CASE STUDIES ON HEALTH CARE WASTE MANAGEMENT PRACTICES OF SELECTED PUBLIC AND PRIVATE HOSPITALS IN METRO MANILA

Enrico C. Mina
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Published by the Ateneo de Manila University
Graduate School of Business
Ateneo Professional Schools Building
Rockwell Drive, Rockwell Center, Makati City, Philippines 1200
Tel.: (632) 899-7691 to 96 or (632) 729-2001 to 2003
Fax: (632) 899-5548
Website: http://gsb.ateneo.edu/

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Grateful acknowledgements are given to the following persons, without whom this paper could not have been completed:

- To Carolina Guina, AGSB Research Director, who encouraged the author to pursue the study, assuring that the topic is highly relevant if the country was to move toward a hazard-free and environmentally responsible management of health care institutions;

- To Dean Albert L. Buenviaje of the AGSB for the support and encouragement;

- To the students in the Operations Management Year Level 8 section of the Ateneo School of Medicine and Public Health who were assigned to the author, particularly those who enthusiastically volunteered to do the detailed investigation and research on their subject hospital’s waste management practices;

- To the organizers of the AGSB Conference on Green Innovation and Competitive Advantage for providing the forum;

- To Dr. Mario C. Villaverde, former Undersecretary of the Department of Health and currently Associate Dean of the Ateneo School of Government, for agreeing to be a panelist and to present the perspective of the Department of Health (DOH);
To Ms. Mary Ann Artates, Senior Manager and Chief Safety Officer of The Medical City, for agreeing likewise to be a panelist and to present the perspective of a hospital senior executive.

Above all, the author expresses gratitude to the Lord God for His guidance and inspiration.
Hospitals provide vital health care services to society and are among the institutions most critical for people’s well-being. They are indispensable. However, because of the nature of their operations and the services they render to their patients (both in-house and out-patient), they also inevitably generate large volumes of some of the most hazardous wastes. If not properly handled, these wastes are dangerous pollutants and can spread diseases to patients and their families, hospital staff, waste management workers, and society in general.

Various laws and rules govern how hospitals should manage their waste output. Aside from general regulations applicable to all organizations, hospitals are specifically subject to the provisions of the Revised Health Care Waste Management Manual (RHCWWM) promulgated by the Department of Health in 2005. It has detailed rules and procedures on how to classify hospital wastes and how to handle, transport, neutralize, and dispose these.

This paper contains case studies on the health care waste management practices of selected public and private hospitals in Metro Manila. These case studies were the output of an Operations Management course handled by the author for Year Level 8 students (fourth-year medical students or clerks) at the Ateneo School of Medicine and Public Health in 2012. These focused on seven hospitals, six of which were the assigned rotations of the students. During their respective on-the-job rotation, the students investigated the waste management practices of their subject hospitals, using the laws and Department of Health (DOH) regulations in the Manual as their frame of reference, and under this author’s guidance.
The study showed various instances of conformity with the standards, even best practices. On the other hand, it also revealed weaknesses and areas of improvement, particularly because of the potentially serious impact on public health. Finally, lessons are drawn from these case studies to help guide hospital managers on the management of their institutions’ wastes.
Case Studies on Health Care Waste Management Practices of Selected Public and Private Hospitals in Metro Manila

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Introduction

Hospitals and other health care facilities (e.g., clinics, infirmaries, diagnostic laboratories) perform a vital role in maintaining and restoring health, obviously a fundamental need if society is to function and progress well. They are therefore indispensable.

However, because of the nature of their operations and the services they render to their patients (both in-house and out-patient), they also inevitably generate large volumes of some of the most hazardous wastes. If not properly handled, these wastes are dangerous pollutants and can cause the spread of diseases to patients and their families, hospital employees and staff, contractors, waste management workers, and society in general.

A well-managed hospital, whether publicly or privately owned, has to take full responsibility for the management and disposal of the various forms of wastes that its operations generate. It cannot afford
A well-managed hospital, whether publicly or privately owned, has to take full responsibility for the management and disposal of the various forms of wastes that its operations generate. to ignore the potential threats wastes bring to the community. If it does, and a health or environmental threat traceable to its improperly handled wastes breaks out, the local community, the local government unit, government agencies---particularly the Department of Health (DOH) and the Department of Environment and Natural Resources (DENR)---and the media will all bear down on the violator-hospital, damaging the latter’s reputation and causing its financial losses. After all, health care waste is a major public health and environmental protection issue.
Under the Joint Administrative Order 2005-02 issued by the DOH and the DENR on August 24, 2005, health care wastes include all wastes generated as a result of the following:

1) Diagnosis, treatment, management and immunization of humans or animals;
2) Research pertaining to the above activities;
3) Producing or testing of biological products; and
4) Waste originating from minor or scattered sources (i.e., dental clinics, alternative medicine clinics, etc.)

Health care wastes can be classified as either: general waste, infectious waste, pathological waste, sharps, pharmaceutical wastes, genotoxic wastes, chemical waste, waste with high heavy metals content, pressurized containers, and radioactive waste. The DOH’s Revised Health Care Waste Management Manual (2005) issued during the term of Secretary Manuel M. Dayrit describes each of them as follows:

1) **General waste** – Comparable to domestic waste, this type of waste does not pose special handling problems or hazard to human health or to the environment. It comes mostly from the administrative and housekeeping functions of health care establishments and may also include waste generated from the maintenance of health care premises. General waste should be dealt with by the municipal waste disposal system.

2) **Infectious waste** – This type of waste is suspected to contain pathogens (bacteria, viruses, parasites, or fungi) in sufficient concentration or quantity and can cause disease in susceptible hosts. This includes:
• Cultures and stocks of infectious agents from laboratory work;

• Waste from surgery and autopsies on patients with infectious diseases (e.g., tissues, materials or equipment that have been in contact with blood or other body fluids);

• Waste from infected patients in isolation wards (e.g., excreta, dressings from infected or surgical wounds, clothes heavily soiled with human blood or other body fluids);

• Waste that has been in contact with infected patients undergoing haemodialysis (e.g., dialysis equipment such as tubing and filters, disposable towels, gowns, aprons, gloves, and laboratory coats);

• Infected animals from laboratories; and

• Any other instruments or materials that have been in contact with infected persons or animals.

3) Pathological waste – Pathological waste consists of tissues, organs, body parts, human fetus and animal carcasses, blood, and body fluids. Within this category, recognizable human or animal body parts are also called anatomical waste. This category should be considered as a subcategory of infectious waste, even though it may also include healthy body parts.

4) Sharps – These include needles, syringes, scalpels, saws, blades, broken glass, infusion sets, knives, nails, and any other items that can cause a cut or puncture wound. Whether or not they are infected, such items are usually considered as highly hazardous health care waste.
5) **Pharmaceutical waste** – This covers expired, unused, spilt, and contaminated pharmaceutical products, drugs, vaccines, and sera that are no longer required and need to be disposed of appropriately. This category also includes discarded items used in the handling of pharmaceuticals such as bottles and boxes with residues, gloves, masks, connecting tubing, and drug vials.

6) **Genotoxic waste** – Genotoxic waste may include certain cytostatic drugs, vomit, urine, or feces from patients treated with cytostatic drugs, chemicals, and radioactive materials. This type of waste is highly hazardous and may have mutagenic, teratogenic, or carcinogenic properties.

Harmful cytostatic drugs can be categorized as follows:

- Alkylating agents: Cause alkylation of DNA nucleotides, which leads to cross-linking and miscoding of the genetic stock;

- Anti-metabolites: Inhibit the biosynthesis of nucleic acids in the cell; and

- Mitotic inhibitors: Prevent cell replication.

Cytotoxic wastes are generated from several sources and include the following:

- Contaminated materials from drug preparation and administration, such as syringes, needles, gauges, vials, packaging;

- Outdated drugs, excess (left over) solutions, and drugs returned from the wards; and
• Urine, feces, and vomit from patients that may contain potentially hazardous amounts of the administered cytotoxic drugs or of their metabolites and should be considered genotoxic for at least 48 hours and sometimes up to one week after drug administration.

7) **Chemical waste** – Chemical waste consists of discarded solid, liquid, and gaseous chemicals such as those from diagnostic and experimental work and from cleaning, housekeeping, and disinfecting procedures. Chemical waste from health care may be hazardous or non-hazardous.

Chemical waste is considered hazardous if it has at least one of the following properties:

- Toxic
- Corrosive (e.g., acids of pH <2 and bases of pH>12)
- Flammable
- Reactive (explosive, water-reactive, shock sensitive)
- Genotoxic (e.g., cytostatic drugs)

Non-hazardous chemical waste consists of chemicals with none of the above properties, such as sugars, amino acids, and certain organic and inorganic salts.

8) **Waste with high content of heavy metals** – Wastes with a high heavy-metal content represent a subcategory of hazardous chemical waste and are usually highly toxic. Mercury wastes are typically generated from spillage from broken clinical equipment (thermometers, blood pressure gauges, etc.). Whenever possible, spilled drops of mercury should be recovered. Residues from dentistry have high mercury content. Cadmium waste comes mainly from discarded batteries. Certain “reinforced wood panels” containing lead is still being used in radiation-proofing of
X-ray and diagnostic departments. A number of drugs contain arsenic but these are treated here as pharmaceutical waste.

9) **Pressurized containers** – Many types of gas used in health care are often stored in pressurized cylinders, cartridges, and aerosol cans. Many of these containers, once empty or of no further use (although they may still contain residues), are reusable, but certain types---notably, aerosol cans---must be disposed of. Whether inert or potentially harmful, gases in pressurized containers should always be handled with care; containers may explode if incinerated or accidentally punctured.

10) **Radioactive waste** – This type of waste includes disused sealed radiation sources, liquid and gaseous materials contaminated with radioactivity, excreta of patients who underwent radionuclide diagnostic and therapeutic applications, paper cups, straws, needles and syringes, test tubes, and tap water washings of such paraphernalia. It is produced as a result of procedures such as *in vitro* analysis of body tissues and fluids, *in vivo* organ imaging, tumor localization and treatment, and various clinical studies involving the use of radioisotopes. Radioactive health care wastes generally contain radionuclides with short half-lives---meaning, they lose their activity in a shorter time. However, certain radionuclides, e.g., C-14 contaminated wastes, have much longer half-lives (more than a thousand years), which need to be specially managed in a centralized treatment facility for radioactive wastes. Special management or handling of disused sealed radiation sources for cancer treatment is also required.
Hazards from Health Care Wastes

Hazards to people in health care facilities. The same Revised Health Care Waste Management Manual (RHCWMM) identifies the hazards of health care wastes (HCW) to people who work in, are confined in, or visit health care facilities such as hospitals.

1) Hazards from infectious wastes and sharps –
Infectious waste may contain any of a great variety of pathogenic organisms. Pathogens in infectious waste may enter the human body by a number of routes: (a) through a puncture, abrasion, or cut in the skin; (b) through the mucous membrane; (c) by inhalation; and (d) by ingestion.

The presence of concentrated cultures of pathogens and contaminated sharps (particularly hypodermic needles) in the waste stream presents the most acute hazards to health. Sharps may not only cause cuts and punctures but also infect the wounds if contaminated with pathogens. Because of this double risk of injury and disease transmission, sharps are considered as a very hazardous class.

Of principal concerns are infections that may be transmitted by subcutaneous introduction of causative agent, e.g., viral blood infections. Hypodermic needles constitute an important part of the sharps waste category and are particularly hazardous because they are often contaminated with patients’ blood.

The consequences of improper handling and disposal of medical waste are serious. For example,
the reuse of improperly discarded needles by IV users or accidental needle-prick injuries encountered by recyclers as they sift through waste dumps could lead to the spread of hepatitis, AIDS, and other blood-borne diseases. Epidemiological studies show that exposure to pollutants from medical waste incinerators increases the risk of various types of cancers and heart diseases.

The elements that need to be present for infection from medical waste to happen are:

- Some components of medical waste (culture dishes, liquid blood, pathological waste, etc.) are potential reservoirs of disease-causing microorganisms.

- The infective dose depends on the virulence of the microorganisms, the portal of entry, and the susceptibility of the host.

- Modes of transmission may be by contact (e.g., contaminated needles or blood splatter), or vehicle borne (e.g., contaminated wastewater), airborne (e.g., aerosolized pathogens from broken culture dishes or the rupture of yellow bags), and vector borne (e.g., rodents in a medical waste storage area).

- Portals of entry include breaks in the skin and mucous membranes (e.g., needle-prick injuries or blood splashes into the mucous membranes), the respiratory tract (inhalation of pathogenic aerosols), etc.

- Susceptible hosts include health care workers, waste handlers, patients and visitors in the health care facility, landfill operators, scavengers, and the public in general.
2) **Hazards from chemical and pharmaceutical waste** – Although chemical and pharmaceutical products may be found in small quantities in health care waste, these substances are nonetheless hazardous. They may cause intoxication, either by acute or by chronic exposure, and injuries, including burns. Intoxication can result from absorption of a chemical or pharmaceutical substance through the skin or the mucous membranes, or from inhalation or ingestion. Injuries to the skin, the eyes, or the mucous membranes of the airways can be caused by contact with flammable, corrosive, or reactive chemicals (e.g., formaldehyde and other volatile substances). The most common injuries are burns. Disinfectants such as chlorine and sodium hypochloride are particularly important members of this group; they are used in large quantities and are often corrosive. It should be noted that reactive chemicals might form highly toxic secondary compounds.

3) **Hazards from genotoxic waste** – Inhalation of dust or aerosols, absorption through the skin, ingestion of food accidentally contaminated with cytotoxic drugs, chemicals, or waste are the main pathways of exposure to genotoxic substances. The severity of hazards also depends on the mode of exposure (inhalation, dermal contact, etc.). Exposure to genotoxic substances may also occur during the preparation of particular drugs or chemicals or through contact with bodily fluids or secretions of patients undergoing chemotherapy.

Many cytotoxic drugs are extremely irritating and have harmful local effects after direct contact with skin and eyes. They may also cause dizziness, nausea, headache, or dermatitis. Special care in handling genotoxic waste is therefore essential; any discharge of such waste into the environment could have disastrous ecological consequences.

4) **Hazards from radioactive waste** – Health effects caused by exposure to radioactive substances or materials can range from
reddening of the skin and nausea to more serious problems such as cancer induction and genetic consequences to offsprings of the exposed individual. The handling of high-activity sources, e.g., certain sealed and unsealed radiation sources used in cancer therapy poses higher health risks. The health hazards from low-activity contaminated wastes may arise from external and internal exposures to undetected contaminated working environment and from improper handling and storage of radioactive wastes and spent/unused radiation sources. Both the workers and other staff personnel are at risk to this health hazard.

**Hazards to public health and the environment.** The RHCWMM insists that apart from the risks to the patients and health care personnel, there is the impact of health care waste on the general public and environment to consider, too. Attention should be given in particular to the possible pollution of the air, water, and soil, including the aesthetic aspects. To minimize the risk to public health and the environment, one has to manage the health care waste within the health care establishment such as properly segregating and minimizing waste so that it does not enter the waste stream during disposal.

While the hospital personnel are at greater risk of infection through injuries from contaminated sharps, other hospital workers and waste management workers outside of the health care establishment are also at risk. Certain infections, however, spread through media or are caused by more resilient agents and therefore may pose a significant risk to the public. For example, the uncontrolled discharges of sewage from field hospitals treating cholera patients are a potential source of cholera epidemic. Feces and urine from patients in isolation wards should be disinfected before disposing in the sewer. However, the use of strong disinfectants should be minimized when there are alternatives.

Chemicals used in health care establishments are a potential source of water pollution via the sewer system. In fact, chemical waste survey is a prerequisite to the development of an effective waste management
program. Thereafter, any hazardous chemical waste generated should be dealt with by a proper chemical waste management system. Substituting chemicals with options that have lesser environmental and health impacts is a sound practice.

The public is very sensitive to seeing anatomical waste---specifically, recognizable body parts, including fetuses. Culturally, the country does not accept any inappropriate disposal of anatomical waste, such as on a landfill.

**Laws and Regulations Governing Health Care Waste**

The Philippines is not lacking in laws and regulations governing the management of health care waste. The most relevant are the following:

1) **R.A. 4226: The Hospital Licensure Act** – This law requires that all hospitals in the country must have a license to operate issued by the DOH, and mandates the latter to provide guidelines for hospital technical standards. Prior to approving any hospital's application to operate, the DOH requires that the former meets standards set by the Sanitation Code of the Philippines, the National Plumbing Code, National Fire and Building Code, Health Facilities Maintenance Manual, and the RHCWMM. This law provides one of the legal bases for the DOH to enforce compliance with its RHCWMM.

2) **P.D. 856: The Code on Sanitation of the Philippines** – The Code on Sanitation mandates the DOH to promote and preserve public health and upgrade the standard of medical practice. This Code provides the other legal basis for the DOH to issue and require compliance with the RHCWMM.
3) **R.A. 8749: The Clean Air Act of 1999** – This law encourages environmentally sound and safe non-burn technologies for the handling, treatment, and disposal of health care wastes. It prohibits the incineration of biomedical wastes that emit poisonous or toxic fumes.

4) **P.D. 1586: The Environmental Impact Statement (EIS) System** – This law requires health care facilities, among other institutions, to secure an Environmental Compliance Certificate (ECC) from the DENR’s Environmental Management Bureau prior to operations. Thus, a new health care facility must undergo an environmental impact assessment study.

5) **R.A. 9003: The Ecological Solid Waste Management Act of 2000** – This law seeks to ensure the protection of public health and the environment through the utilization of environmentally sound methods for treating, handling, and disposing of solid waste, and encourages waste minimization and segregation at the source.

6) **R.A. 6969: An Act to Control Toxic Substances and Hazardous and Nuclear Wastes** – This law sets policies and guidelines on the importation, manufacture, processing, handling, storage, transportation, sale, distribution, use, and disposal of toxic substances, and hazardous and nuclear wastes. Many of the requirements of the RHCWMM are drawn from provisions of this law.

7) **MMDA Ordinance No. 16** – This ordinance of the Metropolitan Manila Development Authority obliges all hospitals in Metro Manila to use four different types of trash bags for easy identification of waste. These are: (a) black bags for non-infectious dry waste; (b) green bags for non-infectious wet waste; (c) yellow bags for dry and wet potentially infectious waste, pathological waste, chemical waste, and
sharps contained in puncture-proof containers covered with solution of lime; and (d) orange bags with trefoil sign for radioactive waste that will be stored in the hospital until rendered inactive and/or disposed in accordance with the rules and regulations prescribed by the Philippine Nuclear Research Institute of the DOST.

All the pertinent provisions of the abovementioned laws and regulations are reflected in the RHCWMM (2005) of the DOH. Thus, compliance by a hospital with the RHCWMM will automatically mean compliance with all of the other laws and regulations. The RHCWMM is the single most significant and most complete guide to the proper management of health care waste.

**Waste Minimization**

The RHCWMM encourages waste minimization, as this reduces the volume of health care waste generated downstream. According to the Manual, the principles of waste minimization are the following:

1) Stakeholders to identify waste generation rates, current hazardous waste management strategies, and current waste management costs.

2) Health care establishment operators/owners to commit to waste minimization for it to be sustainable and successful in the long run.

3) Waste minimization programs to include a written policy with specific goals, objectives, and timelines.

4) Establishments to train employees on hazardous waste handling and site-specific waste minimization methods.

5) Establishments to be aware of and updated on the hazardous materials regulations.
The principal methods of waste minimization are to reduce at the source, reuse, and recycle. Reduction at the source can be done through substitution of materials, supplies, or equipment by less hazardous ones (e.g., using electronic thermometers and blood pressure gauges instead of units containing mercury). Reuse can be done by substituting disposable, one-time use items with reusable ones, thus lengthening their life cycle. Recycling is processing waste into something new and useful. Paper, plastic, metal, and glass are examples of easily recyclable materials.

The RHCWMM recommends implementing waste management strategies, taking into consideration the following:

1) Applying health care waste minimization strategies to specific areas of the facility;
2) Tracking the waste minimization efforts and comparing the results with the waste data gathered during the assessment phase of the program;
3) Documenting results and studying the system for continuous improvement;
4) Evaluating the waste minimization process to document success, determine training efficiency and needs;
5) Instituting policy directives that incorporate improved health care waste minimization processes; and
6) Planning new health care waste minimization pilot projects for future waste reduction.

**Health Care Waste Segregation, Handling, Collection, Storage and Transport**

The subsequent processes of handling, collection, storage, and transport of health care waste start with the identification and proper segregation of health care waste. The RHCWMM requires sorting such wastes into color-coded plastic bags or containers (Table 1).
Table 1. Color Segregation Scheme Specified in the RHCWMM

<table>
<thead>
<tr>
<th>Color of Bag or Container</th>
<th>Type of Waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>Non-infectious dry waste</td>
</tr>
<tr>
<td>Green</td>
<td>Non-infectious wet waste (kitchen, dietary, etc.)</td>
</tr>
<tr>
<td>Yellow</td>
<td>Infectious and pathological waste</td>
</tr>
<tr>
<td>Yellow with black band</td>
<td>Chemical waste including those with heavy metals</td>
</tr>
<tr>
<td>Orange</td>
<td>Radioactive waste</td>
</tr>
<tr>
<td>Red</td>
<td>Sharps and pressurized containers</td>
</tr>
</tbody>
</table>

Source: Revised Health Care Waste Management Manual (RHCWMM), 2005

The RHCWMM’s schematic diagrams for subsequent processes are shown in Figures 1, 2, and 3.

Figure 1. Storage, Collection, Treatment, and Disposal of Non-infectious Wastes

Source: Revised Health Care Waste Management Manual (RHCWMM), 2005
Figure 2. Storage, Collection, Treatment, and Disposal of Infectious Wastes, Chemical Wastes, Pathological Wastes, and Expired Pharmaceutical Wastes

Source: Revised Health Care Waste Management Manual (RHCWMM), 2005
Figure 3. Storage, Collection, Treatment, and Disposal of Sharp Wastes, Aerosols and Pressurized Containers, and Radioactive Wastes
Source: Revised Health Care Waste Management Manual (RHCWMM), 2005
In addition to the color-coding system, the RHCWMM prescribes the following waste collection practices:

1) Residuals of the general health care waste should join the stream of domestic refuse or municipal solid waste for proper waste management.

2) Sharps should be collected together, whether or not they are contaminated. Containers should be puncture-proof (usually made of metal or high-density plastic) and fitted with covers. They should be rigid and impermeable to contain not only the sharps but also any residual liquids from syringes. To discourage abuse, containers should be tamper-proof (difficult to open or break), and needles and syringes should be rendered unusable. Where plastic or metal containers are unavailable or too costly, containers made of dense cardboard are recommended.

3) Bags and containers for infectious waste should be marked with the international infectious substance symbol (Figure 4).

![Figure 4. Symbol of Infectious Waste Substance](image)

4) Highly infectious and other hazardous waste should, whenever possible, be treated immediately by one of the methods recommended in the Manual. It therefore needs to be
packaged in bags that are compatible with the proposed treatment process.

5) Cytotoxic waste, which is produced in major hospitals or research facilities, should be collected in strong, leak-proof containers clearly labeled “Cytotoxic wastes.”

6) Radioactive waste should be segregated according to its physical form (solid and liquid) and according to its half-life or potency (short life and long-life), and stored in especially marked containers as prescribed by the pertinent regulations of the Philippine Nuclear Research Institute (PNRI).

7) Small amounts of chemical or pharmaceutical waste may be collected together with infectious waste.

8) Large quantities of obsolete or expired pharmaceuticals stored in hospital wards or departments should be returned to the pharmacy for disposal. Other pharmaceutical waste generated at this level, such as expired drugs or packaging containing drug residues, should not be returned because of the risk of contaminating the pharmacy. It should be deposited in the specific container at the point of generation.

9) Large quantities of chemical waste should be packed in chemical-resistant containers and sent to specialized treatment facilities (if available). The identities of the chemicals should be clearly marked on the containers. Hazardous chemical waste of different types should never be mixed.

10) Waste with a high heavy metals content (e.g., cadmium or mercury) should be collected separately. These wastes can be sent to a waste treatment facility available in the area.
11) Aerosol containers may be collected together with general health care waste once they are completely empty. Aerosol containers should not be burnt or incinerated.

12) Appropriate containers or bag holders should be placed in all locations where particular categories of waste may be generated.

13) Staff should never attempt to correct errors of segregation by removing items from a bag or container after disposal or by placing one bag inside another bag of a different color. If general and hazardous wastes are accidentally mixed, the mixture should be classified as hazardous health care waste.

14) Cultural and religious constraints in certain parts of the country make it unacceptable for anatomical waste to be collected in the usual yellow bags. Such waste should be disposed of in accordance with the local custom, which commonly calls for burial.

The RHCWMM specifies that all health care waste should be collected and stored in a waste storage area until transported to a designated off-site treatment facility. This area should be marked with a warning sign: “CAUTION: BIOHAZARDOUS WASTE STORAGE AREA – UNAUTHORIZED PERSONS KEEP OUT.”

Storage areas for health care waste should be located within the establishment or research facility. However, these areas should be located away from patients’ rooms, laboratories, hospital function/operation rooms or any public access areas. The waste in bags or containers should be stored in a separate area, room, or building of a size appropriate to the quantities of waste produced and the frequency of collection. In cases where the health care facility lacks the space, daily collection and disposal should be enforced.
Cytotoxic waste should be separated from other wastes and instead stored in a designated, secured location. Radioactive waste should be stored separately in containers that prevent dispersion, and if necessary, behind lead shielding. A storage facility for radioactive waste must be conspicuously marked, “Radioactive Waste”.

These are the RHCWMM’s requirements on storage facilities within a hospital:

1) The storage area should have an impermeable, hard-standing floor with good drainage. It should be easy to clean and disinfect.

2) There should be water supply for cleaning purposes.

3) The storage area should be easily accessed by staff in charge of handling the waste.

4) It should be possible to lock the storage area to prevent access by unauthorized persons.

5) It is essential to give waste collection vehicles easy access to the storage facility.

6) There should be protection from the sun, rain, strong winds, floods, etc.

7) The storage area should be inaccessible to animals, insects, and birds.

8) There should be good lighting and adequate ventilation.

9) The storage area should not be situated near fresh food stores or food preparation areas.
10) A supply of cleaning equipment, protective clothing, and waste bags or containers should be located conveniently close to the storage area.

11) Floors, walls, and ceiling of the storage area must be kept clean according to established procedures, which at a minimum should include daily cleaning of floors.

12) Biodegradable general and hazardous waste should not be stored longer than two days to minimize microbial growth, putrefaction, and odors. If the waste is to be stored longer than two days, application of treatments such as chemical disinfection or refrigeration at 4°C or lower, is recommended.

On-site transport from source or point of waste generation to the storage area could utilize wheeled trolleys, containers, or carts that are dedicated solely for such purpose. On-site transportation vehicles should meet the following specifications:

1) Easy to load and unload.
2) No sharp edges that can damage waste bags or containers during loading and unloading.
3) Easy to clean.

The RHCWMM prescribes that the on-site collection vehicles should be cleaned and disinfected daily with appropriate disinfectants such as chlorine compounds, formaldehyde, phenolic compounds, and acids. All waste bag seals should be in-place and intact at the end of transportation.

Workers transporting the waste should be equipped with appropriate personal protective gears, including heavy-duty gloves, coveralls, thick-soled boots, and leg protectors.
Organization for Health Care Waste Management

To ensure that health care waste management will be given the attention it deserves, the RHCWMM identifies the major roles of select units within the health care establishment:

1) Office of the Administrator of the Health Care Facility

- Form a Health Care Waste Management Committee (HCWMC) to develop a written waste management plan for the health care facility.
- Designate a waste management officer/pollution control officer to supervise and coordinate the waste management plan.
- Keep an up-to-date waste management plan.
- Allocate sufficient financial and personnel resources to ensure efficient operation of the plan.
- Ensure that monitoring procedures are incorporated in the plan. The efficiency and effectiveness of the disposal system should be monitored so that the system can be updated and improved when necessary.
- Appoint/designate immediately a successor in the event of attrition among key personnel in the Committee, or temporarily assign responsibility to another staff member until a successor can be formally appointed/designated.
- Ensure adequate training for key staff members and designate the staff responsible for coordinating and implementing training courses.
- Attend to complaints and legal matters regarding existing and unforeseen problems arising from the implementation of the program.
- Establish good working relationships with other related agencies by engaging in proper referral, consultation and cooperation on health care waste management.
2) **Housekeeping Services**

- Maintain cleanliness and orderliness of the health care premises for aesthetic reasons.
- Assist in the preparation of the health care waste management plan.
- Maintain sanitation during the implementation of the pre-treatment, collection, and waste disposal procedures either by an individual, group, or municipal system.
- Establish baseline data, maintain proper filing system and update program records.
- Maintain constant good working relationship with all health care facility personnel so as to solicit their support and full participation in implementing the program.
- Enhance or provide continuous training to housekeeping/janitorial service members on waste management and government policies.

3) **Maintenance and Ground Services**

- Assist in the proper collection, pre-treatment, and disposal of health care waste.
- Carry out directly the activities related to the operation and maintenance of pre-treatment, collection, and disposal system as soon as possible. Give importance to the drainage system and plumbing facilities of the establishment.
- Attend immediately to problems arising from the repair/installation of waste equipment.

4) **Motorpool Services**

- Assist in the provision of a vehicle for transporting health care waste to a transfer station or disposal site.
• Prepare and plan the collection system routes and frequency of collection of health care waste.

• Inspect and schedule maintenance work on vehicles used for transporting health care waste.

The RHCWMM further requires the creation of a HCWMC, whose functions are the following:

• Promulgate a policy formalizing the commitment of the health care institution to proper management of its waste, and protection of health and environment.

• Establish baseline data and develop the facility’s health care waste management plan, which should include a minimization plan, training, and written guidelines on waste management.

• Implement the health care waste management plan, and review and update the policy, plans, and guidelines annually.

Typically, the HCWMC will be composed of:

• Administrator of the health care facility – Chairperson of the Committee

• Heads of departments

• Infection Control Officer

• Chief Pharmacist

• Radiation Officer

• Senior Nursing Staff

• Health Care Facility Engineer

• Financial Controller

• Waste Management Officer

• Health Education/Information Officer
The waste management officer (WMO) is responsible for the day-to-day operation and monitoring of the waste management system, and should therefore have direct access to all members of the HCWMC. In some hospitals, the WMO is also the head of the Housekeeping/Janitorial Department. The WMO directly reports to the administrator of the health care facility. Its responsibilities include:

- Oversee the internal collection of waste and their transport (ensuring availability of waste bags, protective clothing, and collection carts) and directly supervise collection crews.
- Ensure adequate financial and human resources for implementation of the health care waste management plan.

The RHCWMM requires the HCWMC to develop and regularly update a comprehensive health care waste management plan, which is the key ingredient to successful waste management within the health care facility. To successfully implement and effectively handle health care waste, training of staff on the plan is critical. The RHCWMM outlines the procedures in the making of the plan as thus:

1) Understanding the existing government policies, laws, and regulations related to health care waste management.

2) Reviewing the current waste management system within the facility before drafting or revising a health care waste management plan. Some issues that need to be addressed are:

- Where the waste is generated
- What types of waste are being generated
- How and where the waste is being stored
- The cost effectiveness of the current handling process
3) Designing the Plan – A primary consideration in the design of the health care waste management plan is that it must address the existing and future needs of the facility. The design phase should ensure that the plan is capable of handling the current waste stream as defined in Steps one and two.

4) Training – Comprehensive training and orientation on how the plan is to be implemented must be provided to employees. In carrying out the plan, each of the staff should know his/her individual roles.

5) Plan Evaluation – The plan should be regularly reviewed and updated to reflect the improvements made in the handling of waste within the health care facility.
The Study on Health Care Waste Products

Background of the Study

The idea of conducting case studies on how well (or how poorly) major public and private hospitals in Metro Manila comply with accepted health care waste management standards (as embodied in the RHCWMM) came from a graduate level (MBA) course in Operations Management (OPEMAN), in which the author was one of six faculty members assigned by the Ateneo Graduate School of Business (AGSB) to teach Year Level 8 students (i.e., clerks or fourth-year medical students) of the Ateneo School of Medicine and Public Health (ASMPH).

The ASMPH has an innovative dual-degree program that seamlessly combines medical studies with training in management and public health. Students graduate with two degrees: MD and MBA, and have significant exposure to public health issues.

As part of the course requirements, the Year Level 8 OPEMAN students were made to undertake research projects within a real-life health care institution, focusing on operations management concerns and issues. During class discussions, the issue of health care wastes (the inevitable by-products of hospital operations) and their impacts on public health and the environment came up. Metro Manila has a high-population density and, therefore, health care waste hazards can have potentially disastrous public health consequences. The author-professor encouraged students to form small teams and investigate the health care waste management practices of the hospitals where they had been assigned as part of their clerkship rotations. The resulting reports and presentations would constitute their final course requirement in lieu of a final examination. Many students enthusiastically volunteered to do this project.
Objectives

The objectives of the study were as follows:

1) To raise the consciousness of the Year Level 8 students on the link between protecting the environment and promoting public health;

2) To sensitize the students on the unique hazards created by health care wastes and how these hazards could be minimized through proper management (in line with the MBA side of their education);

3) To identify both best practices and deficiencies in the waste management practices of major public and private hospitals in Metro Manila; and

4) To recommend to hospital managers certain courses of action that will help their institutions minimize their various stakeholders’ (i.e., patients and their families, visitors, employees and staff, contractors, waste management workers, and the public in general) exposure to health care waste hazards.

Methodology

The ASMPH Year Level 8 OPEMAN students formed six teams, each focused on a particular hospital. Because the hospitals had collaborative relationships with the ASMPH, the students were assigned to these for two months as part of their medical studies. Aside from learning about particular specialties of medical science, the students gathered data, interviewed personnel involved in hospital waste management, reviewed records, made personal observations, took pictures, and did other research activities during their rotation in the hospital. In the process, they were able to familiarize themselves with their hospital’s unique culture and operational characteristics. They also got to know the hospital personnel very well, which gave them good access to valuable
internal data on waste management. On the overall, they evaluated their subject-hospital against the requisites of the RHCWMM, which all had to read *a priori* and whose provisions they had to be knowledgeable on.

The hospitals and the students who conducted the research are shown in Table 2.

Table 2. List of Hospitals and Students Who Conducted the Research on Waste Management

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Ownership</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rizal Medical Center, Pasig City</td>
<td>Public</td>
<td>Patricia See, Harold Tan, &amp; John Michael Teotico</td>
</tr>
<tr>
<td>Philippine Children’s Medical Center, Quezon City</td>
<td>Public</td>
<td>Danize Edika Buemio &amp; Ronald Chua</td>
</tr>
<tr>
<td>East Avenue Medical Center, Quezon City</td>
<td>Public</td>
<td>Lawrence T. Bello &amp; Edronel de la Cruz</td>
</tr>
<tr>
<td>Veterans Memorial Medical Center, Quezon City</td>
<td>Public</td>
<td>Jose Lorenzo Angeles &amp; Jose Bernardo Ronquillo</td>
</tr>
<tr>
<td>Philippine Orthopedic Center, Quezon City</td>
<td>Public</td>
<td>Mary Pauline Denise Castro &amp; Arnel Christian Dy</td>
</tr>
<tr>
<td>The Medical City, Pasig City</td>
<td>Private</td>
<td>Blythe N. Ke &amp; Chelsea G. Samson</td>
</tr>
</tbody>
</table>

Source: The Author

It is worth noting that of the six hospitals listed above, four (Rizal Medical Center, Philippine Children’s Medical Center, East Avenue Medical Center, and Philippine Orthopedic Center) were gratefully acknowledged by Secretary of Health Manuel M. Dayrit in the Foreword of the RHCWMM for having “shared their insights and experiences during the series of workshops and public consultations whose struggles, debates, and arguments have greatly influenced and contributed to the refinements of the Revised Health Care Waste Management Manual.”

The students presented their findings, analysis, conclusions, and recommendations in class and submitted a written report to the author-professor. Each presentation was followed by a question-and-answer segment with the professor and the rest of the class. The written reports became the basis for the six case studies in this paper.
Rizal Medical Center (RMC) is a tertiary, DOH-retained hospital that serves as a charity institution catering to indigent patients and the residents from nearby communities. It has a total capacity of 300 beds and is located along Pasig Boulevard, Barangay Pineda, Pasig City. It provides consultation services in various medical specialties as well as a wide range of medical services, including radiological services and laboratory testing services. A current thrust of the hospital involves human resource development, particularly the continuing education for employees. It has been honored with the Philippine Health Insurance Company (PhilHealth) Award of Excellence and is a Gold Awardee for “malinis, mabango na ospital” (clean and fragrant hospital) by the DOH. Because it sits within a highly populated catchment area and offers lower treatment cost as a public hospital, RMC has a very high occupancy and capacity utilization rate.

The construction of the Rizal Provincial Hospital was initiated in 1939 and made possible in 1941 by virtue of Congressional Act 3114 and later amended by Act 3168. It opened to serve the general public in the same year, with a handful of detailed personnel. Badly damaged during World War II, the hospital was rehabilitated and re-
opened in January 1947. It changed its name to Rizal Medical Center to reflect its growth in size and medical capabilities over the years. It is under the supervision and direct control of the director of the Bureau of Health Facilities and Services, with the chief of the hospital as its authorized representative.

**Mission and Vision**

**MISSION**

*We, at RIZAL MEDICAL CENTER, are committed to provide comprehensive, globally competitive quality health care services to all Filipinos, through compassionate, affordable and safe care; continuing education, training and research; state-of-the-art technology; active integration of Public Health measures; and, efficient utilization of resources.*

**VISION**

*The RIZAL MEDICAL CENTER is an institution of excellence providing world-class health care services to all.*

**The RMC Health Care Waste Management Committee**

RMC has organized its HCWMC in compliance with the RHCWMM. Its HCWMC’s organizational chart (Figure 5) is characterized as flat/horizontal, emphasizing the need for collaboration and coordination among the various stakeholders of waste management in the hospital. The strength of the horizontal structure is that it allows for quick communication among the committee members so that issues and concerns would be brought up proactively. *A key weakness of the organizational chart of the Waste Management Committee is that it does not have a representative from the Janitorial Services* (underscoring supplied). The study’s research team believes that the janitorial services division is a key unit in undertaking waste collection, transport, and storage.
Assessment of the Organizational Chart of the Waste Management Committee

The roles and responsibilities of the Waste Management Committee members are stated below (as taken from the Waste Management Manual of the Rizal Medical Center):

**Chairman**
- Organizes a Waste Management Committee to develop a waste management plan for the hospital.
- Designates a waste management officer (WMO) to supervise and coordinate the waste management plan. The chairperson retains overall responsibility of ensuring that the health care waste is disposed of in accordance with the national policies and guidelines.
- Keeps an up-to-date waste management plan.
- Allocates sufficient financial and personnel resources to ensure efficient operation of the plan.
- Ensures that monitoring procedures are incorporated in the plan. The efficiency and effectiveness of the disposal system should be monitored so that the system can be updated and improved when necessary.
• Ensures adequate training for key staff members and designate the staff responsible for coordinating and implementing training courses.

Waste Management Officer (WMO)

• Responsible for supervision of the day-to-day operations and monitoring of the waste management system.
• Has direct access to all the members of the hospital staff.
• Directly responsible to the medical center chief.
• Liaises with the infection control officer, pharmacist and radiation officer, and other department heads so as to become familiar with the correct procedure for handling and disposing of all kinds of waste in the hospital.
• Has control over the internal collection of waste containers and their transport to the storage facility/waste holding area.
• Ensures the availability and proper use and maintenance of waste collection supplies and facilities.

Assistant Waste Management Officer

• Provides technical assistance to the WMO in all her duties and responsibilities.
• Serves as secretariat during all committee meetings; responsible for all document proceedings.

Department/Section Heads

• Responsible for the segregation, storage, and disposal of waste generated in their department.
• Ensure that all staff under their departments are aware of the segregation and storage procedures and that all personnel comply with the highest standards.

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Case 1: Rizal Medical Center (RMC) in Pasig City
• Ensure that key staff members in their departments are given training in waste segregation and disposal procedures.
• Encourage medical and nursing staff to be vigilant in ensuring that hospital attendants and ancillary staff follow correct procedures at all times.

Senior Nursing Officer or Nursing Instructor or Health Educator and Personnel Officer

• Responsible for organizing hospital staff’s training on the correct procedures for segregation, storage, transport, and disposal of waste.
• Liaises with department/section heads regarding training activities and other waste management issues specific to particular departments/sections.

Infection Control Officer, Pharmacist and Radiation Officer

The infection control officer, pharmacist, and radiation officer have the same duties and responsibilities but relate to their particular fields of expertise.

• Liaise with the WMO on a continuous basis by providing advice on the control of infection, national policy and guidelines on pharmaceutical and radioactive waste disposal.
• Identify training requirements according to staff level and field responsibilities.

Financial Controller / Supply Officer

• Liaises with the WMO to ensure continuous supply of items required for the implementation of the waste management program.
Hospital Engineer / Pollution Control Officer

- Responsible for the installation and maintenance of waste storage facilities and handling of equipment that comply with the specifications of the national guidelines.
- Accountable for the adequate operation and maintenance of any site treatment equipment.
- Trains the principles on waste disposal and on their responsibility over the staff involved in waste treatment.

Assessment of Roles and Responsibilities

The research team observed one key problem with regard the roles and responsibilities of these stakeholders: That is, that members of the Waste Management Committee lack awareness of the roles and responsibilities assigned to them (underscoring supplied). For example, the research team’s interview with the hospital engineer showed his lack of knowledge on the waste management operations being conducted in the hospital. It is therefore imperative that each Committee member must be aware of the tasks assigned to him/her so that operations would run as smoothly as possible. Furthermore, the research team found out that there are no accountability mechanisms set by the hospital in cases where the members of the waste management committee do not comply with the stated roles and responsibilities (underscoring supplied). There ought to be a means of ensuring that the committee members commit themselves to the stated responsibilities.

The objectives set by the committee include:
1) To implement proper management of health care waste;
2) To make hospital patients, personnel, and people in the community aware of the risks and hazards brought by improper waste disposal; and
3) To minimize and eventually eliminate disease transmission, accidents, environmental pollution through proper health care waste management.

Assessment of Objectives

It is critical to note that the Committee’s objective statements lack specificity, measurability, and time-bound characteristics (underscoring supplied). The objectives set should be measurable. For example, the third objective---i.e., minimizing and eventually eliminating disease transmission through proper implementation of health care waste management---lacks clarity on how hospital administrators would be able to assess whether disease transmission lessened due to enforcement of proper waste management techniques.

Strategies formulated by the Committee to address the waste management situation are as follows:

1) To create a Hospital Waste Management Committee (HWMC);
2) To conduct Committee monthly meetings on how to effectively implement the health care waste management plan;
3) To develop a waste management monitoring checklist that will be evaluated by its members;
4) To implement guidelines aligned with the provisions in the DOH’s health care waste management manual and the hospital’s own waste management manual;
5) To conduct regular orientation seminars, trainings, and workshops for hospital personnel;
6) To conduct continuous information dissemination to patients and watchers by using IEC materials and health education;
7) To allocate sufficient financial and manpower resources; and
8) To establish a baseline data and develop the facility’s health care waste management plan, which should include a minimization plan, training, and written guidelines on waste management.

Assessment of Strategies

The research team commended the creation of a Waste Management Committee that would oversee the waste management plan befitting the hospital. Nevertheless, it is important to note that some of the strategies conceptualized have not been properly implemented. For example, the waste management monitoring checklist is not been completed as of the moment. As such, there is no clear assessment on whether the policies set by the Waste Management Committee are being followed or not. Also, the financial resources needed to efficiently implement the waste management plan continue to be lacking, as evidenced by the lack of workshops that were supposed to educate employees on the importance of segregating waste (underscoring supplied). In the past year, there had only been one workshop on waste management for employees.

The RMC Waste Management System

According to RMC approximately 160 kilos of all hospital wastes are accumulated per day. The Waste Management Committee was able to identify the key areas of the hospital where waste is generated. According to the Rizal Medical Center’s Manual on Health Care Waste Management, waste is generated in the out-patient department, emergency room, the wards, specialty areas, and other administrative locations.

However, latest data on overall waste generation continues to be lacking. Non-infectious wastes are collected daily by the waste management services of Pasig City. They no longer weigh non-
infectious wastes like they used to in 2007, thereby making it difficult to estimate the total wastes generated daily.

On the other hand, the hospital still continues to avail of the services of Chevalier Envirotech Services Corporation for the collection, treatment, and disposal of infectious wastes. The hospital is billed by the kilo, thus requiring them to weigh their infectious wastes prior to collection. Figure 6 shows the total amount of infectious wastes collected from July 2010 to June 2012, while Figure 7 shows the yearly total amount of infectious wastes produced from 2010 to 2012.

Figure 6. Total Amount of Infectious Wastes Collected per Month, July 2010- June 2012

Source: Rizal Medical Center
Segregation of waste is facilitated through the use of a three-color scheme of categorizing waste. Trash bins covered with yellow plastic are designated for infectious waste. Meanwhile, trash bins lined with black plastic are assigned for non-infectious, dry waste. Furthermore, trashcans with green plastic are for non-infectious, wet waste. For sharps such as needles, scalpels and test tubes, separate containers are used.

Department heads are in charge of ensuring that waste segregation is followed in hospital offices. Meanwhile, nurses are in charge of ensuring waste segregation in the wards. While responsibilities are assigned in the waste segregation drive, there are no accountability mechanisms put into place to ensure that individuals who do not follow the policies and procedures would be penalized (underscoring supplied). Such accountability measures should be considered if one aims to see that the waste segregation policies are adherence to.

**Assessment of Waste Segregation**

*Figure 7. Yearly Total Amount of Infectious Wastes Produced, 2010-2012*

*Source: Rizal Medical Center*

**Case 1: Rizal Medical Center (RMC) in Pasig City**
From interviews and walk-through analyses, the research team concluded that waste segregation continues to be a problem in the hospital. *Cases where both hospital personnel and patients discard waste in the wrong trash bin still abound. As such, infectious and non-infectious wastes become mixed with one another* (underscoring supplied).

*Additionally, segregation efforts are hampered by the lack of trash bins in the hospital.* The research team’s inspection of the operating room wards, for example, showed that only one yellow trashcan is available in each ward (Appendix A). Green or black trashcans are nowhere found in the operating room wards. *This is a problem because it creates a situation where hospital staff would be forced to discard non-infectious and infectious waste in one receptacle* (underscoring supplied).

Interestingly, the research team also discovered that there are no trash bins present in the cafeteria. *When the employees were asked where the trash bins were, they disclosed that the trash bins were sent immediately to the main storage area* (underscoring supplied). Ideally, trash bins should be always available in each location of the hospital, even during times that the trash bins are being moved to storage areas.

*Furthermore, segregation is made more difficult with the lack of signages indicating what the three-colored scheme means* (underscoring supplied). The research team observed that only the wards had signages with pictures of objects that may be dropped in the specific trash bins. Meanwhile, signages in the recovery room only list down the names of objects that may be placed in the specific trash bins (Appendix B), making it harder for individuals to easily figure out what objects should go to which trash bin.

**Assessment of Waste Collection and Transport**

Collection of waste happens four times a day: twice early in the morning (6:00am and 10:00am), and twice in the afternoon (2:00pm and 4:00pm). The maintenance staff collects waste from the different
locations of the hospital, making sure that the different types of waste are properly segregated from one another. Janitors use gloves as protective gear in collecting the waste. Afterward, a push cart is used to transport the waste to the main storage areas.

A major problem discovered by the research team during waste collection and transport is the lack of protective gear for the maintenance staff (underscoring supplied). Their uniform does not protect most of their bodies, making them susceptible to the pathogens present in the garbage. Another major issue raised is the lack of set route in transporting waste from one location to another. The movement of waste within the hospital may endanger the health of hospital personnel and visitors (underscoring supplied). As such, the hospital must look into developing a route least used by people.

Assessment of Waste Storage

Waste gathered from the operating room ward is initially stored in the nurses' dressing room (underscoring supplied) (Appendix C). This creates a situation where the health of the nurses is endangered because pathogens may be present in the garbage temporarily stored in the nurses' room. Later, waste from the operating room ward, together with waste from other locations of the hospital, would be transported to the garbage houses, which are three shacks that correspond to the type of waste being deposited (Appendix D). The green shack is for non-infectious, wet waste; the yellow shack, for infectious waste; and a black shack, for non-infectious, dry waste. Based on observations, these storage shacks are well maintained.
**Assessment of Waste Treatment**

The hospital employs different equipment to properly disinfect wastes. Disinfection units are used for potentially infectious moist liquid. Meanwhile, specific chemical disinfectants are employed to sterilize general waste, infectious waste, pathologic waste, and sharps. However, one significant problem observed is that the water treatment in the hospital remains non-functional. As such, contaminants and pathogens may seep into the water supply, resulting in health risks to people in nearby areas (underscoring supplied).

**Assessment of Waste Disposal**

In the hospital, the nursing station’s comfort room is used as a disposal area for feces and urine samples (Appendix E). This practice is troubling since the feces and urine samples may contain pathogens that would be transported to the drainage, contaminating the nearby water bodies (underscoring supplied). The Waste Management Committee needs to deliberate on an alternative way of disposing feces and urine samples.

For non-infectious waste, the municipal government picks up the garbage everyday and brings them to authorized landfill areas. The disposal of non-infectious waste is free. Meanwhile, contractor Chevalier Envirotech Services Corporation collects infectious waste every Monday, Wednesday and Friday, bringing the garbage to a sanitary landfill approved by the Department of Environment and Natural Resources. Rizal Medical Center pays a fee of P20,000 to P30,000 in compensation for the disposal services provided by Chevalier.

**Assessment of Waste Recycling**

To facilitate recycling of waste, the hospital segregates plastic bags, used cooking oil, and empty bottles, which are sold to willing buyers. Furthermore, leftover food is sold as animal feed, providing additional revenue to the hospital. Old linen is used as rags by the hospital staff.
Other objects that are recycled by the hospital include papers, empty IVF bottles, cans, dry leaves, vehicle tires, and old x-ray films.

**Assessment of Communications and Training**

Rizal Medical Center has undertaken a one-day training seminar last April 2012 to discuss the importance of waste management in the day-to-day operations of the hospital. The seminar discussed waste segregation protocols of the hospital and the process flow involved in waste management. Unfortunately, the training seminar has not been regularly conducted. *In the past two years prior to April 2012, there has been no training seminars conducted* (underscoring supplied).

Lectures regarding waste management are, however, provided in the outpatient department and wards of the hospital. Furthermore, all waste management policies, procedures and information are disseminated to all hospital employees, patients, visiting clients. The use of various information dissemination tools is critical in communicating the waste management policies of the hospital to employees and patients.

*Unfortunately, interviews and walk-through analyses undertaken by the research team showed that lack of awareness on waste segregation protocols continues to be a problem in the hospital. Cases where hospital personnel and patients discard waste in the wrong trash bin have been documented* (underscoring supplied). As such, infectious and non-infectious wastes mixed with one another.

**Assessment of Budgeting**

According to the Rizal Medical Center’s WMO, the budget for the Waste Management Committee is limited to payment of infectious waste disposal services rendered by Chevalier Corporation. Budget allotted for training programs is limited to food since the hospital depends on in-house resource speakers. *There is no funding plan developed to help finance the waste management operations of the hospital* (underscoring supplied).
Assessment of Monitoring and Evaluation

To monitor the waste management operations of the hospital, members of the Waste Management Committee randomly go to the wards and check whether waste is placed in the appropriate waste basket. Since January 2010, there have been three random inspections made. The use of such monitoring tools should be applauded. Nevertheless, there must also be a way for the hospital to hold erring employees or patients accountable for failing to put their trash in the right waste basket.

Records keeping is another important tool in evaluating the waste management operations of the hospital. *Unfortunately, the hospital does not have updated records pertaining to hospital waste. The latest records were dated to be from 2007.* In such a case, it is important for the hospital to obtain baseline data regarding its waste management operations so that they could determine the actions they need to take to improve the flow of operations.

Recommendations of the Research Team

1) The hospital’s HCWMC should make its health care waste management objectives more specific, with measurable indicators and timelines. Once strategies have been agreed upon, responsibilities should be assigned to specific individuals and units, and the proper financial and human resources allocated. Reviews on the progress of the plan implementation should take place regularly. Problems identified should be resolved quickly and permanently.

2) The Janitorial Liaison Officer, who interfaces with the contractual janitorial agency, should be made a member of the HCWMC.
3) Rizal Medical Center has to establish accurate and documented baseline data on volumes of each type of health care waste and on the sources of such wastes.

4) The hospital should improve the trash bin identification signs by including pictures or illustrations of items that should fall under each bin category. The bins should be brightly painted with the appropriate waste-classification color. These improvements in identification will reduce the possibility of individuals throwing their trash in the wrong bin.

5) In handling waste, the janitorial staff should be provided with adequate protective gear to prevent the transmission of pathogens and diseases. The janitorial staff should be armed with latex gloves, tongs/forceps, and masks. Furthermore, the Waste Management Committee should study the floor plan of the hospital to devise set routes wherein waste would be passing by with as little public contact as possible.

6) The hospital administrators should refrain from using the nurses’ dressing room as temporary storage area for wastes gathered from the operating room wards. There should be an assigned location where waste is temporarily stored so that the risk of infections and pathogen transmission would be reduced.

7) The hospital should have the water treatment facilities fixed at the soonest time possible. Through proper water treatment, the water supply of the hospital and nearby areas would be safer.

8) The hospital should ensure that feces and urine samples would not be disposed in the nurses’ comfort room. The hospital staff’s health and well-being should be guarded against unhygienic waste management practices. Also, throwing feces and urine samples in the comfort room can
endanger the water supply since there may be pathogens present in the samples gathered. Hospitals without an operating treated sewage system should break up the feces and empty it into a can that has a 5 percent solution of phenol or cresol type disinfectant. This procedure would ensure that infectious particles would not be present in the feces sample.

9) To improve adherence to waste management policies and guidelines, the hospital can emulate the profit-sharing program employed by the Philippine Children’s Medical Center. Hospital employees that are directly involved in the waste management operations should receive incentives from the sales of food or recyclable waste. Through this incentive program, the employees would be better motivated to properly segregate waste.

10) To improve the hospital personnel’s awareness of waste management policies and updates, training seminars should be conducted as a one-day affair once a quarter. Topics to be discussed may include lectures on the possible risks of hospital waste, waste generation, segregation, collection, storage, and disposal. Training seminars should also emphasize the responsibility of each hospital staff in applying proper waste management in their work area. These can also come in the form of walkthrough tours to landfills so that the hospital employees can understand better the entire waste management system. Furthermore, evaluations prior to and after the seminars should be conducted so that the seminar handlers would be assured that the participants understood the lectures.

11) Likewise, the hospital should provide standardized and regular patient education sessions on proper waste segregation and disposal. Such sessions could further extend this awareness of the proper waste segregation to hospital visitors.
12) The research team proposes a multimedia approach to disseminating information on proper waste management. In fact, the research team created posters that informed and reminded hospital employees and visitors on the waste management policies of Rizal Medical Center. These posters carried information about proper waste segregation and disposal as well as emphasized the risks of improper waste handling.

13) The research team also created an audiovisual presentation that explained the waste segregation and disposal policies of the hospital and informed employees on the risks associated with improper waste handling. Through the video, the research team hoped to inspire the employees to take responsibility over the proper waste management in their areas.

14) The Waste Management Committee should develop a budget plan that would estimate the amount of money needed to sustain and fulfill the waste management operations of the hospital.

15) Accountability mechanisms should be put into place in each segment of the waste management operations. Monitoring of waste management procedures should be undertaken at least once a week to ensure adherence to policies. Each department would have a waste management overseer who is responsible for waste segregation and disposal in the area.

16) Finally, accountability mechanisms should be enforced among the members of the hospital staff. Employees who do not adhere to the waste management policies and guidelines for the first time would be informed on the error committed. On the second offense, they would be publicly reprimanded. The third and subsequent offenses should then be reflected in their records. Erring employees and staff should also be
mandated to attend training seminars on waste management. Through this mechanism, the hospital staff would be more disciplined to follow its waste management policies.

**Conclusion**

Proper waste management continues to be an important concern in the Rizal Medical Center as shown in Figures 8, 9, 10, 11, and 12. Hospital employees and visitors still lack awareness and knowledge of the hospital's waste management policies. Furthermore, accountability mechanisms and safe operation protocols have not been set in place. Despite these problems in waste management, there is still hope in improving the situation. By developing a multimedia information dissemination campaign and setting appropriate accountability mechanisms and operational protocols, the Rizal Medical Center can become a more environmental-friendly hospital for visitors and employees.

*Figure 8. Photo of a Trashcan in the Operating Room (OR) Ward*

Source: Rizal Medical Center

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*Occasional Paper No.14*
Case 1: Rizal Medical Center (RMC) in Pasig City

Figure 9. Signage in the Recovery Room Wards Uses Words Instead of Pictures/Visual Representations

Source: Rizal Medical Center

Figure 10. Use of the Nurses’ Dressing Room as Temporary Waste Storage Area Creates a High-risk Situation for the Nurses

Source: Rizal Medical Center
Figure 11. Observed the Use of a Color-coded Scheme for Waste Storage Area of the Hospital

Source: Rizal Medical Center

Figure 12. Nurses’ Comfort Room. Feces and urine samples are discarded into the toilets of the nurses’ comfort rooms, which may contaminate the nearby water supply.

Source: Rizal Medical Center
The Philippine Children’s Medical Center (PCMC) is a specialized hospital and health institution that is one of the government-owned and controlled National Centers for Specialized Health Care under the DOH. It is a tertiary-capacity hospital mandated to provide pediatric care, give additional training programs for medical and allied health care providers, and be a specialized center for clinical research. It is located along Quezon Avenue, Diliman, Quezon City.

One of the medical center’s major thrusts is to be globally competitive in terms of quality and comprehensive health care for infants and even women.

The PCMC has 163 medical consultants, of which 1.84 percent (3 consultants) are active and do their duties full time. Then, 39.26 percent (64 consultants) are part-time and 58.90 percent (96 consultants) are on honorarium basis in the medical center. There are also 46 residents and 13 fellows per year who participate in research and submit research papers.

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2 Based on the final report written by Danize Edika Buemio and Ronald Chua of ASMPH Year Level 8 and on information found in the website www.pcmc.org.ph.
The PCMC has a 200-bed capacity but can accommodate 270 admitted patients. On average, there are 25 to 30 admissions per month. During peak seasons, the number can reach up to 50 admissions. With such number of patients, the hospital incurs a significant amount of wastes every day, ranging from food wastes, non-infectious dry wastes to pathologic wastes.

**Segregation of Health Care Waste**

The PCMC only uses a three-color scheme in segregating their health care wastes: green, black, and yellow.

- **Green** - *basa* (nabubulok) – mostly food wastes
- **Black** - *Di-nabubulok* – paper, newspaper, plastic cups, softdrink bottle, candy wrapper, medicine bottles, medicine boxes, and plastic bags
- **Yellow** – tubings, disposable diapers, IV fluids, gauze, gloves, tissue, cotton, masks, organ tissues, needles, and other pathologic wastes

The PCMC somehow follows the basic steps in waste disposal. However, their infectious wastes, chemical wastes, and pathologic wastes all go into the same yellow plastic bag. Even though their sharps are initially placed in a plastic bottle container, these will then be mixed with the other wastes in the yellow plastic bag. The yellow bag will then be transported to the yellow storage room.

Food wastes from the green garbage bins will be delivered to the Dietary section and then placed in a 3-kg waste can that takes in an average of 30-50kg of food waste daily. These wastes are then collected by Lope K. Cortega Piggery everyday (including holidays) from 5:30pm to 7:00pm. It was Lope K. Cortega Piggery that won the bidding process for the service in the year 2012. Based on their memorandum of
agreement, the service provider pays PCMC a monthly rate regardless of the amount of food waste collected.

Wastes in the black garbage bins are directly brought out to the black storage room outside the hospital. The Metropolitan Manila Development Authority (MMDA) collects the wastes from the black bins every day.

The pathologic wastes from the yellow garbage bins are also directly brought out to the yellow storage room, just beside the black storage room outside the hospital. These wastes are collected two to three times a week by Chevalier Envirotech Services Corporation, an independent specialist in the fields of water treatment, waste water treatment, air treatment, as well as waste treatment and disposal. It played an active role in China’s sewage, water and air treatment works, joint ventures and Build-Operate-Transfer projects. Chevalier has further extended its expertise to the Philippines and set up a facility in Manila to collect, treat and dispose medical waste, using the microwave disinfection technology.

Figures 13 and 14 show the waste disposal system of PCMC. These include general wastes, biodegradable wastes, and pathologic wastes.
Collect garbage from offices, patients' rooms and doctors' clinic

General waste, infectious, or biodegradable?

General Waste

Place in black garbage bag hanged in the wheeled trolleys

Transport from the rooms to garbage storage located at the back of the hospital building

General waste is collected twice weekly by the MMDA (Tuesdays, Thursdays)

End

Figure 13. Process of General Waste Collection
Source: Philippine Children's Medical Center
Case 2: Philippine Children's Medical Center

Figure 14. Process of Biodegradable and Infectious/Sharp Waste Collection
Source: Philippine Children’s Medical Center
In PCMC, sharps are placed in a rigid and impermeable plastic bottle. These bottles are then placed in the yellow plastic bag as part of the pathologic wastes.

Generally, bags and containers for infectious waste should be marked with the international infectious substance symbol. However, waste bags and containers in PCMC don’t bear the symbols (underscoring supplied).

**Volume of Health Care Waste**

Since PCMC, a public tertiary hospital, receives many patients, it consequently produces a lot of wastes. It, however, does not monitor the volume of its non-infectious wet wastes, which are predominantly food wastes. This is primarily because Lope K. Cortega Piggery pays them a fixed monthly amount regardless of the volume of food wastes collected every day. The hospital, however, does estimate their daily food waste at around 30-50 kg based on the number of waste cans filled up daily (10 to 15). Each can carries at least 3 kg of food wastes.

Table 3 presents the amount of general non-infectious dry wastes from January 2010 to August 2012.

**Table 3. The amount of General Non-infectious Dry Wastes, January 2010 - August 2010**

<table>
<thead>
<tr>
<th>Month/Year</th>
<th>2010 (kg)</th>
<th>2011 (kg)</th>
<th>2012 (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>5578</td>
<td>6344</td>
<td>8675</td>
</tr>
<tr>
<td>February</td>
<td>6143</td>
<td>6721</td>
<td>8234</td>
</tr>
<tr>
<td>March</td>
<td>5905</td>
<td>6112</td>
<td>8761</td>
</tr>
<tr>
<td>April</td>
<td>5987</td>
<td>6347</td>
<td>8535</td>
</tr>
<tr>
<td>May</td>
<td>6729</td>
<td>6995</td>
<td>8903</td>
</tr>
<tr>
<td>June</td>
<td>6103</td>
<td>6965</td>
<td>8655</td>
</tr>
<tr>
<td>July</td>
<td>5098</td>
<td>6566</td>
<td>8123</td>
</tr>
<tr>
<td>August</td>
<td>6145</td>
<td>6324</td>
<td>8455</td>
</tr>
</tbody>
</table>
Case 2: Philippine Children’s Medical Center

Figure 15 shows that there is a 42 percent and a 31 percent increase in the amount of general waste generated in the first semester of 2012 compared to the same periods in 2010 and 2011, respectively. More dry wastes were consumed in 2012 compared to 2010 and 2011.

Figure 15. Monthly Collection of General Waste, January 2010 - August 2012
Source: Philippine Children’s Medical Center

(...Table 3 continuation)

<table>
<thead>
<tr>
<th>TOTAL (1)</th>
<th>47688</th>
<th>52374</th>
<th>68341</th>
</tr>
</thead>
<tbody>
<tr>
<td>September</td>
<td>6198</td>
<td>6235</td>
<td></td>
</tr>
<tr>
<td>October</td>
<td>5893</td>
<td>6128</td>
<td></td>
</tr>
<tr>
<td>November</td>
<td>5991</td>
<td>6456</td>
<td></td>
</tr>
<tr>
<td>December</td>
<td>6201</td>
<td>6989</td>
<td></td>
</tr>
<tr>
<td>TOTAL (2)</td>
<td>71971</td>
<td>78182</td>
<td></td>
</tr>
</tbody>
</table>

Source: Philippine Children’s Medical Center
Table 4 shows the amount of pathologic wastes that PCMC collected per month for the past three years.

Table 4. Monthly Collection of Pathologic Wastes, January 2010 - August 2012

<table>
<thead>
<tr>
<th>Month/Year</th>
<th>2010 (kg)</th>
<th>2011 (kg)</th>
<th>2012 (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>5897</td>
<td>5998</td>
<td>6002</td>
</tr>
<tr>
<td>February</td>
<td>6998</td>
<td>6788</td>
<td>7437</td>
</tr>
<tr>
<td>March</td>
<td>6012</td>
<td>5998</td>
<td>6194</td>
</tr>
<tr>
<td>April</td>
<td>6698</td>
<td>6724</td>
<td>7385</td>
</tr>
<tr>
<td>May</td>
<td>5199</td>
<td>6142</td>
<td>5669</td>
</tr>
<tr>
<td>June</td>
<td>6915</td>
<td>7865</td>
<td>7884</td>
</tr>
<tr>
<td>July</td>
<td>7298</td>
<td>7321</td>
<td>7540</td>
</tr>
<tr>
<td>August</td>
<td>5934</td>
<td>5899</td>
<td>5992</td>
</tr>
<tr>
<td>TOTAL (1)</td>
<td>50951</td>
<td>52735</td>
<td>54103</td>
</tr>
<tr>
<td>September</td>
<td>7219</td>
<td>7453</td>
<td></td>
</tr>
<tr>
<td>October</td>
<td>6198</td>
<td>6528</td>
<td></td>
</tr>
<tr>
<td>November</td>
<td>7109</td>
<td>7652</td>
<td></td>
</tr>
<tr>
<td>December</td>
<td>7604</td>
<td>7821</td>
<td></td>
</tr>
<tr>
<td>TOTAL (2)</td>
<td>79081</td>
<td>84498</td>
<td></td>
</tr>
</tbody>
</table>

Source: Philippine Children's Medical Center

There is a 2.7 percent and a 7.6 percent increase in the amount of infectious waste generated during the first semester of 2012 compared to the same period in 2010 and 2011, respectively. The pathologic wastes for the past three years have been relatively consistent. There seems to have a peak in the months of February, April, June, July, September, November, and December (Figure 16). On the other hand, the numbers dipped in January, March, May, August, and October. The peak months may have been the months when there was an influx of patients in the hospital.
Figure 16. Monthly Collection of Infectious Waste, January 2010 - August 2012

Source: Philippine Children's Medical Center

The amount of money PCMC pays Chevalier in exchange for the latter’s disposal services rendered on the pathologic wastes is shown in Table 5. From the months of January to April 2012, PCMC paid Php 19.50 for every kilo of pathologic wastes. Then, from May to August, the amount decreased to Php 18.50 per kilo. For the year 2012, the month of June 2012 had the highest volume of pathologic waste.
Table 5. Amount of Money PCMC Paid to Chevalier for Disposal of Pathologic Wastes, 2012

<table>
<thead>
<tr>
<th>Month (year 2012)</th>
<th>Pathologic Wastes (kg)</th>
<th>AMOUNT (Php)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>6002</td>
<td>117,039</td>
</tr>
<tr>
<td>February</td>
<td>7437</td>
<td>145,021.50</td>
</tr>
<tr>
<td>March</td>
<td>6194</td>
<td>120,783</td>
</tr>
<tr>
<td>April</td>
<td>7385</td>
<td>144,007.50</td>
</tr>
<tr>
<td>May</td>
<td>5669</td>
<td>104,876.50</td>
</tr>
<tr>
<td>June</td>
<td>7884</td>
<td>145,854</td>
</tr>
<tr>
<td>July</td>
<td>7540</td>
<td>139,490</td>
</tr>
<tr>
<td>August</td>
<td>5992</td>
<td>110,852</td>
</tr>
<tr>
<td>TOTAL</td>
<td>54103</td>
<td>1,027,923.50</td>
</tr>
</tbody>
</table>

Source: Philippine Children's Medical Center

Storage of Health Care Waste

The PCMC's storage area is located outside the hospital building but still within the establishment's compound. There are two storage rooms: One is for the non-biodegradable wastes packed in black garbage bags; the other is for the pathologic wastes packed in yellow garbage bags. *The whole area does not bear the sign: "CAUTION: BIOHAZARDOUS WASTE STORAGE AREA – UNAUTHORIZED PERSONS KEEP OUT"* (underscoring supplied).

These storage areas are located away from patient rooms, laboratories, hospital function/operation rooms, or any public access areas. Waste bags or containers are stored in a separate room of a size appropriate to the quantities of waste produced and the frequency of collection.

The storage rooms in PCMC have color-coded metal doors. *However, they are not locked properly such that any person can enter the rooms anytime* (underscoring supplied). There is a faucet for cleaning.
purposes in both rooms. However, the whole area is still dirty and infested with mosquitoes\(^3\) (underscoring supplied).

The storage area in PCMC is also strategically located such that it is easily accessed by staff in charge of handling the waste and by the waste collection vehicle. However, the room has no light and no proper ventilation. Furthermore, PCMC’s pathologic wastes are only collected twice a week—meaning, that these wastes stay in the storage room for more than two days (underscoring supplied). The RHCWMM sets a normal limit of two days for storage without the need for chemical disinfectants.

Collection and Transport of Health Care Waste

Work in PCMC consists of three shifts, and the collection of wastes is done at the start of each shift. Wastes are transported using designated wheeled trolleys. Benzylkonium chloride is used to clean these trolleys daily.

The RHCWMM requires waste collectors to use appropriate personal protective gears. However, in PCMC, collectors only don their uniform of shirt and pants. They wear gloves at times, but do their collection with bare hands most of the time (underscoring supplied).

Deficiencies and Areas for Improvement

There is a need to re-educate and re-inform patients and staff on the importance of segregation. Trash bins with faded labels must be replaced or repainted to be readable and conspicuous enough. If a single piece of general waste gets mixed in the biodegradable or infectious bin, the orderlies are forced to handle the trash manually when segregating—a practice that may lead to untoward accidents (underscoring supplied). Orderlies resort to this bad practice of segregating with their bare hands.

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\(^3\) Mosquitoes are known carriers of malaria and dengue fever.
hands to avoid being penalized if found to not follow proper waste. To mitigate this, there ought to be enough trash bins visible and easily accessible in every floor so that patients and staff themselves will be encouraged to throw their waste in the proper bins. 

*Trash bins with leaks or holes must also be replaced* (underscoring supplied).

The collection of pathologic wastes should also be increased to three to four times per week so that these wastes do not stay in the storage area for more than two days.

The storage room for general dry wastes and pathologic waste also does not have a warning sign. It is unlocked, making it accessible to anyone, any time. The storage area itself is also not well maintained and in fact infested with mosquitoes.

The segregation of the pathologic wastes can also be improved. Sharps should not be mixed with the infectious and chemical wastes. The collection of pathologic wastes should also be increased to three to four times per week so that these wastes do not stay in the storage area for more than two days.

**Recommendations**

The housekeeping head claims that PCMC’s only major waste management problem pertains to the volume of disposable diapers collected monthly. Disposable diapers comprise the bulk of the waste under the yellow category and account for a major portion of the cost the Center pays its third-party waste collector. It should, however, be pointed out here that another public hospital specializing in pediatrics--the National Children's Hospital--is able to minimize this kind of waste by restricting its patients from bringing in and using disposable diapers, except for ICU patients. Their ruling reduces the volume of
diapers in the garbage, thus lowers costs—a clear example of waste minimization at the source.

This research recommends that the storage area for both general non-infectious dry wastes and pathologic wastes must bear the warning sign: “CAUTION: BIOHAZARDOUS WASTE STORAGE AREA – UNAUTHORIZED PERSONS KEEP OUT.” It should also be kept locked and clean.

The processing of pathologic wastes can also be improved by increasing the frequency of collection from the current two to three times, to three to four times per week. Doing so will make the PCMC compliant with the guidelines that limits storage of pathologic wastes to two days.

Sharps should also have a separate plastic bag and not mixed with infectious and chemical wastes.

This study also recommends that orderlies consistently use personal protective gears like masks, tongs, and gloves to prevent needle-prick injuries and other accidents related to waste handling, and to reduce possible transmission of infectious diseases.

Case 2: Philippine Children’s Medical Center
**Case 3:**
East Avenue Medical Center in Quezon City

The East Avenue Medical Center (EAMC) is a tertiary government hospital located at East Avenue, Diliman, Quezon City. It is strategically located near the National Government Center, where the largest lowest-income Filipinos (at approximately 42,000 squatter families) reside. It was originally built as the Hospital ng Bagong Lipunan on January 8, 1978, by Presidential Decree (PD) No. 1411 and was later given the name East Avenue Medical Center by virtue of the Executive Order No. 48 Series of 1986 promulgated by President Corazon Aquino.

The hospital has a 350-bed capacity with patients mostly coming from low-income households due to its health care subsidization by DOH and its strategic location. It has a very high occupancy rate of 133 percent for adult patients and a bassinet occupancy rate of 282 percent. It has eight general service departments: Administrative, Consultation, Out-Patient, Laboratory, X-ray, Operation, Intensive Care, and Pulmonary departments. It also has six clinical departments: Surgery, Medicine, Ophthalmology, Pediatrics, EENT, and Obstetrics-Gynecology.

Per PD 1411, the East Avenue Medical Center is governed by the Board of Governors and headed

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4 Based on the final report written by Lawrence T. Bello and Edronel de la Cruz of ASMH Year Level 8 and on information found in the website www.eamc.doh.gov.ph.
by the Secretary of Health. The hospital director of the East Avenue undertakes the daily operations. The EAMC has two buildings: a seven-storey main building and a two-storey structure that houses the outpatient department. It has a newly built ER department and currently has new services such as MRI and CT imaging modalities.

**Vision and Mission**

**VISION**

*To be a globally competitive center of excellence and premier tertiary category DOH Hospital.*

**MISSION**

*To provide specialized quality tertiary level health care services to all patients, provide training to medical and allied health care professionals, complying with the standards set by the DOH, and to conduct relevant and bioethical researchers for the improvement of health care delivery.*

**The EAMC Health Care Waste Management Committee**

The waste management of the hospital is under the Administrative Department through the Housekeeping Unit. Around 5,000 kg of hazardous wastes are produced from the hospital per month. The official waste management system was developed based on the Manual on Hospital Waste Management from the Environmental Health Service of the Department of Health and Metro Manila Authority Ordinance No. 16, series of 1991 (*underscoring supplied. The RHCWMM was revised and issued in 2005*). Currently, the Waste Management Committee has the following objectives: (1) To protect and ensure the health and safety of all the people in the hospital; (2) To comply with all the laws imposed by DENR, MMDA, and the local government; and (3) To enhance community relations by
demonstrating a commitment to environmental protection. The EAMC Waste Management organizational chart is shown in Figure 17.

\[\text{Figure 17. The East Avenue Medical Center Waste Management Organizational Chart}\]

\text{Source: East Avenue Medical Center}

Note that the composition of the HCWMC is not totally compliant with the RHCWMM and does not have a waste management officer (WMO).

\textbf{Degree of Compliance}

Wastes at the EAMC are segregated into three different trashcans, each color-coded with green, black or yellow (Figure 18). The green bin is for the wet, general wastes, while the black trashcan is for the dry general wastes. The yellow can is used to collect all the infectious wastes, which are later further segregated into different categories based primarily on the treatment.
Case 3: East Avenue Medical Center in Quezon City

Despite the fact that majority of the waste in the hospital is comprised of general wastes, both the wet and dry ones, it is also important to take the numbers for the other kinds of wastes. Table 6 shows the monthly collection of waste according to classification in EAMC. Infectious wastes are mostly made up of hospital items such as laboratory cultures, swabs, gloves, catheters, napkins; used cotton balls and gauze. Sharps are mostly comprised of needles, knives, blades, syringes and broken glass, which are relatively light and small in nature as compared to other forms of wastes. Of the total weights of 15,716 kgs and 2,079 kgs, infectious waste and sharps make up only 7 percent and 1 percent of the total weight respectively (Figure 19). Nonetheless, the volume of infectious and sharp wastes must be of enormous quantity to be able to sum up to these weights (underscoring supplied).
Table 6. Monthly Collection of Waste According to Classification in East Avenue Medical Center, 2006

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>13000</td>
<td>5500</td>
<td>2178</td>
<td>1238</td>
<td>800</td>
<td>150</td>
</tr>
<tr>
<td>February</td>
<td>8000</td>
<td>4500</td>
<td>1380</td>
<td>1808</td>
<td>780</td>
<td>280</td>
</tr>
<tr>
<td>March</td>
<td>10000</td>
<td>3800</td>
<td>2295</td>
<td>1387</td>
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<td>80</td>
</tr>
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<td>1890</td>
<td>445</td>
<td>195</td>
</tr>
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<td>July</td>
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<td>4250</td>
<td>1995</td>
<td>1357</td>
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<td>280</td>
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<tr>
<td>August</td>
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<td>4100</td>
<td>2301</td>
<td>1169</td>
<td>486</td>
<td>350</td>
</tr>
<tr>
<td>September</td>
<td>11000</td>
<td>3901</td>
<td>2111</td>
<td>989</td>
<td>560</td>
<td>175</td>
</tr>
<tr>
<td>October</td>
<td>8000</td>
<td>4125</td>
<td>2662</td>
<td>954</td>
<td>280</td>
<td>131</td>
</tr>
<tr>
<td>November</td>
<td>9000</td>
<td>2100</td>
<td>996</td>
<td>758</td>
<td>196</td>
<td>140</td>
</tr>
<tr>
<td>December</td>
<td>15000</td>
<td>8500</td>
<td>3554</td>
<td>1208</td>
<td>440</td>
<td>80</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>122,906</strong></td>
<td><strong>59,541</strong></td>
<td><strong>23,455</strong></td>
<td><strong>15,716</strong></td>
<td><strong>6,028</strong></td>
<td><strong>2,079</strong></td>
</tr>
</tbody>
</table>

Source: East Avenue Medical Center

**Figure 19. Percentage of Each Waste Classification**

Source: The author's computation
Although the amount of waste can give an indication on the waste consumption of the hospital, they do not accurately measure the total volume of each waste category. Factors such as relative weight and size may very well confound the measurement. Volume metrics such as liters or cubic meters may be a more accurate way of measuring hospital waste generation.

Figure 20 shows that the waste in EAMC peaks during the end of summer and the year-end holidays, specifically in the months of May and June, and December and January, respectively. The sudden increase in the amount of hospital wastes may be directly attributed to the number of people going to the hospitals. It is hypothesized that the sudden influx of patients during the summer is because people choose to be confined during this time while there is an increase in the number of patients during the holidays because of the accidents that occur during this time of the year, particularly during the month of January.
Flowchart of Disposal

The flowchart diagram (Figure 21) summarizes the process that EAMC undertakes when disposing various kinds of waste.

Figure 21. East Avenue Medical Center Waste Management Flowchart

Source: East Avenue Medical Center
A. Pathological Waste

Doctors, nurses and laboratory aides who are responsible for further examining the wastes, handle the pathological wastes. The nursing and laboratory aides are usually the ones who discard this kind of waste in yellow plastic bags and place them in the temporary staging area. At the end of the day, Chevalier Envirotech Services Corporation picks up the wastes and transports them to its treatment facility. Chevalier Enviro Services uses thermal processes such as pyrolysis and incineration in treating pathological wastes. These methods make use of very high temperature to destroy the pathogens and transform them into organic wastes.

B. Infectious Waste

Housekeepers are responsible for packing infectious wastes in yellow plastic bags and finally placing them in the temporary staging area. Alongside the pathological wastes, infectious wastes are also collected at the end of the day by Chevalier Envirotech Services Corporation, which uses dry thermal treatment through microwaves to further treat this kind of waste. Through this process, infectious wastes are shredded and disinfected by using very high heat.

C. Pharmacological Waste

Housekeepers and nursing aides are responsible for handling pharmacological wastes, particularly vials. These vials are placed in a yellow plastic container as standard precaution against broken glasses and shards. They are then placed in the temporary staging area for one week. The hospital uses a vial crusher machine, which transforms the vials into shards that are then sold to pharmaceutical companies for recycling.
D. General Wastes

Housekeepers are mainly responsible for discarding general wastes into their respective bins. Dry wastes are thrown into the black plastic bag, while the wet wastes are placed in the green plastic container. They are then stored in their respective temporary staging areas for sorting. Wastes that can be recycled or reused are sold to local buyers. Wastes that are for discarding are collected daily by the local government, through the Environmental Protection and Waste Management Department (EPWMD), and transported to the Payatas Land Fill.

What is unique with EAMC’s waste management system is that even though the hospital has its own waste management team, there are point persons responsible for handling the waste. Hospital personnel are assigned to handle certain kinds of wastes based on their expertise and training. For example, only doctors, nurses, and laboratory aides are allowed to handle pathological wastes because these wastes need to go through further examination before being discarded. By doing this, the hospital ensures that waste management would be compliant with the guidelines.

Majority of the waste disposal in the hospital are outsourced. Pathological and infectious wastes are collected daily by Chevalier Enviro Services, which transports the wastes to its plant for further treatment. On the other hand, the local government, through EPWMD, collects the general wastes and is generally responsible for the transport of wastes to the Payatas Land Fill. The hospital ensures daily collection of wastes through constant communication through calls and mobile texts. The hospital waste management, however, **failed to mention how it measures the level of compliance from these outsourcing companies** (underscoring supplied).

The only available on-site treatment facility in EAMC is a health care material recovery facility (MRF) shown in Figure 22, which is a standard temporary staging area for waste segregation. The hospital has
its separate storage facilities for mercurial waste and busted light bulbs; for batteries, old computers and lab machines; for hazardous wastes such as infectious and pathological wastes; and for recyclable wastes such as bottles, cans, and papers. The hospital is also equipped with its own vial crusher machine used for treating pharmaceutical waste vials.

Figure 22. East Avenue Medical Center Healthcare Material Recovery Facility
Source: East Avenue Medical Center

Deficiencies

A. Offsite Waste Treatment

East Avenue Medical Center has been outsourcing its hospital waste treatment for years and from the information that has been gathered, the hospital seems have a knowledge gap on the full waste treatment undertaken by the outsourcing companies. Although the hospital waste management administrators have a theoretical idea on how the hospital wastes are being treated, they are not fully aware of the waste situation in Chevalier Enviro Services, particularly how the outsourcing companies further manage the wastes after treatment.
Only the outsourcing companies have an idea on how these hospital wastes end up. Although both share the burden of seeing to it that EAMC’s wastes are treated and managed properly, the hospital depends on Chevalier to strictly comply with the rules and regulations of waste management.

B. Improvement of Waste Segregation

Although the hospital is currently using a color-coded scheme for waste segregation, not all people—particularly, the patients and hospital visitors—follow the system (underscoring supplied). Knowing how to segregate does not just help determine the type of waste treatment but also help lighten janitors and housekeepers’ workload. If the segregation system is not strictly followed, the hospital’s point persons will be obliged to validate the content of the waste containers. However, as it is impossible for each point person to double-check every bin or every plastic bag, there is really a high likelihood that some wastes end up in the wrong bag or container.

If patients and hospital visitors do not conform to the segregation rules, there is a higher likelihood that staff handling the wastes end up getting injured, either from a needle prick or from directly acquiring diseases from infectious wastes. This is one reason the hospital needs to strengthen its implementation of the waste segregation system, not only among hospital personnel, but most specially, among the hospital visitors. The personnel handling the hospital waste should wear appropriate personal protective equipment.

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5 If the point persons see errors in waste segregation—e.g., waste is in the wrong color bag—do they then attempt to correct the mistake by re-segregating the waste? If Yes, then this is contrary to the RHCWMM’s protocol.
C. Waste Minimization

Even though EAMC has an effective and efficient waste management system, there seems to be a lack of initiative to lessen the volume of its wastes (underscoring supplied). The consequences of mismanagement of waste do not only manifest in people getting needle-pricked or acquiring disease, but more in floods and landfill congestions. The issue on waste management has a much broader scope and can affect the society at a much larger scale. The hospital must actively do its part in trying to reduce the overall volume of waste in our country.

D. Wastewater Treatment Facility

One issue that the hospital waste administration presently has is how to handle and recycle water being used in the hospital. The lack of a waste water treatment facility forces the hospital to dispose dirty water to the sewerage system (underscoring supplied). Nonetheless, they are aware that there should be a special way of managing its water waste since hospital water waste can cause infections and diseases. The hospital administration is also aware that there is a dire need to conserve or recycle water.

Recommendations

A. Offsite Waste Treatment

To be able to monitor the offsite waste treatment, the waste management administration should take extra steps in establishing a more functional working relationship with Chevalier Enviro Services. According to the hospital waste administrator, a point person from the hospital is responsible for making monthly visits to the waste treatment site of Chevalier Enviro Services to check how the company performs its waste treatments. Results from this monthly visit are then presented to a hospital panel.
However, sending a hospital representative to the treatment facility once a month may not be enough to encourage strict compliance with waste treatment guidelines. There should be an active participation of a hospital representative within the outsourcing company.

Adding other measures such as checking the quality of work and facilities, and inspecting the waste end points should further strengthen this monthly audit. Also, the hospital and the outsourcing company can establish contracts that encompass transportation and treatment of waste. A check-and-balance or even a penalty system must be in place so that waste treatment is done properly. These steps allow the hospital to perform its responsibility in waste management and control.

B. Employee and Visitor Education

Employees and visitors should be made aware of the waste management system of the hospital through information, education, and communication. Campaign materials should be developed and properly disseminated in the hospital. One way is to place larger and simpler signs in front of waste bins. An education campaign through newsletters bulletin and promotional signs must be launched so that even visitors are made aware of the hospital’s waste management system.

Educating hospital employees may be done via training. Employees may be assessed or audited quarterly on hospital policies on waste management. This way, these employees will be able to familiarize themselves with the hospital’s waste management system and follow the guidelines in their daily work. Patients and visitors, on the other hand, can be trained by conducting ward/room classes on the hospital policies, including waste segregation.
C. Waste Prevention

The hospital waste volume can further be reduced in a number of ways. The use of biodegradable materials can prevent sewage clogging with dry wastes, as this kind of wastes takes up the most volume. The hospital can also build a suitable and eco-friendly material recovery facility, in which dry wastes can be broken down into their bare minimum. This can help conserve space and lessen the burden in transporting wastes products. Crushing or shredding hospital wastes can make them easier to recycle and handle.

Patient education also helps control the volume of waste. That is, the hospital can encourage visitors to regulate their waste production as well as bring reusable food containers in place of disposable styrofoam and plastic containers.

D. Building a Wastewater Treatment Facility

The hospital should raise funds for its own waste water treatment facility. If budget allocation is not possible, fundraising activities may be in the form of fun runs and food sale. In fact, building a waste water treatment facility should be one of the hospital’s top priorities.
Case 4:  
Veterans Memorial Medical Center 
in Quezon City

The Veterans Memorial Medical Center (VMMC), located on the corner of North Avenue and Mindanao Avenue in Quezon City, was constructed as the Americans’ token of gratitude to the Filipino soldiers who stood by them during World War II. The 80th Congress of the United States of America passed Public Law 865 on July 8, 1948, which allocated $9.4 million for the construction of a hospital facility in the land to be donated by the Filipino people. The law was implemented via an agreement between the United States and the Philippines as signed by then Pres. Elpidio Quirino and the U.S. Ambassador to the Philippines Myron Cowen. The hospitalization service was extended to veterans of World War II and their dependents. The passing of R.A. 6948 further extended the benefits of the Public Law to AFP retirees and their dependents.

Vision and Mission

VISION

The VMMC envisions itself to render premium medical services to the veterans and their dependents through a comprehensive health care system characterized by excellence, dedication, and commitment.

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6 Based on the report written by Jose Lorenzo Angeles and Jose Bernardo Ronquillo of ASMPH Year Level 8 and on information found in the website www.vmmc.gov.ph.
MISSION

• **Patient Care** – To provide the best possible medical care and treatment to eligible veterans and their dependents.

• **Education and Training** – To provide an integrated, comprehensive, and progressive educational training program in the medical and allied fields not only for its staff and personnel but also to fellows, residents, interns, and undergraduate students.

• **Research** – To develop and muster the research capabilities and potential of the Medical Center by initiating, encouraging, and promoting basic and clinical research.

• **Civic Action and Outreach Program** – To provide basic medical services to nearby communities and to support the civic action program of the national government.

**Responsibility for Waste Management**

The responsibility for the Veterans Memorial Medical Center’s waste management is overseen by the Building Management Division (BMD). This department’s mission is to maintain cleanliness for a healthy hospital environment (Figure 23).

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*Figure 23. Mission Statement of Veterans Memorial Medical Center*

Source: Veterans Memorial Medical Center
The BMD consists of six individuals, each with a specific role in assuring proper waste segregation and disposal within the hospital (Figure 24). The department oversees the entire system of waste disposal and makes sure that the protocols are implemented well.

Aside from ascertaining and educating the public on proper waste segregation, the department also makes sure that all the hospital areas have a complete set of bins and necessary cleaning equipment.

Figure 24. Manning and Organization Charts of the Building Management Division
Source: Veterans Memorial Medical Center

**Degree of Compliance**

- **Reduction of Waste at Source** – The hospital has been complying with the waste reduction principle when it launched its information campaign for proper segregation and
recycling. Likewise, its segregation officer regularly inspects how the system is being implemented.

- **Recycling and Reusing** – Recycling and reusing is exemplified by how VMMC makes use of the vials and ampoules collected. These types of refuse are sent back to the pharmaceutical suppliers for credit in the purchase of new medicine vials and ampoules.

- **Periodic Inspection** – Inspection allows the hospital to identify areas that need improvement, uncover issues arising from waste management, and monitor how the staff undergoes continuous education and learn about best practices.

- **Routing and Frequent Collection** – Waste materials have an alternative route to the pick-up points that does not involve much contact with the people, staff, and patients of the hospital walking along hallways. The routing scheme was systematically organized to provide ease in collection by the maintenance people and avoid build up of traffic within the hospital. There are designated two collection times for wastes daily, 6:00am – 8:00am and 1:00pm – 2:00pm, to avoid the accumulation of too much waste within the hospital.

- **Waste Classification and Segregation** -- Veterans Memorial Medical Center implements a waste segregation method that begins at the first level of garbage collection. This also operates on the assumption that not all types of waste will be encountered in every area of the facility. The BMD has implemented its own rule on the collection of waste, which differs in every area of the hospital. This seemed to lessenthe overall quantity of certain waste types, costs for some receptacles, as well as a filtering of infectious wastes that seem to come only from medical-related areas of the institution.
In compliance with the DOH’s Solid Waste Management protocol, three simplified color-coded receptacles have been identified in the hospital. The green receptacle represents biodegradable waste (non-infectious wet waste); the black receptacle represents non-biodegradable waste (non-infectious dry waste); while the yellow receptacle is for infectious waste materials (infectious and pathological waste). As a guide for all who would encounter the receptacles, reminders are posted on the bins so that people would know where to place their garbage (Figure 25).

There are no orange receptacles for radioactive wastes (radioactive isotopes) in the hospital rooms and along the corridors because only specialized rooms and areas handle such wastes.

Figure 25. Photos of the Color-coded Receptacles
Source: Veterans Memorial Medical Center
The VMMC management aims to educate people on proper segregation of various health care wastes through information campaign and segregation signs on trash bins. Trash bins will have reminders in Tagalog as well as images (such as of paper, plastic cups, bottles, banana peelings, etc.) displayed on the side of the bins to help people identify which wastes go to which bins.

Since offices are assumed to not produce any type of infectious waste, only black and green receptacles are placed within each. Only non-biodegradable wastes and food leftovers were identified to need segregation at all the administrative level offices. These waste bins are still inspected everyday by the segregation officer to ensure compliance with the segregation rules.

Because of the variety of types of people in the wards, all the three color-coded bins are placed on the areas. Within each central nursing station in the various wards present (pediatrics, orthopedics, medicine, emergency, etc.), there is initial segregation made at the onset. Infectious wastes are identified to come from wards, hence yellow receptacles are present. This is counter-checked by a segregation officer who constantly does the rounds in the various wards. He carefully inspects the contents of the waste bins before approving them for collection and disposal.

Wards are also designated with their own sharps containers. Used needles and portions of syringes are separated and collected in a different plastic bottle labeled as “Sharps” in each ward (Figure 26). This type of waste is separated from the rest to avoid the possible spread of infection.
Like the segregation of sharps in wards, the used vials, bottles, and ampoules are separated on a labeled and designated corner of the nursing station. These products are initially grouped together and sent back to the pharmaceutical department for crediting and for further recycling.

New medicine stock will be given in exchange for these segregated materials from the various wards. Ultimately, the segregation process at the ward level also benefits the patients.

Meanwhile, small vials and ampoules that are not sent undergo a recycling process in-house.

Black receptacles (Figure 27) are situated in almost every corner of the institution for the general non-biodegradable (non-infectious dry waste) garbage from people around the hospital. The BMD assigned black bins on the assumption that majority of the people in the hallways produce non-infectious dry waste and, therefore, there was no need to place green and yellow receptacles in areas such as the hallways. These are often checked by the designated segregation officer, sorting out misplaced trash in the lone hallway bins.
The comfort rooms at VMMC feature different sets of waste bins depending on their location. For example, a complete set-of-three designated waste receptacles is located within ward comfort rooms (Figure 28), which is not the case for public comfort rooms located along the hallways.
**Staff Compliance**

In a hospital situation, staff compliance is of utmost importance, particularly because the hospital staff members (doctors, nurses, janitorial services, etc) have the primary access as well as responsibility to properly segregate wastes as they are used. To ascertain compliance, bins are occasionally checked and monitored not only by the BMD of the hospital, but by senior nurses on duty and segregation officers as well. Misplaced wastes (those found in the wrong containers) are duly recorded and reported.

The VMMC Building Management Office conducts regular educational meetings or lectures to reiterate and reinforce to the staff the importance of the waste management system. Lectures cover proper waste segregation, including a discussion on which wastes should go to which trash bin. Lectures are also given to regular patients, including veterans undergoing recurring therapy.

On the overall, one of the goals of the Building Management Office is to have sustained monitoring, implementation and educational activities that will improve staff’s compliance to waste management guidelines, not only during accreditation periods as a requirement for PhilHealth and as a tertiary-level hospital, but to develop a habit of moving toward a cleaner VMMC.

**In-house Recycling and Treatment**

Veterans Memorial Medical Hospital has recycling protocols in place to handle specific wastes. For example, small vials and ampoules undergo a grinding process as shown in Figure 29 and are subsequently added to concrete mixtures to be used for road and sidewalk repairs inside the compound of the hospital.
Other wastes such as plastics used for IV Fluid containers are also collected by the hospital and sold to a private company to be recycled. These companies are selected based on a bidding process and are bound by contracts to the hospital.

The hospital also has an in-house sewage treatment facility (Figure 30) to handle liquid wastes such as those coming from hospital drains and toilets. Liquid wastes are disinfected, processed and stored into large containers also found inside the compound. The clean water that results from the process is then used by the hospital to water the golf course inside the compound.
Other biodegradable wastes coming particularly from the canteen and dietary services are locally collected and then picked up by a private company, which uses the leftover food as animal feeds. These wastes, however, do not include the food that was already sent to the patients’ rooms and wards, as those are disposed of in the appropriate non-infectious waste bins.
**Annual Volume of Waste Categories**

Knowing the annual volume or quantity of each waste category may prove to be essential in the management of health waste. This may aid the management in concentrating efforts toward the disposal of the majority of the institution’s waste.

The VMMC claimed that it has quantitative data on its different waste types. Its estimated cumulative volume of wastes is 13,140,000 liters annually. The figure excludes radioactive waste and other recyclable refuse.

Non-infectious waste is collected by the Metro Manila Development Authority as part of the protocol, while infectious wastes are collected by a privately outsourced company for proper disinfection and disposal. The process ends with the hospital able to segregate and collect all refuse from their designated points on the scheduled pick up hours.

**Flowchart of How VMMC Handles Disposal of Each Waste Category**

In compliance with rules regarding pickup points and waste routes, VMMC’s holding area (Figure 31) for the wastes prior to pickup by collection trucks is more than 100 meters from the hospital buildings to ensure adequate distance from the immediate hospital premises, patients, and staff. It is also situated along the edge of the compound, where a designated entry/exit gate along Mindanao Avenue allows collecting garbage trucks to enter the compound as an alternative to the hospital’s main entrance found along North Avenue.
Black and green waste containers for non-infectious wet and dry wastes are collected twice daily by MMDA trucks (Figure 32) and brought to landfills. Infectious wastes (yellow containers) are collected by a privately outsourced company twice a day. Human wastes (body parts, amputated limbs/tissues, etc) are initially stored in the morgue and not treated like regular infectious wastes. When the collecting trucks arrive for the infectious wastes, these are separately packed, collected and cremated. Initially, VMMC was using its own incinerator to handle human wastes, but after the implementation of the Clean Air Act, the hospital had to cease the operations of its incinerator in compliance.
The VMMC also produces radioactive wastes coming from radioactive isotopes usually for patients with thyroid conditions. The VMMC does not mix radioactive wastes with infectious or other wastes products. Radioactive wastes are tagged in a specified orange container and directly sent to a separate room near the Nuclear Medicine area for disposal. These are then allowed to decay (for around 3 months), taking into consideration the half-life of the radiation. Three months after, the radioactive wastes are then transferred into yellow containers and are treated subsequently as infectious wastes (underscoring supplied). The Waste Management Process of VMMC is shown in Figure 33.
Figure 33. Waste Management Process of VMMC

Source: Veterans Memorial Medical Center
Recommendations

One of the major areas for improvement during the study on VMMC is the lack of quantitative data on the amount of waste produced per category. Wastes picked up by the collecting trucks should be measured to come up with data on the amount of waste by type from the hospital.

The hospital currently works on a set of assumptions regarding sources of different wastes, hence the limited number of receptacles. This setup may entail a more tedious process of sorting out the wastes once people mix the garbage types in bins located along hallways, comfort rooms, and offices. However, the RHCWMM strongly discourages hospital staff from removing an item from a bag or receptacle after disposal in an attempt to correct waste segregation errors. Doing so can be hazardous to hospital personnel if they are dealing with infectious or pathological waste.
Case 5: 
Philippine Orthopedic Center in Quezon City

The Philippine Orthopedic Center (POC) shown in Figure 34 is a 700-bed tertiary specialty hospital located along Maria Clara corner Banawe St., Santa Mesa Heights, Quezon City. It is owned and operated by the Department of Health. Majority of its patients are those with orthopedic and neuromuscular diseases, regardless of age, and are provided with diagnostic, therapeutic, and rehabilitation services. The POC is also the country’s major referral center for spinal injuries, which requires intense care due to the high risk of losing functional capacity or one’s life.

Its Medical Division includes (1) Trauma Service; (2) Adult Orthopedic Service; (3) Children’s Orthopedic Service; (4) Tumor Unit; (5) Hand Service; and (6) Spine Surgery Service. Departments that are most often tapped and bundled with the above services include: (1) Anaesthesia Department; (2) Radiology Department; (3) Rehabilitation Medicine Department; (4) Laboratory

Figure 34. Photo of Philippine Orthopedic Center
Source: Philippine Orthopedic Center

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7 Based on the report written by Mary Pauline Denise Castro and Arnel Christian Dy of ASMPH Year Level 8 and from information found in www.poc.doh.gov.ph.
Department (i.e., Blood Bank, Bacteriology unit, and Clinical Pathology Unit); and (5) Specialty Service and Dental service. Important auxiliary departments include (1) General Surgery; (2) Neurosurgery; (3) Urology; (4) Internal Medicine (i.e., Cardiology and Pulmonology); and (5) Diabetes Care.

The POC is currently in need of renovations as 150 of its beds are dilapidated, bringing down its true functional bed capacity to 550. Many in-patients stay long, the shortest being three months.

The POC is the second largest hospital that produces medical waste, next only to the National Kidney Institute. Its chief engineer, Engineer Jose Valenzuela, is in-charge of the entire waste management operation and receives continuing training on the management of health care waste.

Description of Waste Management at POC

Non-infectious wastes are a combination of wastes from patients, their visitors, and hospital personnel. They are indirectly affected by medical activities and are more difficult for the hospital to manage (e.g., proper segregation is often not followed by patients’ visitors).

Wastes such as infectious, pathologic, chemical, pharmaceutical, radioactive, and pressurized wastes are directly affected by medical services carried out. These wastes can be more controlled by the hospital---e.g., infectious wastes are generated when medical procedures are done; hence, it is easier to instruct doctors, nurses, and staff to comply with policies and segregate properly and is easier to monitor as opposed to general waste generated by visitors.

To improve segregation efficiency, hospital staff underwent health care waste management training. Waste is collected at least thrice a day by housekeeping personnel. A specific route around the hospital is followed for transportation of waste products to the hospital’s waste
holding area. At the waste holding area, the housekeeping supervisor is assigned to ensure compliance with segregation guidelines.

Segregation efficiency is also achieved by strategically placing properly labeled green, yellow and black containers in locations with increased traffic and waste generation.

Apart from segregation, POC applied other standard practices:

• Staff are never permitted to correct errors in waste segregation after disposal. If general and hazardous wastes are mixed, then the mixed waste is now considered infectious.
• The on-site storage facility has an impermeable, hard standing floor with good drainage, and is generally easy to clean and disinfect.
• There is adequate water supply, in the form of a faucet and sink, for cleaning purposes.
• Storage area is easily accessible to staff handling the wastes.
• The storage area can be locked to guard against unauthorized access.
• The storage area is easily accessible to garbage trucks.
• The storage area is adequately protected from natural environmental forces, such as strong winds.
• The storage area is inaccessible to animals, insects, and birds.
• There is adequate lighting and ventilation.
• Waste site is located far from the dietary preparation area.
• The storage site also houses garbage supplies.
• Daily cleaning of floors as well as collection of infectious wastes are practiced.
**Color-coded Waste Segregation**

The POC follows the color-coded segregation scheme for health care waste as specified by the RHCWMM.

Green and black bags are for non-infectious wet and dry wastes, respectively. Non-infectious wet wastes consist of kitchen waste such as leftover food, cooking oil, fish entrails, scales and fins, fruit and vegetable peelings. Non-infectious dry waste consists of paper and paper products, bottles (glass and plastic), and packaging materials (styropore, aluminum, and plastic wrappers). The hospital has its green and black wastes collected by the city government of Quezon City daily.

According to Engineer Valenzuela, POC has been producing 600 kg of general waste per day for a per annum average of 219 metric tons in the past three years. This is broken down into 400 kg of dry waste and 200 kg of wet waste (146 metric tons and 73 metric tons, respectively). Majority of wet waste is from dietary services. Table 7 shows the amount of wastes collected by category.

**Table 7. Amount of General Wastes Collected**

<table>
<thead>
<tr>
<th>Category</th>
<th>Per Diem</th>
<th>Per Annum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry general waste</td>
<td>400 Kg</td>
<td>146 metric tons</td>
</tr>
<tr>
<td>Wet general waste</td>
<td>200 Kg</td>
<td>73 metric tons</td>
</tr>
<tr>
<td>Total general waste</td>
<td>600 Kg</td>
<td>219 metric tons</td>
</tr>
</tbody>
</table>

Source: Philippine Orthopedic Center

There are four types of waste that are segregated into yellow bags marked with the international infectious symbol: (1) infectious wastes; (2) chemical wastes; (3) expired pharmaceutical wastes; and (4) pathological waste.

Wastes that do not need to be sent to a crematorium are picked-up by a contracted service provider, Chevalier Enviro Services, once daily.

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Case 5: Philippine Orthopedic Center in Quezon City
For the past three years, the hospital generates an average of 380 kg of infectious wastes (or a per annum quantity of 138.7 metric tons of yellow bag waste). The hospital spends Php 21.62/kg of yellow bag wastes amounting to Php 3 million worth of payment. All wastes that will be picked-up by the company are brought to a holding area near the road and accessible to a garbage truck. Small amounts of pharmacologic and chemical wastes are collected along with infectious wastes. Table 8 shows the amount of infectious wastes collected.

Table 8. Amount of Infectious Wastes Collected

<table>
<thead>
<tr>
<th>Rate</th>
<th>Per Annum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infectious wastes</td>
<td>380 Kg/day</td>
</tr>
<tr>
<td>Expenses</td>
<td>Php 21.62/Kg</td>
</tr>
<tr>
<td></td>
<td>Php 3M</td>
</tr>
</tbody>
</table>

Source: Philippine Orthopedic Center

All yellow bag wastes are transported to Chevalier’s dumpsite in San Pedro, Laguna, where decontamination is done via a microwave disinfection technology. According to Engineer Valenzuela, majority of the infectious wastes generated is from plaster de paris contaminated with blood, pus, and other potentially infectious secretions. No specific percentages were cited.

Non-hazardous chemical wastes are drained through the sink in the waste holding area. On the other hand, pathologic waste, such as biopsy specimens, amputated limbs, and tissues, are sent to Funeraria Paz for cremation.

Cytotoxic wastes (e.g., unused chemotherapeutic agents) are placed in strong, leak-proof containers clearly label as “cytotoxic wastes”. Chemical wastes generated in large quantities are packed in special chemical-resistant containers and sent to specialized treatment facilities when the situation applies. These include wastes with heavy metal content. Other chemicals used in contact with pathologic waste are disposed by sealing or burying in the end. Where possible, immediate treatment of highly infectious and hazardous wastes as prescribed by the Manual is also done before handover to Chevalier.
Expired pharmaceuticals are not returned to the pharmacy and instead are directly moved to the storage facility for pick-up by the supplier.

All sharps generated from medical activities, such as scalpels, syringes, and trocars from IV catheterization, are considered infectious and must be placed in puncture-proof containers often made of high-density plastic or metal and fitted with covers. Containers are rigid and impermeable enough to contain residual liquid, e.g., blood generated with the wastes. Sharps are collected by the contracted medical waste disposal company, Chevalier. The amount of sharps produced annually is included in the 85 metric ton computation and no further expense is required for its disposal. There have been no needle stick injuries in the past three years—or since the adaptation of puncture-proof containers. Sharps that are non-infectious, such as dead fluorescent light bulbs, are technically segregated into yellow containers, but are treated differently. They are placed in puncture-proof containers, such as hard plastic garbage cans if long and large. If smaller, they are placed together with other yellow sharps in a container when needed.

Although the POC does not generate any radioactive waste such as radioactive iodine for goiter therapy, it still keeps orange bags on hand in compliance with the DOH and PhilHealth’s health care waste handling policies.

Pressurized containers are labeled in red or placed in red containers. For the hospital, these are mainly oxygen tanks. With every delivery of oxygen at least once every two weeks, depending on demand, the supplier collects empty containers and leaves oxygen-filled ones.

**Deficiencies**

1) Patients and visitors are not totally compliant with the segregation of general waste;
2) The contractor company Chevalier lately had some missed collection days. Fines had already been slapped on the company, but infectious wastes are sometimes still being collected every other day; and

3) All information regarding waste management, both processes and hard data, is centralized with the engineer; hence, if something should happen to him and there is no contingency plan in his absence, the hospital’s waste management system might encounter hiccups.

**Recommendations**

1) Aside from the written instructions on how to segregate, add pictures or graphics in the signage above each trashcan. For instance, above the black trashcan, add pictures of cardboard food packaging, papers; above the green trashcan, add pictures such as empty banana skin and leftover food.

2) The hospital must improve its information collection and dissemination systems, particularly on the amount of waste they generate per type so that it can effectively have a holistic picture of its waste minimization scheme.

3) The POC should share its data and processes with the rest of the organization and increase its operational flexibility in terms of the bidding process for suppliers and contractors and the monitoring process on contractors’ performance.

4) The hospital needs to increase its knowledge and awareness around how to reduce the amount of unnecessary wastes. This is one way to cut down expenses, such as on the disposal of infectious wastes, where payment is by the kilogram.
The Medical City (TMC), located along Ortigas Avenue in Pasig City, is a tertiary care hospital with over 40 years of experience in hospital operations and administration. Its world-class health care complex serves some 40,000 in-patients and 400,000 out-patients annually. The hospital has over 1,000 physicians who are established experts in their various fields of specialization. This core of professionals is complemented by a 2,200-strong human resources complement engaged in allied medical, administrative, and support services. The TMC is accredited by the Joint Commission International (JCI), the world’s most prestigious accrediting body for international health care organizations.

Vision and Mission

VISION

To always be a leader in shaping how Filipinos think, feel and behave about health and how health services are accessed by and delivered to them, and to use such leadership to serve equity in health, life and development.

MISSION

The pursuit of our vision is animated by a passion to always keep our patient on center stage and deliver service of greater worth, engaging strategic partners who share our vision and passion, constantly

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8 Based on the report written by Blythe N. Ke and Chelsea G. Samson of ASMPH Year Level 8 and from information found in www.themedicalcity.com
proceeding from what we do best, and in the process of carrying these out, align the interests of our employees, our professional staff and our shareholders with the interests of those we serve.

**Quantity of Waste Generated**

The Medical City keeps an accurate and updated record of the waste that it generates per category. Table 9 shows the average annual quantity of hospital waste generated for the 12-month period, February 2011 to January 2012. Note that each kind of waste is even given a unique code number for ease of input into the database.

**Table 9. Average Annual Quantity of Hospital Waste Generated, February 2011- January 2012**

<table>
<thead>
<tr>
<th>HW No.</th>
<th>HW Class</th>
<th>HW Generated</th>
<th>Quantity</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>G704</td>
<td>Waste organic solvent</td>
<td>205.525</td>
<td>Liters</td>
<td></td>
</tr>
<tr>
<td>C399</td>
<td>Alkali waste</td>
<td>6</td>
<td>Liters</td>
<td></td>
</tr>
<tr>
<td>B299</td>
<td>Acid waste</td>
<td>5.875</td>
<td>Liters</td>
<td></td>
</tr>
<tr>
<td>B201</td>
<td>Sulfuric acid</td>
<td>8.515</td>
<td>Liters</td>
<td></td>
</tr>
<tr>
<td>B208</td>
<td>Organic acid</td>
<td>28.39</td>
<td>Liters</td>
<td></td>
</tr>
<tr>
<td>D407</td>
<td>Inorganic waste</td>
<td>260.75</td>
<td>Liters</td>
<td></td>
</tr>
<tr>
<td>D407</td>
<td>Inorganic chemical</td>
<td>0</td>
<td>Kg</td>
<td></td>
</tr>
<tr>
<td>D406</td>
<td>Fluorescent lamps</td>
<td>2422.25</td>
<td>Pieces</td>
<td></td>
</tr>
<tr>
<td>I101</td>
<td>Waste oil</td>
<td>169.75</td>
<td>Liters</td>
<td></td>
</tr>
<tr>
<td>I101</td>
<td>Waste oil filters</td>
<td>2.75</td>
<td>Pcs</td>
<td></td>
</tr>
<tr>
<td>F602</td>
<td>Paints</td>
<td>0</td>
<td>Kg</td>
<td></td>
</tr>
<tr>
<td>F601</td>
<td>Organic sludge</td>
<td>0</td>
<td>Kg</td>
<td></td>
</tr>
<tr>
<td>M501</td>
<td>Pathological</td>
<td>32650.88</td>
<td>Kg</td>
<td></td>
</tr>
<tr>
<td>M501</td>
<td>Pharmaceutical</td>
<td>695</td>
<td>Kg</td>
<td></td>
</tr>
<tr>
<td>M503</td>
<td>Pharmaceutical</td>
<td>102.75</td>
<td>Kg</td>
<td></td>
</tr>
</tbody>
</table>

Source: The Medical City

Occasional Paper No.14
The facility serving as the storage area is located in the hospital’s basement while the transporters of wastes hired by the hospital include CleanWay Environmental Services, CleanHaul Environmental Services, and Vangie’s Enterprise. The first two transporters collect pathological wastes every Tuesday to Thursday 5:00pm while the latter collects general wastes daily at 11:00am. Parties that provide waste treatment services include Chevalier Envirotech Services Corporation for most of the year 2011 and currently, IWM Inc starting Dec 2011.

The following protocols for waste handling, storage, collection, and transport for different wastes types are being implemented in the hospital:

A. **Waste Handling**

   Personnel and patients should be made fully aware of the need to exercise extreme caution when handling substances that are to be discarded as waste. The following instructions should be noted when handling waste:

   1) Patient should be made aware of the health hazards associated with contaminated or infectious materials.
   2) Protective clothing (e.g. gloves, overalls, masks, visors, etc.) should be worn when handling hazardous waste.
   3) Adequate supply of appropriately marked or coded container of suitable strength and durability should be provided in safe yet convenient locations throughout the area where waste is being generated.
   4) A system of marking, coding, or identifying should be understood by all of the hospital members, especially personnel engaged in the collection of waste for disposal off-site so that appropriate handling and disposal techniques are employed.
   5) Appropriate codes of practice must be enforced at both ends of the waste disposal system.

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*Case 6: The Medical City in Pasig*
B. Waste Storage

The hospital management shall maintain adequate sanitary facilities for the temporary storage of hospital waste on its premises. A central storage area for all accumulated waste shall also be provided and maintained in sanitary condition. Proper separation of various types of waste generated in the hospital is necessary to avoid any accidents or hazards to the personnel. Figure 35 shows the dumping area in the lower ground of The Medical City. General wastes are sorted out and put into different sections of the room; the reusable cardboards are placed at the back of the room while different colored-plastic bags are used to segregate specific wastes.

![Image of the Dumping Area in the Lower Ground of The Medical City](source: The Medical City)

Figure 35. Photo of the Dumping Area in the Lower Ground of The Medical City

Source: The Medical City

C. Waste Receptacles and Bulk Storage

1) **General waste** should be stored in a 3-5 gallon metal\bin or plastic bag located within the
hospital rooms and vicinity. These should preferably be equipped with a lock-type cover and should be washed in intervals to avoid odors, insects and bugs. A similar larger receptacle shall be placed in a strategic place for garbage outside the hospital building to maintain general cleanliness of the surroundings.

2) **Pathological waste** should be in a similar receptacle as for general waste with chemical disinfectants and tight lids to avoid emission of offensive odor.

3) **Radioactive waste**, as required by the Philippine Nuclear Research Institute, should be handled and stored as follows:

- Storage site should not be accessible to unauthorized personnel.
- Method of storage should prevent accidental release to surroundings.
- Record stored must be kept to ensure that the storage facilities are not overloaded.
- The storage area or room should not be prone to flooding and fire accidents.
- The storage area or room should be marked with conspicuous signs and/or appropriate symbols that indicate radioactive wastes are stored there.
- Periodic inventories of the containers should be performed and recorded (e.g., regular inspection of liquid contaminants to ensure that leaks have not occurred).
- The storage area room should be used only for storage of radioactive wastes.

4) **Chemical waste** should be stored in containers (glass/plastic) with tight covers to prevent the contents from spilling.

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*Case 6: The Medical City in Pasig*
5) **Infectious waste** should be kept in metal or plastic airtight storage bins (Figure 36) and should be separated from general wastes.

![Figure 36. Photo of the Metal Container Where Infectious Wastes are Stored](source: The Medical City)

6) **Sharps** must be stored in a puncture-proof container prior to pre-treatment and disposal to prevent any cut accidents.

Storage for infectious wastes: This room contains airtight storage bins and is always kept locked with a sign posted outside to indicate its biohazard quality.

7) **Pharmaceutical waste**, such as expired liquid medicines, can be disposed directly into the sink while medicines in tablet form should be pulverized and stored temporarily in a metal or plastic container prior to final disposal.

8) **Pressurized container waste** must be handled and properly stored in a container made of metal or tin color-coding in red and marked as “flammable”. Storage of this waste should
be located in a room outside the hospital building and away from heat to prevent accidents due to its precarious volatile characteristics.

For bulk storage, a metal bin, plastic bin, oil drum, or concrete bin within the hospital compound is necessary to collect the accumulated waste material prior to final disposal.

D. Collection and Transportation System

The ability to prepare the appropriate collection and transportation systems is vital for the speedy disposal of wastes. The success of such system brings about benefits from both the standpoints of health and economic considerations. Of course, such can only be achieved if there is an effective coordination among hospital maintenance services, housekeeping service, motor and pool service, motor pod service personnel, and all other hospital personnel.

1) Radioactive Waste Management Program

- Radioactive wastes are classified into solid or liquid waste.
- All radioactivity labels are removed from containers and packages prior to disposal as in-house waste.
- Non-radioactive wastes have separate waste bags (black bags).
- Refuse garbage cans with foot-operated lids are lined with heavy plastic bags. These containers are emptied regularly or when the receptacle exceeds 2 Mr/hr when measured on contact with lead protective shield.
- The activity of waste released as ordinary refuse should be less than 1.85 MBq/m3.
- Remains of Mo9 generators are stored in the outhouse for more than six months. After six months of storage, the generators will be dismantled. The column is placed very
close to the survey meter. If the reading does not exceed background radiation levels, then the container will be dismantled.

- The RIA kits beads or tubes are soaked overnight in 50 percent solution of household bleach. The next day, the solution is decanted and the beads/tubes rinsed with tap water. To dispose, 1-125 is transferred into the sewer as liquid and the beads and tubes are discarded as common trash.

- Radioactive waste is held in storage until they decay to background levels, for ten half-lives. For details, see Appendix 6.

- Records on the type of radionuclide, activity, nature, period of storage or decay, date of disposal, and initials of the person assigned to dispose are kept.

- All liquid wastes used in Nuclear Medicine have a half-life of less than two years. It is ensured that the liquid waste is soluble or dispersible in water.

- Liquid waste concentration released in sewer is less than 4 Bq/cc and in one day, does not exceed.
  - $^{131}$I = 370 kBq (10 uCi)
  - $^{125}$I = 370 kBq (10 uCi)
  - Tc$^{99m}$ = 37 MBq (1000 uCi)
  - T1-201 = 37 MBq (1000 uCi)

- Liquid wastes that cannot be disposed through sewers are disposed of by decay-to-decay method. Storage period is at least 10 half-lives.

- Neutralization of liquid wastes is conducted if necessary.
2) Waste Management: Diagnostic Decayed Waste from the Outhouse

Prior to performing the following procedures, the personnel involved must wear protective clothing (i.e., lab gown with closed buttons over ordinary clothes, facemask, and gloves). A survey meter or contamination monitor must be placed in a transparent plastic bag.

- Bring the boxes containing the contaminated syringes, vital, etc., outside the outhouse for monitoring. Start with boxes labeled with the earliest date possible.
- Using the GM survey meter, measure the radiation level at the surface of the box. The reading should not be above background levels.
  - If it is above background level, return the box with its contents to the outhouse.
  - If it is not above background level, open the box and monitor the content inside. The reading should again be comparable to background levels.
  - If higher than the background level, return the box with its contents to the outhouse and do not dispose at this time.
  - If it is at background level, deface all radioactive sign around the box and the plastic container. Transfer the waste into the ordinary waste bins.

- Record the date of disposal, the number of boxes disposed, and the contents of the boxes on a logbook for this purpose and affix signature.

3) Checklist for Monitoring Program Implementation

The Medical City regularly checks the implementation of the set protocols by going through a checklist. Table 10 shows this checklist.

---

Case 6: The Medical City in Pasig
Table 10. Mitigation Measures Checklist

<table>
<thead>
<tr>
<th>Enhancement/Mitigation measures</th>
<th>Status of Implementation</th>
<th>Actions taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landscape work</td>
<td>Yes</td>
<td>Completed</td>
</tr>
<tr>
<td>Solid waste management</td>
<td>No</td>
<td>Proper waste segregation is implemented and monitored. The solid waste are regularly collected by a contract hauler</td>
</tr>
<tr>
<td>Hazardous wastes management</td>
<td>No</td>
<td>Hazardous wastes are identified, regularly collected and treated by DENR-accredited treaters.</td>
</tr>
<tr>
<td>Wastewater treatment</td>
<td>Yes</td>
<td>Sewage treatment plant located at basement 3 is existing and is operated by the Facilities Department.</td>
</tr>
<tr>
<td>Noise control for generator sets</td>
<td>No</td>
<td>The walls of the generator room are built with acoustic material to control noise. The exhaust stacks of the 3 generators are equipped with mufflers and silencers for noise reduction. In addition, the generator sets are regularly maintained.</td>
</tr>
<tr>
<td>Air quality management</td>
<td>Yes</td>
<td>Ambient air monitoring of the premises is being conducted regularly.</td>
</tr>
</tbody>
</table>

Source: The Medical City

4) Handling of Hazardous Waste Stream Flowchart

Waste management starts from the collection of wastes from the different floors by the janitors. Each one has been assigned a number of floors. They go through the corridors assigned to them, collect the trash and push their carts toward the elevators. The service elevators lead the loads of trash down to the dumping area. This process takes about 20-30 minutes, depending on the amount to be collected. Once on the lower ground, the waste handlers change into protective gears before handling infectious and radioactive wastes. The trash is transferred to different bins for further categorizing and this takes about 30 minutes to 1 hour depending on the waste types. Based on the flowchart (Figure 37), the total time it takes to collect waste from patient rooms/areas and to prepare for haulers is about 50 minutes to 1.5 hours.
Figure 37. Flow Chart of Collection and Disposal of Hospital Waste from Point of Generation to Pick-up Area

Source: The Medical City
Some wastes require crushing, grinding or compressing in the crusher (Figure 38) to make transport or handling convenient.

*Figure 38. Photos of the Crusher and Crushed Waste Properly Labeled*

*Source: The Medical City*
The characteristics of the hospital’s waste management operations is shown in Table 11.

Table 11. Characteristics of the Hospital’s Waste Management Operations

<table>
<thead>
<tr>
<th>Operating hours/day</th>
<th>Operating days/week</th>
<th>Number of shifts/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>24</td>
<td>7</td>
</tr>
<tr>
<td>Maximum</td>
<td>24</td>
<td>7</td>
</tr>
</tbody>
</table>

Operating Capacity

<table>
<thead>
<tr>
<th></th>
<th>1st quarter (Feb-Mar-Apr)</th>
<th>2nd quarter (May-Jun-Jul)</th>
<th>3rd quarter (Aug-Sept-Oct)</th>
<th>4th quarter (Nov-Dec-Jan)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average daily production output</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Total water consumption (cubic meters)</td>
<td>58,214</td>
<td>54,959</td>
<td>55,408</td>
<td>57,286</td>
</tr>
<tr>
<td>Total output this quarter</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Total electric consumption this quarter (KwH)</td>
<td>4,494,000</td>
<td>4,942,000</td>
<td>5,012,000</td>
<td>4,452,000</td>
</tr>
</tbody>
</table>

Source: The Medical City

Deficiencies

As shown earlier in Figure 37, several delay points and deficient areas were identified. *This includes turnaround time, which takes 20-30 minutes from a patient’s room to the dumping area* (underscoring supplied). While this may be considered fair, rapid disposal time decreases individuals’ exposure to hazardous waste materials. Primarily, however, the delay in the transportation of waste was found to be due to technical reasons. *The slow ascent and descent of the elevator seems to be the identified factor causing most of the delay in the Hazardous Waste Stream* (underscoring supplied).
Recommendations

1) **Clearly define the problem.**
Consistent and scientifically based definitions of medical waste, its components, goals and how it is managed must be established before any clear improvement can be made in medical waste management.

2) **Focus on segregation first.**
No matter what final strategy for treatment and disposal of waste is selected, it is critical that wastes are segregated (preferably at the point of generation using color-coded containers and bags) prior to treatment and disposal. This important step must be taken to safeguard the occupational health of health workers. Adequate training, proper containers, presence of signs and availability of protective gear for workers are all necessary components of this process to assure that segregation takes place and is maintained.

3) **Institute a sharp management system.**
Proper segregation of materials in rigid, puncture-proof containers, which are then monitored for safe treatment and disposal is the highest priority for any health care institution. A sharp management system, likewise, calls for proper equipment and containers distributed in each location where sharps are generated, a secure system of collecting and transporting contaminated sharps for treatment and final disposal, and proper training of all hospital personnel on how to handle sharps safely.

4) **Keep focus on reduction.**
Establishing clear guidelines on product purchases can help keep waste management problems in check. A renewed emphasis needs to be focused on reduction of hazardous waste materials. For example, the hospital could benefit from
phasing out mercury-based products and technologies and instead moving toward digital- and electronic-technology diagnostic tools.

5) **Ensure workers’ safety through education, training, and proper personal protective gears.**

Proper education and training must be offered to all workers to ensure an understanding of the risk that wastes pose. Trainings should focus on how to protect themselves and how to properly segregate and manage wastes.

6) **Provide secure collection and transportation.**

If the benefits of segregation are to be realized, then there must be secure internal and external collection and transportation systems in place. Items that could potentially be reused illegitimately must be either rendered unusable after their use (cutting needles, puncturing IV bags, etc.).

7) **Require plans and policies.**

To ensure continuity and clarity in their management practices, health care institutions should develop clear plans and policies around management and disposal of waste. Details on these plans and policies need to be integrated into the routine employee training, continuing education, and hospital management evaluation processes for systems and personnel.

8) **Invest in training and equipment for reprocessing of supplies.**

Explore the possibility of judicious reuse or recycling of materials and, where found appropriate, set standards for reprocessing. This will provide quality products and help decrease the use of disposables.
9) *Invest in environmentally sound and cost-effective medical waste treatment and disposal technologies.*

Other countries’ rush to consider incineration of medical wastes as the ultimate solution to a problem is doing a great injustice to the community, the public health of its people, and the environment. Lesser risks are associated with other treatment technologies for unsegregated wastes such as autoclaving, hydroclaving, microwaving, and chemical disinfection.

10) *Develop infrastructure for the safe disposal of hazardous materials and solid waste.*

11) *Have regular maintenance check-ups on facilities involved in waste management (i.e., service elevators).*
The most basic best practice in health care waste management is to study thoroughly and to implement consistently the guidelines contained in the RHCWMM of 2005 issued by the Department of Health. As stated before, this Manual has the most comprehensive and complete set of standards on the safe and environmentally friendly segregation, collection, transportation, storage, treatment, and disposal of health care waste. The RHCWMM incorporates the requirements of all Philippine laws and regulations governing health care waste, as well as takes into consideration the recommendations of the World Health Organization.

Process Management of Health Care Waste

The management of health care waste is an operational process, a series of interrelated activities that transform inputs (raw wastes of various categories) into desirable outputs (safe and environmentally-friendly waste residues). As with any process, this relies on the interaction of six process elements, all of which must follow certain appropriate standards before the process is operated. If any of these are non-compliant with the relevant standards, the process will inevitably go wrong. Thus, hospital managers must ensure that these process standards are in place and that compliance with such standards is checked before the health care waste management processes are started. This assures a smooth, problem-free operation.

The six process elements, in the context of health care waste management are:
1) Personnel – The human resource is the most important of all process elements. It is indispensable to proper operations. At the same time, it is also the most difficult to manage. Personnel must undergo training in the protocols of health care waste management. However, only personnel that have passed such training should be allowed to handle health care waste. They must develop the self-discipline to follow these protocols, including the wearing of appropriate personal protective equipment, even when no one is watching. They should also be encouraged to contribute ideas for improving health care waste management based on their front-line experience.

2) Equipment and facilities – Management must provide the needed equipment and facilities, including dedicated and user-friendly color-coded bins, carts, tongs, color-coded storage rooms, etc.

3) Materials – This will include the adequate provision of consumables such as color-coded bags and disinfecting materials and supplies.

4) Methods – The adoption, documentation, and dissemination of RHCWMM-compliant procedures and regular audits of compliance are critical. All personnel must follow the correct protocols consistently. The path for the in-house transport of collected waste must be designed for minimal contact with non-health care waste management personnel. An appropriate schedule for waste collection must be followed. All safety measures must be adhered to. Furthermore, there should be efforts to adopt waste minimization policies and procedures (reduce, reuse, and recycle).

5) Measurement – This refers to the collection, recording, analysis, and reporting of quantitative or tangible information on health care waste. Management and staff should have a clear knowledge, at any given time, of the quantity, nature, and sources of health care wastes. Where storage time is relatively long, as in the case of radioactive wastes, accurate records must be kept for each container,
particularly its contents, half-life, start date of storage, radiation reading, and target date of disposal.

6) Work Environment – The waste storage rooms should be kept locked to prevent unauthorized access. They should have adequate water, lights, and ventilation, and be regularly cleaned using the appropriate cleaning materials.

Institutionalizing Proper Health Care Waste Management

Based on the six cases presented, certain key success factors are critical in ensuring that a culture of proper health care waste management is inculcated in the hospital organization. These are:

1. **Strong, consistent, and visible leadership support from the top management (the senior executives or managers of the institution)** – Proper health care waste management is difficult. It is a daily struggle. It is easy to slack off and fail to follow protocols if the top management does not show such leadership.

2. **The creation of an organizational unit charged with the planning and implementation of the program, whose head reports directly to the President or Hospital Chief** – The RHCWMM mandates the creation of a Health Care Waste Management Committee, and the appointment or designation of a waste management officer. The officer must report to the head of the hospital in order to give the position influence and clout.

3. **Continuous communication to create awareness and widespread support for the program** – All hospital personnel have to develop a keen awareness of and commitment to the health care waste management program. At the same time, patients and their families and hospital visitors, contractors, and suppliers have to be aware as well of such hospital’s program, particularly the proper segregation and handling of the waste they generate.
4. **Wide participation, through the Health Care Waste Management Committee, that involves a cross-section of the hospital community** – All members of the hospital community--personnel as well as external stakeholders---should be encouraged to contribute to the success of the health care waste management program, whether it be by complying with the waste segregation scheme, or giving suggestions or ideas for improvement.

5. **Training and education on health care waste management given to everyone.** This is very basic. People will not follow standards and procedures if they do not understand and appreciate the rationale. Everyone should receive the basic training regularly, not just once. Those who are specifically involved in the collection, transport, storage, and disposal of health care waste must receive additional trainings.

6. **The creation, documentation, and dissemination of appropriate measurable and/or tangible standards for health care waste management based on the Revised Health Care Waste Management Manual (RHCWMM).** -- Everyone should know exactly how specific wastes coming from their particular work area are to be classified, segregated, handled, collected, transported, and disposed.

7. **The formulation of explicit and formal plans, programs, and strategies for Waste Management** – The RHCWMM requires the creation of a waste management plan. This plan should be the product of collaboration among all concerned units, so that everyone will feel a sense of ownership over it. The plan should be widely disseminated, and regularly updated.

8. **The regular audits that enforce the standards and sanction violators** – There should be regular audits and inspections, preferably done at random and without prior notice, to verify if the standards and protocols of health care waste management are actually being followed. This audit should extend to the contractors.
that collect and dispose the pathological, chemical, sharps, and other hazardous wastes. Where deviations from standards are observed, the accountable managers or supervisors should be made to explain and to prepare a corrective and preventive action plan that aims to eliminate permanently the root causes of such deviations.

9. **The rewards/incentives and recognition scheme that positively reinforces the efforts of those who contribute to the successful implementation of the health care waste management program** – Such positive reinforcements (e.g., sharing the proceeds of the sale of waste with the involved hospital personnel) create a strong incentive for the success of the program.

10. **A list of accredited buyers of the recovered materials, and qualified contractors to handle hazardous waste that cannot be recycled or reused internally** – Buyers of non-hazardous materials should be accredited to ensure that these are legitimate, not fly-by-night, businesses. For the hazardous waste, the hospital management must first investigate the background and technical capabilities of the proposed contractors, including the technology of waste disinfection and neutralization they propose to use. Track records and referrals from present and past clients should be obtained. Their facilities should be inspected and qualified.

**Conclusion**

While some forms of waste are inevitable in the operation of hospitals and other health care facilities, both quantity as well as the hazards inherent in such waste can be managed. Proper health care waste management is an integral part of competent hospital operations. It cannot be ignored or neglected; otherwise the hospital will ironically become a major source of serious health threats to the community it is committed to serve. For private hospitals that have to compete to survive, it is an essential condition for gaining a competitive advantage.
Appendices

Appendix 1: Handling of Hazardous Waste Stream Policy Guidelines

Specific waste streams that any hospital or health care facility must examine in its assessment and planning process shall include the following:

<table>
<thead>
<tr>
<th>Hazardous Materials</th>
<th>Point of Generation</th>
<th>Point of Use and Disposal</th>
<th>Common Disposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemotherapy and Anti-neoplastic Chemicals</td>
<td>Prepared in the central clinic or pharmacy</td>
<td>Patient care areas, Pharmacy, Specialty Clinics</td>
<td>Incineration as RMW, Disposal as HW</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>Pathology, Autopsy, Dialysis, Nursing Units</td>
<td>Pathology, Autopsy, Dialysis, Nursing Units</td>
<td>Diluted and Flushed down sanitary sewer</td>
</tr>
<tr>
<td>Photographic Chemicals</td>
<td>Radiology</td>
<td>Radiology</td>
<td>Developer and fixer is often flushed down sanitary sewer, X-ray film is disposed of as solid waste</td>
</tr>
<tr>
<td>Solvents</td>
<td>Pathology, Histology, Engineering, Laboratories</td>
<td>Pathology, Histology, Engineering, Laboratories</td>
<td>Evaporation, discharged to sanitary sewer</td>
</tr>
</tbody>
</table>
(Appendix 1 continuation. . .)

<table>
<thead>
<tr>
<th>Hazardous Materials</th>
<th>Point of Generation</th>
<th>Point of Use and Disposal</th>
<th>Common Disposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
<td>Throughout all clinical areas in thermometers, sphygmomanometers, etc.</td>
<td>Clinical areas, Labs</td>
<td>Broken thermometers are often disposed in sharps containers. If no spill kits are available, mercury is often disposed of as RMW or SW. Often incinerated.</td>
</tr>
<tr>
<td>Anesthetic Gases</td>
<td>Operating Theater</td>
<td>Operating Theater</td>
<td>Waste gases are often direct vented by vacuum lines to the outside.</td>
</tr>
<tr>
<td>Ethylene Oxide</td>
<td>Central Sterile Reprocessing, Respiratory Therapy</td>
<td>Central Sterile Reprocessing, Respiratory Therapy</td>
<td>Vent exhaust gas to the outside.</td>
</tr>
<tr>
<td>Radionuclides</td>
<td>Radiation Oncology</td>
<td>Radiation Oncology</td>
<td>Storage in secure area, disposal by PNRI.</td>
</tr>
<tr>
<td>Disinfecting Cleaning Solutions</td>
<td>Hospital-wide Environment Services, Facilities Management, Operating Theater</td>
<td>Diagnostic Areas, Operating Theater, Facilities Management</td>
<td>Dilution, disposal in sewer.</td>
</tr>
</tbody>
</table>
## Appendix 2:
### Solid waste characterization/information

<table>
<thead>
<tr>
<th></th>
<th>Average quantity of solid wastes collected/month</th>
<th>Total quantity of solid wastes collected this quarter</th>
<th>89 truckloads</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entity in charge of collecting solid wastes</td>
<td>Vangie’s Enterprises</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brief description of solid waste management plan</td>
<td>Segregation of general waste from hospital waste collection. Pathological waste collected by accredited transporter and treater.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Appendix 3:
**Water Pollution Data**

<table>
<thead>
<tr>
<th></th>
<th>Feb-Mar-Apr</th>
<th>May-Jun-Jul</th>
<th>Aug-Sept-Oct</th>
<th>Nov-Dec-Jan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic wastewater</td>
<td>256</td>
<td>250</td>
<td>250</td>
<td>272.73</td>
</tr>
<tr>
<td>(cubic meters/day)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooling wastewater/wash</td>
<td>278.30</td>
<td>278.30</td>
<td>292</td>
<td>223.64</td>
</tr>
<tr>
<td>water, equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Process wastewater</td>
<td></td>
<td></td>
<td></td>
<td>87.3</td>
</tr>
<tr>
<td>Others: wash water, floor</td>
<td>69.5</td>
<td>69.5</td>
<td>73</td>
<td>--</td>
</tr>
</tbody>
</table>
Appendix 4: 
Record of Cost of Treatment (2010-2011)

<table>
<thead>
<tr>
<th></th>
<th>Feb</th>
<th>Mar</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug</th>
<th>Sept</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Jan</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of employees</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost of employees</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost of chemicals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utility costs</td>
<td>105,670</td>
<td>107,691.8</td>
<td>114,493.2</td>
<td>115,725</td>
<td>134,341.12</td>
<td>129,100</td>
<td>120,800</td>
<td>113,390.2</td>
<td>125,564.5</td>
<td>136,946</td>
<td>135,183</td>
<td>137,861</td>
</tr>
</tbody>
</table>
### Appendix 5:
**RA 8740 – 2011-2012 Summary of APSE/APCF**

<table>
<thead>
<tr>
<th>Fuel burning equipment</th>
<th>Location</th>
<th>Fuel used</th>
<th>Quantity Consumed (L)</th>
<th>Hours of Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generator 1</td>
<td>Basement 1</td>
<td>Diesel</td>
<td>4844</td>
<td>20.2</td>
</tr>
<tr>
<td>Generator 2</td>
<td>Basement 1</td>
<td>Diesel</td>
<td>4844</td>
<td>20.2</td>
</tr>
<tr>
<td>Generator 3</td>
<td>Basement 1</td>
<td>Diesel</td>
<td>0</td>
<td>Ongoing construction</td>
</tr>
<tr>
<td>Diesel fire pump</td>
<td>Basement 2</td>
<td>Diesel</td>
<td>36</td>
<td>25</td>
</tr>
<tr>
<td>Monark-caterpillar</td>
<td>Basement 1</td>
<td>Diesel</td>
<td>4844</td>
<td>20.2</td>
</tr>
</tbody>
</table>
Appendix 6: 
Radioactive Materials Storage Procedure

1. Radioactive materials are stored in a secured place, adequately shielded and with a radioactive material sign prominently displayed. Only authorized personnel have access to the storage area.

2. All radioactive sources are marked with the radiation sign and properly labeled as to the activity and name.

3. Syringe shields and lead pots are available for use. A designated area in the hot lab (that is, I-131) is assigned inside the vented area.

4. Radioactive materials will be held in storage until they decay to background levels, generally for 10 half-lives. Once they have decayed to background level are they considered as non-radioactive.

5. The “hot rush” will be disposed every morning, or when the receptacle exceeds 2mR/hr when measured on contact with the lead protective shield. At any time, all contaminated materials will be immediately taken to the decay container.

The sign outside and the lock on the radioactive waste room, prevent unauthorized people from accessing the room.
6. A decay room (outhouse) is placed in an area apart from the general public and hospital personnel. It is also secured with a lock to prevent inadvertent entry. The decay box, which is subject to filling for one week, will contain all syringes, needles (capped tightly) and vials that will be decomposed. As one container is being filled, the contents of the other container are decaying. This ensures the decay of all but very few radionuclides.

7. Boxes must be appropriately labeled with warning signs.
References


Department of Health website http://www.doh.gov.ph


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Philippine Orthopedic Center website http://www.poc.doh.gov.ph


Rizal Medical Center website http://www.rizalmedicalcenter.gov.ph

References

The East Avenue Medical Center website http://www.eamc.doh.gov.ph

The Medical City website http://www.themedicalcity.com

Veterans Memorial Medical Center website http://www.vmmc.gov.ph
Enrico C. Mina, DBA is a senior lecturer at the Department of Business Studies, Papua New Guinea University of Technology; and an experienced consultant and seminar leader on total quality management (TQM) and Kaizen. He has held several posts on quality management: vice-president and consulting director at Kaizen Management Systems, Inc.; advisor on TQM for a USAID-funded technical assistance project for the National Telecommunications Commission; deputy managing director and chief operating officer of Resource Consultants International, Inc.; executive director of E. C. Yap, Jr. Quality and Productivity Institute of the University of the East; manager of a productivity consultancy project of the Philippine Quality and Productivity Movement; head facilitator of quality management system at the Beer Division of San Miguel Corporation; and manager of the Methods Department, as well as administrator of the quality circles, at the United Laboratories, Inc.

His other posts in the academe include part-time faculty in the Masters in Business Administration (MBA) program of the Ateneo Graduate School of Business for 24 years; and full time on applied economics in the Master in Public Management program at the Ateneo School of Government since 2007. He was also a faculty of the Ateneo School of Medicine and Public Health, which pioneered the dual-degree program consisting of a medical degree and MBA, from 2009.

Dr. Mina is actively involved in advocating quality in the private and public sectors. Among his involvements include the Big Enterprise Small Enterprise Program of the Employers Confederation of the Philippines, in collaboration with the Department of Trade and Industry and the Department of Science and Technology. He is a life member of the Board of Trustees of the Philippine Quality and Productivity Movement; and an assessor for the Philippine Quality Award, which is based on the Malcolm Baldrige National Quality Award of the United States. He also qualified in the Philippine branch of Mensa, an international organization comprising members whose IQs are in the top 2% of the population; and as a registered coordinator for the COPC-2000® Gold Standard, an internationally accepted set of quality and productivity standards for customer contact centers.

He graduated summa cum laude from De La Salle University (DLSU) Manila, with Bachelor of Arts major in Economics and Bachelor of Science in Business Administration in 1973. He obtained his MBA from the Ateneo de Manila University in 1979, and Doctor in Business Administration from DLSU in 2011.

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