implement new products and practices.

Examples of Potential Participants in a Mercury Reduction Working Group

Potential Representatives	Contributions/Strengths
Administration/Senior Management (Mandatory)	<ul style="list-style-type: none"> • Communicate the organization’s commitment to elimination of mercury • Ensure personnel and fiscal resources are available to meet program goals
Clinical staff and Laboratory services staff	<ul style="list-style-type: none"> • Provide insight into current practices and use of mercury • Participate in pilot evaluations of proposed products and offer feedback on implications of new products or practices • Identify key product criteria • Serve as conduit between the team and clinicians/lab staff to facilitate communication, ensure buy-in and assist with training staff on new products/practices
Financial services	<ul style="list-style-type: none"> • Assist with financial justification for alternative products and practices
Purchasing/procurement, Materials management	<ul style="list-style-type: none"> • Help identify alternative products and manufacturers • Provide cost data for making informed decisions.
Housekeeping, waste management	<ul style="list-style-type: none"> • Provide insight into and ensure safe control of waste mercury • Assist with evaluation and implications of alternative products/practices

Environmental Services	<ul style="list-style-type: none"> • Provide insight into and ensure safe control of waste mercury • Assess the environmental implications of proposed products
Operations (Physical plant, security, maintenance, operations)	<ul style="list-style-type: none"> • Provide insight into non-medical mercury use in the physical plant • Assist with proper management of mercury in the plant
Infection control	<ul style="list-style-type: none"> • Ensure that alternative products/practices meet infection control needs
Food services, Laundry	<ul style="list-style-type: none"> • Participate in controlling mercury in equipment (e.g. freezer thermometers, candy thermometers, flame or temperature sensors in ovens, tilt/position switches in freezers or laundry washers & dryers)
Communications/Public relations	<ul style="list-style-type: none"> • Communicate to employees, patients, visitors, and local community about the hospital's commitment to a healthy environment through the reduction of mercury • Promote successes • Assist with educational outreach

Although the leadership team will include a core group, staff from additional areas might be invited to participate in a particular discussion or as part of a subgroup working on a specific task.

II. Baseline assessment of policies and practices

Key points

- Conduct a baseline assessment of policies and practices related to mercury
- Assess the hospital resources related to mercury or other areas where there might be synergies (e.g. glutaraldehyde elimination, integrated pest management, etc.)
- Consider policies, practices, spill response procedures, green teams, safety committees, EPP efforts, et cetera
- Identify roles in handling & managing mercury

Toolkit resource for this Activity

- Worksheet: Walk-through interviews and assessment (Appendix II-1)
- Sample mercury policies for hospitals (Appendix II-2)
- Sample summary report (Appendix II-4) – *to be added*
- Sample database record (Appendix II-5) – *to be added*
- List of national and local regulations and policies - Ecuador (Appendix II-6) – *to be added*
- List of national and local regulations and policies - Mexico (Appendix II-7) – *to be added*

The “baseline assessment” examines and records the policies or practices in your facility related to mercury at this point in time. It can include, for example, purchasing policies, spill clean-up procedures, what mercury products are used in each department and how they are used, whether mercury devices are sent home with patients, and whether alternative mercury-free products have been tried or are in use.

The baseline assessment serves multiple purposes:

- identifies existing policies/practices that can be built upon
- establishes a ground level from which subsequent progress (or non-progress) can be tracked
- facilitates periodic assessment of the effectiveness of the improvement activities
- provides for positive feedback when new levels are achieved
- shows whether the issues identified in the original baseline still exist
- allows one to see if new issues have emerged that need to be addressed
- allows self-assessment of progress

How to conduct the assessment

The assessment is done by interviewing people in the hospital who are knowledgeable about policies and practices related to mercury. Policies and practices may be written down or they may be informal, such as

verbal training on how to clean up a broken thermometer. Appendix II includes sample written policies from other hospitals; these samples can help an interviewer know what to look for as they are starting out. It may be more difficult to tease out the unwritten practices, which become so natural that a worker may not think of them when you ask. General questions are likely to reveal the practices, such as:

- Do you use any products that contain mercury? How do these products get selected and procured?
- Do the mercury products ever break? How are the pieces cleaned up?
- Do you have spill kits?
- What is done with the waste mercury from the broken device? Is it wrapped up or put in a container? Can you show me? Who is it given to for disposal?
- Does the same procedure get followed if something breaks at night or during the weekend (off-shift)?
- Who else cleans up or handles mercury? Do they do it the same way?
- Is there anyone else I should talk to about mercury handling in this department?

A key element of the interviews is that the interviewee and his/her department is not blamed or punished for what they say about how mercury is handled. The answers may reveal an urgent need for improving the practices and that is part of the process. It is important to remember that the assessment provides the baseline for improvement and a trusting relationship is essential for an effective and sustainable mercury reduction effort.

In addition to interviewing administrators, this evaluation will include interviews of procurement staff, front line workers, custodians, and others who have a direct link to the use of mercury. Members of the Mercury Reduction Leadership Team can help identify key interviewees and if appropriate, help with scheduling interviews. The tool “*Walk-Through Interviews and Assessment*” (Appendix II-1) is designed to capture the information from an interview that asks about written or informal procedures/practices, mercury-containing equipment, and mercury in labs and non-clinical areas.

There are several points worth noting:

- Typically, one worksheet is used for a single department or interviewee.
- The most important step is getting into the working areas of the hospital (clinical areas, labs, procurement office, environmental services, maintenance areas, waste storage) and working with the person in charge or their designee.
- The worksheet is designed to be used with a clipboard, allowing for information to be gathered during a hospital walk-through. Being out in the work area will provide a better understanding of the circumstances in which mercury products are used.
- Interviews can be conducted in a single, focused sweep or in shorter visits over the course of several days.
- There is nothing sacred about the form – notes can be written in the margins, on the backside, or on additional sheets of paper. If your interviews suggest additional questions that should be asked, ask them!
- You may find that no policies or documented practices, such as mercury clean up procedures, exist. Don't feel that this is a failure in any way. The assessment is not a judgment, it is merely a written description of what the hospital does at this point in time.

Follow up to the walk-through assessment

After completing the interview(s), the findings should be summarized promptly to ensure that the key points are recorded and clearly stated. The summary report becomes the baseline for prioritizing improvement activities and for measuring future progress. A sample summary report is shown in Appendix II-4 (*to be added*).

The worksheets (notes) from individual departments should also be maintained on file the by the leadership team. These notes can serve as a useful resource in future months.

III. Quantifying mercury use – the whys and hows of doing a mercury inventory

Key points

- Conduct a baseline count (inventory) of mercury-containing products and materials in the facility
- Compile the findings into a database

Toolkit resource for this Activity

- Mercury inventory worksheet (Appendix III-1)
- Sample completed mercury inventory worksheet (Appendix III-2)
- Record sheet for inventory process (Appendix III-3)

The mercury inventory provides a detailed description of mercury in the hospital, including the type of mercury-containing product or material, where they are located and the number or amount of each type of product or material. This information is important for several reasons:

- It facilitates estimating the total amount of mercury in the hospital,
- It allows the team to gain consensus on the magnitude and extent of the hospital's mercury use and to develop a prioritized strategy for eliminating the mercury,
- It helps explain the scope of the team's work to someone outside the team, and
- It demonstrates the benefits of undertaking the mercury reduction work.

How to conduct the inventory

1. Distribute the worksheets to the designated contact in each department. To keep track of inventory activities, the Mercury Team may wish to keep a master list of the departments and contact person for each department.

Appendix III-1 Inventory worksheet

Appendix III-3 Record Sheet for Inventory Process

2. In each department, the designated staff member goes through department with the Mercury Inventory worksheet and locates all the mercury-containing products. For each product, he/she records a brief description of product and the quantity of that product in the department. If the product is a liquid or material measured by volume or weight, the appropriate measure should be recorded. For example: *10 unopened jars (125 g each) of mercuric oxide. 1 partially used jar approximately 1/2 full (~63 g).*

The staff member chosen to perform the inventory in his/her department should be familiar with the devices or materials used in that department and knowledgeable about how to identify mercury. (In clinical areas, most of the mercury will be in the form of a silvery liquid contained in a glass column or ampoule.)

3. The completed form is returned to the Mercury Leadership Team.
4. The Mercury Team (or designee) will compile the inventory information into a database.

5. The database will be used to estimate total amount of mercury, amount by department, et cetera that will be used to prioritize and develop action plans, as well as to measure progress over time.

IV. Prioritizing and developing action plans



Please check back later!

Key points

-

Toolkit resource for this Activity

- Tools for prioritizing and developing action plans – to be added
- Criteria and methods for prioritizing mercury reduction efforts
 - Cost
 - Volume of mercury
 - Potential for spill
 - Ease
- How to find alternatives
- How to evaluate alternatives
- Case study – piloting mercury reduction in one area

Tools

Worksheets

V. Implementing action plans



Please check back later!

Key points

-

Toolkit resource for this Activity

- Fact sheet: Replacing mercury thermometers with digital thermometers (Appendix V-1)
-

VI. Post-implementation assessment



Please check back later!

Key points

-

Toolkit resource for this Activity

- *Tools to be added*

- How to monitor performance
- Using key indicators (from III) effectively

VII. Special Topics



Please check back later!

Key points

-

Toolkit resource for this Activity

- Mercury spill clean up (Appendix VII-1)
- Management of mercury containing waste (Appendix VII-2)
- Dental: Mercury Hygiene Guidance (Appendix VII-3)
- Dental: Best Management Practice for Amalgam Waste (Appendix VII-4)

A. Mercury Spill Clean Up

How to assemble a spill kit

How to clean up a spill

B. Management of Mercury Containing Waste

Non-dental

Dental

Appendices: tools & resources

Appendix I: Toolkit for Developing Organizational Capacity

I-1 Matrix of training and review meetings for mercury reduction

I-2 Guidance notes for mercury reduction training - government and non-gov't stakeholders

I-3 Guidance notes for mercury reduction training – hospital staff

I-4 Sample PowerPoint presentation #1

I-5 Sample PowerPoint presentation #2

I-6 Bowling Green State University Mercury Vapor Experiment (video)

Appendix II: Toolkit for Baseline Assessment of policies and practices

- II-1 How to identify mercury policies in your hospital
- II-2 Sample mercury policies for hospitals
- II-3 Walk-through Interviews and Assessment (worksheet)
- II-4 Sample summary report
- II-5 Sample database record
- II-6 List of national and local mercury regulations and policies¹ - Mexico
- II-7 List of national and local mercury regulations and policies - Ecuador

Appendix III: Toolkit for Quantifying Mercury Use (Mercury inventory)

- III-1 Mercury Inventory worksheet
- III-2 Sample completed mercury inventory worksheet
- III-3 Record sheet for inventory process

Appendix IV: Toolkit for Prioritizing and Developing Action Plans

Appendix V: Toolkit for Implementing Action Plans

- V-1 Replacing Mercury Thermometers with Digital Thermometers (Fact sheet)

Appendix VI: Toolkit for Post-implementation Assessment

Appendix VII: Toolkit for Special Topics

- VII-1 How to prepare a spill kit
- VII-2 Mercury spill clean up (EPA)
- VII-3 Mercury Quick Facts: Cleaning up Mercury Spills in Your House & (Spanish) Datos basicos sobre el mercurio: Limpieza de los vertidos de mercurio en su hogar (EPA/ATSDR)
- VII-4 Dental: Mercury Hygiene Guidance & (Spanish) Recomendaciones para la Higiene de Mercurio (FDI)
- VII-5 Dental: Best Management Practices for Amalgam Waste (ADA)
- VII-6 Brochure: How to Clean Up a Small Mercury Spill & (Spanish) Cómo limpiar un pequeño vertido de mercurio (based on EPA/ATSDR and ME DPH documents)
- VII-7 Mercury Waste Labels (4" x 3.33"; to attach to waste containers): Caution: Waste Mercury & Caution: Spill Cleanup. (Spanish) Precaución Residuos de Mercurio & Precaución: Limpieza del Derrame.

¹ Regulations and policies may include national laws, standards, rules and norms that apply to mercury.