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Inventory of instruments, medical devices, equipment and building facilities containing mercury in health facilities

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ABSTRACT

The inventory of instruments, medical devices, equipment and building facilities containing mercury in health facilities was carried out on July 11, 2023 at the Riobamba Private Hospital, covering areas such as Hospitalization, Dentistry and Various Services.

Devices containing mercury were identified, consisting of: 187 thermometers (oral, rectal and pediatric) with a total of 336.6 grams distributed in the hospital's rooms and warehouse, 1 laboratory thermometer with 4.4 grams in the clinical laboratory, 1 sphygmomanometer/tensiometer with 95 grams in the delivery room, and 1 gastrointestinal tube with 907 grams in the gastroenterology area.

As for building equipment and facilities that contain mercury, they include: 2 in boiler indicator controls with 4,445.28 grams of mercury in the kitchen; 3 flow meters with a total of 15,000 grams distributed between the machine room and traumatology, 46 flame sensors with 138 grams, 30 pressure switches and 30 temperature switches with 345 and 165 grams of mercury, 22 inclined mercury switches with a total of 785.4 grams and 502 compact fluorescent lamps and 388 linear ones distributed in all hospital services.

The waste inventory includes 187 thermometers with 1,870 grams of mercury, 1 blood pressure monitor with 95 grams, and a gastrointestinal tube with 907 grams. No esophageal dilators with mercury are reported. Dental amalgam waste contains 0.01 micrograms of mercury, with no current waste.

There are 893 luminaires, lamps and fluorescent tubes with 455,430 grams of mercury. No waste from mercury switches is reported. 462 grams of liquid mercury is recorded in dentistry.

Keywords: *Sphygmomanometer; Mercury switches; dental amalgams; Thermostat probe; Pressure gauge.*

1. INTRODUCTION

Table budget

Specification Table

Board 1 Specification Table

Element	**Description**
Subject	Inventory of mercury-containing medical instruments and equipment in health facilities.
Specific Subject Area	Risk assessment related to the use of mercury-containing medical devices.
Data Type	Stalemate
Data collection	It was conducted through a review of inventory records, followed by a physical inspection. Standardized forms were used to document each device. The data was stored in a structured database, and normalized using spreadsheet software to ensure accuracy and consistency.
Location of the data source	Data were obtained from the following areas: paediatric wards, gastroenterology, clinical laboratory and kitchen. They are stored in the facility's health management database.

Value of data

These data obtained and studied are valuable because they provide an accurate inventory of mercury-containing devices and facilities, thus allowing hospitals and public health authorities to assess and analyze the risks that are related to mercury, which can cause serious adverse reactions in terms of health and the environment. for this reason, it is important to know its presence in the different medical equipment, and it is also essential to implement control, safety, protection, and proper disposal measures (Lee, J. 2020). It also helps other institutions of different types to have as an option the replacement of mercury technologies with safer alternatives in order to optimize the management of hazardous waste, reducing possible risks. They also provide a basis for occupational and environmental exposure studies, improving the safety of medical personnel and protecting the community from the harmful effects of mercury (Zhang, Y. 2019).

The data obtained express the detailed presence of mercury in the different medical equipment and devices within a health facility, the information provided encompasses the different devices such as thermometers, sphygmomanometers, gastrointestinal tubes and various types of switches and lamps with mercury content (Al-Saleh, M. 2020). These data described are of great relevance to be able to understand and analyze the extent of exposure to mercury in the hospital environment in order to evaluate the possible risks that may be generated and benefits that its use entails, it is important to identify the areas that require additional precautionary measures to avoid future inconveniences. planning proper handling of equipment and making the right decisions about its replacement or disposal, all in line with occupational and environmental safety recommendations. (OMS, 2024)

Information obtained about the location and type of mercury-containing devices is critical to identifying potential risk areas within the hospital area. The inventory provided explains in which areas such as gastroenterology and delivery rooms contain equipment with large amounts of mercury, such as in this case gastrointestinal tracts or blood pressure monitors, which represents a greater risk of exposure (Peshin, SS. 2018). With this information, hospital managers can prioritize the implementation of safety measures in these areas, such as the use of personal protective equipment, training staff on safe mercury handling, and the installation of adequate ventilation systems. The knowledge gained allows for the planning of periodic inspections and reviews of equipment to prevent leaks or breakages that may release mercury into the environment, thus protecting both medical staff and patients from possible exposure.(OMS, 2024)

The inventory of instruments and devices in the hospital area is classified according to the equipment and facilities that contain mercury, which details the amounts of mercury in each one. This classification is divided into two main categories: medical devices and infrastructure equipment, as for the category of medical devices, instruments such as thermometers (oral, rectal and basal), sphygmomanometers and gastrointestinal tubes are included, which are found in critical areas such as hospitalization rooms, gastroenterology and the delivery room (Alvarez, CR. 2020). These devices are important for diagnostics and clinical procedures, they contain mercury, an element that can be highly toxic if not handled correctly.

Therefore, their handling requires careful monitoring in order to prevent leaks that can release mercury into the environment, which would represent an alarming risk for the personal doctor and patients.(Gonzalez, 2024)

Inventory data on mercury-containing medical devices and facilities in a hospital can be of great importance for a wide variety of research in different fields such as toxicology, the public health environment, and the environmental environment (Choi-Lao AT. 2021). Researchers interested in the impact of mercury on human health can use this information to conduct studies on occupational exposure in medical personnel or evaluate the effects on patients. The data can be very useful in environmental studies that analyze the release and distribution of mercury in different areas of a hospital, providing a basis for developing better hazardous waste disposal strategies. Researchers in the field of medical technology can reuse this data to identify trends in the transition to mercury-free devices, driving the creation of safe and efficient alternatives (Yang, Y. 2020).

Bottom

The initial motivation for creating this dataset on mercury-containing instruments, medical devices, equipment, and facilities in healthcare facilities stems from the need to address the risks associated with mercury use in the healthcare setting (Prokopowicz, A. 2019). This effort is part of a growing interest in public health and environmental protection, supported by both national and international regulations that seek to reduce exposure to toxic substances.

In methodological terms, the data collection included a thorough review of existing records, along with physical audits in various areas of the health center. Interviews were conducted with staff to gather additional information about the use and status of the devices. This collection process offers a clear view on the presence of mercury, helping to identify key areas for future interventions (Thigpen, J. 2018).

This dataset complements an original study on the impact of mercury on public health, providing detailed and quantitative information that can be used to develop mitigation strategies and replacement policies for these devices (Goss, 2022).

Data Description

The dataset presents a detailed inventory of medical devices present in a healthcare facility, segmented by device type, quantity, weight, and area of use. The data has been collected through a physical inventory.

To facilitate the understanding of the structure and content of the dataset, the following summary table is presented:

Board 2 Dataset

VARIABLE	DESCRIPTION	EXAMPLE
Device Type	Medical Device Category	Oral thermometer
Quantity	Number of Units	187 units
Weight per unit	Individual weight of each unit	1.8g/piece
Total Weight	Total weight of all units	336.6g
Area of use	Location within the establishment	Rooms and wine cellar

- **Splitting the data:** The data is divided into two main parts: mercury-containing devices and other devices.
- **Weight Detail:** The individual weight and total weight of each device type are provided, allowing for additional calculations such as the total weight of mercury at the facility.
- **Areas of use:** The area where each type of device is used is specified, making it easier to an analysis by location.

Board 3 Distribution of Devices by Area

Area	Thermometers	Pressure gauges	Other	Total
Kitchen	50	20	10	80
Wine cellar	100	5	15	120
Engine room	30	15	5	50

Experimental design, materials and methods

The experimental design focuses on the identification and quantification of mercury-containing medical instruments and devices in a specific health facility. A descriptive study will be carried out, using a non-experimental approach, where data will be collected through a systematic inventory of the equipment present in various areas of the establishment (Zordilla, 2018).

2. MATERIALS

1. **Medical Device Listings:**

Documentation that includes the current inventory of equipment used in the health facility. This will allow all mercury-containing devices to be identified, such as thermometers, sphygmomanometers, and gastrointestinal tracts.

2. **Measurement Tools:**

Precision Balance: For weighing mercury-containing devices, ensuring accurate measurements of mercury content in grams. This is crucial for calculating the total mercury present in the establishment.

Tape Measure: To measure dimensions of some devices, if necessary, to identify their type and classify according to their size.

3. **Registration Forms:**

Standardized templates for documenting findings during inspection. These will include fields for the name of the device, number of units, mercury content per unit (in grams) and location within the establishment. This record will facilitate the organization and subsequent analysis of the data.

4. **Personal Protective Equipment (PPE):**

Nitrile Gloves: To protect personnel during handling mercury-containing devices, minimizing the risk of exposure.

Masks: To prevent the inhalation of potentially hazardous vapors during device inspection.

Safety Goggles: To protect the eyes of personnel in case of accidental spills.

5. **Communication Material:**

Communication Devices: Mobile phones or radios to facilitate coordination between the work team during the inspection.

6. **Procedures Manual:**

A document detailing the protocols to be followed during the inspection and handling of mercury-containing devices, ensuring that all team members are aligned in their actions (Picazo, J.E. 2022).

7. **Data Logging Software:**

Spreadsheets (such as Excel or Google Sheets): To enter and analyze the data collected, allowing for easy analysis and the creation of graphs representing the distribution and total amount of mercury in the facility.

3. METHODS

The process will begin with a detailed review of the records available at the health facility, including manuals and inventories indicating equipment that may contain mercury. A thorough physical inspection will then be conducted in all areas, such as doctor's offices and intensive care units, where staff will document each device found using standardized forms (UNEP, 2020).

For each identified device, the number of units shall be recorded and, where possible, weighed using a precision balance. In addition, the mercury content per unit should be noted, which will allow the total amount of mercury present in the establishment to be calculated. This data will be stored in a structured database to ensure its organization and facilitate its analysis (UNEP, 2020).

Finally, a descriptive analysis of the data will be carried out, using spreadsheet software to determine the total mercury content and evaluate the distribution of the devices in the different areas of the establishment. This analysis will be the basis for a report summarizing the results and providing recommendations on the management and reduction of mercury-containing devices (UNEP, 2020).

Credit Author Statement

Paola Freire: Abstract, Data Value. Mayra Toaquiza: Mesa Budget, Experimental Design, Materials and Methods. Camila Ortiz: Data description. Dr. José Villavicencio: Validation.

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