Proceedings of the Training on Health Care Waste Management

CaLaBaRZon Region, Philippines
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Health Care Waste Management
CaLaBaRZon Region, Philippines

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**ABBREVIATIONS**

<table>
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<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>3R</td>
<td>Reduce, Reuse and Recycle</td>
</tr>
<tr>
<td>CHD</td>
<td>Center for Health Development</td>
</tr>
<tr>
<td>DOH</td>
<td>Department of Health</td>
</tr>
<tr>
<td>GEF</td>
<td>Global Environment Facility</td>
</tr>
<tr>
<td>HCF</td>
<td>Health Care Facility</td>
</tr>
<tr>
<td>HCWM</td>
<td>Health Care Waste Management</td>
</tr>
<tr>
<td>HCWMC</td>
<td>Health Care Waste Management Committee</td>
</tr>
<tr>
<td>LGU</td>
<td>Local Government Unit</td>
</tr>
<tr>
<td>MOEJ</td>
<td>Ministry of the Environment of Japan</td>
</tr>
<tr>
<td>MRI</td>
<td>Mitsubishi Research Institute</td>
</tr>
<tr>
<td>PD</td>
<td>Presidential Decree</td>
</tr>
<tr>
<td>RA</td>
<td>Republic Act</td>
</tr>
<tr>
<td>RRC.AP</td>
<td>Regional Resource Centre for Asia and the Pacific</td>
</tr>
<tr>
<td>SMCS</td>
<td>Sound Material Cycle Society</td>
</tr>
<tr>
<td>TCI</td>
<td>Training Comfort Index</td>
</tr>
<tr>
<td>TWG</td>
<td>Thematic Working Group</td>
</tr>
<tr>
<td>UNDP</td>
<td>United Nations Development Programme</td>
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</table>
I. EXECUTIVE SUMMARY

Solid and Hazardous waste is increasingly becoming a major environmental burden of most urban and industrial areas. An alarming rate of solid and hazardous waste arising in Asia and the world has been witnessed parallel to urbanization, industrialization and economic development. Issues such as the increase in volume, variety of solid wastes, their qualitative diversification, and the trans-boundary movement of hazardous materials and soaring prices of resources now bound. The Thematic Working Group on Solid and Hazardous Waste (Waste TWG) of the Regional Forum on Environment and Health in Southeast and East Asian Countries was established in 2007 to address many of these problems. The goal of Waste TWG is to ensure environmentally sound management of solid and hazardous waste, particularly municipal and medical waste, and promote the 3R's.

Several meetings of the Waste TWG were held, the first meeting was held in Singapore (28-29 February 2008), the second meeting was held in Cambodia (2-3 December 2008). These meetings discussed the status-quo and issues on medical waste management or health care waste management (HCWM) in member countries as well as shared good practices and lessons learnt relative to the 3R principle. Based from the recommendation of the first phase of Waste TWG, the second phase (2010-2013) of waste TWG includes, among other objectives, to 1) hold workshops to promote activities relevant to the recommendation utilizing the status-quo reports compiled in the first phase; and 2) enhance capacity building of policy makers to identify and address waste and health problems by sharing knowledge including best practices in the region.

Moreover Waste TWG Secretariat conducted a survey on March 2011 to 14 member countries on the need for capacity-building of HCWM in relevant stakeholders in the region. The secretariat compiled the survey duly accomplished by the member countries, particularly the health sector tackling on HCWM. The results on capacity-building needs analysis showed that the strengthening of national/local level training workshops for health care managers, health care waste authorities/facility managers/workers or municipalities was a high priority and was selected.

Based on the above-mentioned developments, the Ministry of the Environment of Japan, through the Mitsubishi Research Institute (MRI), requested RRC.AP to support the waste TWG member countries to build capacity on HCWM. The Philippines was selected to conduct the HCWM training at the local level. Upon completion of the capacity building through HCWM training, the results will be disseminated to other areas within the country and to other TWG member countries.
RRC.AP worked in collaboration with the Citigate Travelplus Dasma and Department of Health (DOH) Region 4A (CaLaBaRZon\textsuperscript{1}), of which the latter agreed to be a collaborating centre for the implementation and conduct of the HCWM training. The training was aimed to train head or key staff/local persons involved in health care waste management from DOH, LGU, and selected private hospitals within the CaLaBaRZon Region. The CHD CaLaBaRZon hosted the training with the support of RRC.AP. Planning, preparations, and management of the training including the training modules, materials, resource speakers, listing and communication of invitations for prospective participants, venues and logistics were carried out by DOH 4A CaLaBaRZon, RRC.AP and Citigate TravelPlus.

The five day training on Health Care Waste Management was designed to address the management of health care waste of local health facilities. The training aimed to train head/Chief of Hospital or key staff/focal person involved in healthcare waste management from DOH, LGU and selected private hospitals within the CALABARZON.

The chosen venue for the HCWM training was the City State Tower Hotel located in Ermita, Manila, Philippines. On the day of the training thirty-two (32) individuals from twenty-three (23) different health facilities of CaLaBaRZon Region composed this batch of participants (Annex A).

\textsuperscript{1} CaLaBaRZon region covers the mainland provinces and cities of Cavite, Laguna, Batangas, Rizal and Quezon
II. INTRODUCTION

The Center for Health Development No. 4A (CHD 4A) is the Department of Health Regional Field Office for CaLaBaRZon Region, covering the mainland provinces and cities of Cavite, Laguna, Batangas, Rizal and Quezon. CHD 4A is responsible for the field operations of the Department of Health in the CaLaBaRZon region and it is mandated to implement and monitor health and health-related laws, regulations, policies and programs; and to coordinate with regional offices of other departments, offices and national government agencies as well as local government units within the region.

In CALABARZON Region there are two hundred thirty-nine (239) health facilities, 29% (69) are government-owned hospitals and 71% (170) are privately-owned hospitals. The service capability/category of these health facilities are Level 1 to Level 4. The authorized bed capacity of Level 1 to Level 4 ranges from 10 to 260. For this project of Regional Resource Centre for Asia and the Pacific (RRC.AP) - Training on Health Care Waste Management, the recipients were from twenty-three (23) health facilities (10%). Thirty-two individuals from these twenty-three (23) different health facilities of CaLaBaRZon Region composed this batch of participants (Annex A). The training was held on March 5 – 9, 2012 at the City State Tower Hotel, Ermita, Manila.

Table 1 shows the name of health facilities represented by the participants.

Table 1: Distribution of Participants According to Health Facilities

<table>
<thead>
<tr>
<th>Name of Health Facility</th>
<th>Number of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apacible Memorial District Hospital</td>
<td>1</td>
</tr>
<tr>
<td>Batangas Regional Hospital</td>
<td>2</td>
</tr>
<tr>
<td>CarSiGMA District Hospital</td>
<td>1</td>
</tr>
<tr>
<td>Dela Salle University Medical Center</td>
<td>1</td>
</tr>
<tr>
<td>Don Juan Mayuga Memorial District Hospital</td>
<td>2</td>
</tr>
<tr>
<td>Don Manuel Lopez Memorial District Hospital</td>
<td>2</td>
</tr>
<tr>
<td>Dona Marta Memorial District Hospital</td>
<td>1</td>
</tr>
<tr>
<td>Dr. Jose P. Rizal Memorial District Hospital</td>
<td>1</td>
</tr>
<tr>
<td>Emilio Aguinaldo College Medical Center</td>
<td>1</td>
</tr>
<tr>
<td>Gen. Emilio Aguinaldo Memorial Hospital</td>
<td>1</td>
</tr>
<tr>
<td>Gen. J. Cailles Memorial District Hospital</td>
<td>1</td>
</tr>
<tr>
<td>Gumaca District Hospital</td>
<td>1</td>
</tr>
<tr>
<td>Laguna Provincial Hospital</td>
<td>2</td>
</tr>
<tr>
<td>Lipa Medix Medical Center</td>
<td>1</td>
</tr>
</tbody>
</table>
A total of thirty-five (35) participants were invited to attend in this training and thirty-two (32) (91.42%) actually participated.

Participants representing the government health facilities (Provincial and District Hospitals) operated by Local Government Units (LGU) level constituted the majority of the trainees (78.12%) of the course. Seven participants (21.88%) were from private hospitals.

Table II. Distribution of Participants According to Department and Their Designation

<table>
<thead>
<tr>
<th>Department of Health Levels</th>
<th>Designation</th>
<th>Number of Participants</th>
<th>Total Number of Participants (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional</td>
<td>1. Medical Officer IV – Health Facility Enhancement Program Coordinator</td>
<td>1</td>
<td>5 (15.63%)</td>
</tr>
<tr>
<td></td>
<td>2. Supervising Administrative Officer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Engineer III – Hospital Licensing Officer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Engineer III – Maintenance Engineer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Sanitary Inspector V – Hospital Licensing Officer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Provincial</td>
<td>1. Provincial Sanitary Engineer</td>
<td>2</td>
<td>7 (21.88%)</td>
</tr>
<tr>
<td></td>
<td>2. Pollution Control Officer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Administrative Officer</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Engineer II</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Asst. Chief Nurse</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>District Hospital</td>
<td>1. Chief of Hospital</td>
<td>4</td>
<td>11 (34.38%)</td>
</tr>
<tr>
<td></td>
<td>2. Administrative Officer</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Nurse</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
This Training on Health Care Waste Management was designed to address the management of health care waste of local health facilities. The demand for health services of the CaLaBaRZon growing population is increasing and there is need for continuous improvement and upgrading of health facilities. As a result, there is an increasing volume of health care wastes generated that, if not properly handled, carries risk for infection and injury. The health care facilities have the responsibility to prevent these through proper handling, collection, storage, treatment and disposal of health care waste. With the development of new technologies for health care wastes and promulgation of new laws and policies, there is an urgent need to train the health care providers. This will provide a more effective and efficient approach in the management of health care wastes that will eliminate potential risk to people’s health and reduce health problems.

### III. OBJECTIVE

By the end of the training workshop, the participants were able to:

1. Developed awareness of the health, safety and environmental issues relating to HCW in health care establishments;

2. Identify the health and environmental impacts of health care waste and appreciate the need to protect patients, health care staff, the community and environment by ensuring proper HCW management;

3. Discuss the concepts and importance of application of 3Rs and environmentally sound technologies; and

4. Identify the requirements and strategies necessary to institute and sustain a health care waste management program in their respective facilities.
IV. OPENING CEREMONY

The Opening Ceremony was graced by the newly appointed Director IV of Department of Health - Center for Health Development IVA – (CHD IVA) - Dr. Edgardo M. Gonzaga. Dr. Gonzaga acknowledged the participants one by one by calling all their names and the health facilities where they belong. He was grateful to the Ministry of Environment of Japan and the Regional Resource Center for Asia and the Pacific (RRC.AP) in collaborating with the DOH – CHD IVA in providing support in this training. He also welcomed the participation of the private hospitals being our partners in providing quality health care. He thanked the participants for believing in this kind of training. It is the mandate of the DOH to provide technical assistance but he emphasized that DOH cannot do it alone, that it needs partners in providing quality care and also being responsible for the management of health care wastes. Lastly, he solicited the comments of the participants if they had any problem with their License to Operate, and that if they have any concerns that need to be addressed. He inspired the participants and challenged them with the task ahead and he thanked them for attending the training.

V. CONTENT OF THE COURSE

1. Health and Environmental Impacts of Health Care Waste
2. Legislation, Laws and Policies Related to HCW Management
3. Health Care Waste Minimization (3Rs Application)
4. Segregation, Collection, Storage and Transport of Health Care Waste
5. Mercury in Health Care Facility
6. Hazardous Waste Storage Options: Mercury
7. Health and Safety Practices in HCW Programs
8. Health Care Wastewater Management
9. Waste Treatment and Disposal
10. Institutionalization and Sustainability of HCW Management
11. Case Studies on HCW Management
12. Case Studies on HCW Technologies and Energy Efficiency in HCF
13. Innovative Practice of Health Care Waste in Asia
14. Health Care Facility Visit
15. Health Care Waste Management Plan
A. Overview

The training overview was presented by Engr. Corazon Vidad. She briefly discussed the objective of the training, its content, and gave a brief orientation on the topics to be presented and schedule of activities. The mechanics for the following activity, which was the levelling of expectations, was presented by Engr. Vidad. The expectations are categorized into: 1) expectation from the training; 2) expectation from the resource persons/facilitators; 3) expectation from the co-participants; and 4) expectation from each trainee/participant. To gather the responses from the participants, they were divided into four groups and all of them transfer from one station to the next station, until they complete posting their responses on the four boards where the different expectation categories were posted. Engr. Vidad processed the activity by clarifying the responses written on the board. This levelling of expectation is an important activity to gauge the effectiveness/success of the training.

The participants were also asked to fill in a form to assess their personal Training Comfort Index (TCI), facilitated by Engr. Guilberto Borongan. The Index was calculated from the self-assessment of the trainees, who rated their capacity in the training categories of Data Gathering, Data Analysis, Solution Development, and Action Taking. The scoring for each category was placed on a chart where the TCI was illustrated by the area of a quadrilateral, resulting from the connection of the four scores. With only one exception, all participants assessed themselves with general high scores, which indicated a high level of confidence and expectations. Nevertheless, the two categories requiring more inventiveness and initiative, i.e. Solution Development and Action Taking, scored relatively low, indicating the need for the training to focus on the practical implementation of the topics. Participants were requested to take the test again at the end of the training. In this case the results indicated a significant improvement, especially regarding the confidence of the trainees in taking action and developing solutions. The shape of the resulting quadrilaterals was also more regular and closer to a square shape, indicating the achievement of a balance among the different categories of acquired knowledge.

B. Health and Environmental Impacts of Health Care Waste

Number of hours: 1 hour
Learning Objectives:

1. To define key terminology related to health care waste.
2. To identify the various types of health care waste.
3. To identify the various health and environmental risks from health care wastes

The Health and Environmental Impacts of Health Care Waste Management module was presented by Dr. Gilbert Par. He discussed that in pursuing the aims of the health care services in reducing health problems and eliminating potential risks to people’s health, the process inevitably creates wastes that are hazardous to health. The waste produced by the health care facilities in the course of health care activities carries risk for infection and injury. Wherever it is generated, safe and reliable methods for its handling are, therefore, essential.

Inadequate and inappropriate handling of health care waste poses serious public health consequences and a significant impact on the environment. Thus, sound management of health care waste should be considered a crucial component of environmental health protection.

In both the short term and the long term, the actions involved in implementing effective health care waste management programs require multisectoral cooperation and interaction at all levels. Since the wastes that are inadequately managed may have a widespread impact, policies should be generated and coordinated globally, and the management practices implemented locally. Establishment of a legal framework vis-à-vis a national policy is of utmost importance.

Management of health care waste should thus be put into a systematic, multifaceted framework, and should become an integral feature of health care services. Improved awareness of the problem in the community is as well vital in ensuring public participation in generating and implementing policies and programs related to health care waste management.

C. Legislation, Laws and Policies Related to HCW Management

Number of hours: 1 hour

Learning Objectives:
1. Discuss laws, polices and guidelines related to health care waste management;
2. Identify the requirements and strategies on how to comply with the existing laws and regulations.

The module on “Legislation, Laws, and Policies related to HCW Management” was presented by Engr. Corazon Z. Vidad. The health care facilities (HCF), as generators of health care waste (HCW), are responsible for the collection, handling, segregation, transport, treatment and disposal of the HCW they produce. To do this, the HCF have to be cognizant on the existing international agreements, national laws, policies, guidelines and specific administrative requirement related to health care waste management (HCWM). Understanding these laws polices and guidelines will provide direction to HCF in developing HCWM program.

This presentation provided the participants with the knowledge of the existing international agreements and laws, policies, guidelines required by regulatory agencies such as Department of Health, Department of Environmental and Natural Resources, Environmental Management Bureau, Laguna Lake Development Authority and Department of Labor and Employment. The importance in complying with all these regulations to protect the health and the environment was emphasized.

D. Health Care Waste Minimization (3Rs Application)

Number of hours: 2 hours

Learning Objectives:

1. Identify challenges faced in Health Care Waste Management at the HCF;
2. Discuss about the concept and importance of 3Rs in Health Care Waste Management at the HCF;
3. Build awareness on 3R principles and its practices in HCF;
4. Identify the health care waste categories at the HCF from Asian countries;
5. Inform about existing regional frameworks on waste management system; and
6. Identify elements in carrying out recycling projects in HCF

The lecture on health care waste minimization was discussed by Engr. Guilberto Borongan. The high potential for waste minimization and the Reduce, Reuse and Recycle (3Rs) of wastes in developing country cities or provinces are beset with
problems and challenges that include the use of open dumps that create and spread health problems, contamination of underground water resources, decreasing capacity of sanitary landfills along with difficulties in establishing new dump-sites and rising costs of wastes disposal. Similarly, lack of initiatives and actions toward its segregation at source are evident – most medical/hospital wastes are disposed together with municipal wastes while others are openly burnt. Only a few local initiatives have been undertaken by non-government organizations.

The 3R approaches are necessary for the establishment of a Sound Material Cycle Society (SMCS). The key strategies for the promotion and implementation of 3Rs include; raise awareness, create partnerships between various health care stakeholders, share information, carry out technological research/development and provide incentives. Effective linkage between these diverse approaches will achieve synergistic effects, making effective promotion and implementation of the 3Rs possible.

Existing initiatives and regional framework in SEA and East Asia related to waste management and 3Rs as well as healthcare waste categories in some Asian countries, and the challenges faced in healthcare waste management at the HCF were discussed.

His discussion provided the participants with an overview of 3Rs and its application on Health Care Waste Management by building awareness on 3R principles and its practices in Health Care Facilities.

**E. Segregation, Collection, Storage and Transport of Health Care Waste**

Number of hours: 2 hours

Learning Objectives:

1. Identify proper methods of segregation, coding and labeling of health care waste;
2. Discuss guidelines on proper storage of health care waste;
3. Identify requirements for a central waste storage facility;
4. Discuss guidelines on proper collection and transport of health care waste; and
5. Identify requirements for packaging and vehicles for off-site collection of waste

The Segregation, Collection, Storage and Transport of Health Care Waste session conducted by Engr. Aida C. Barcelona discussed the important concepts involved in the management of health care wastes and the process of separating different types of
waste at the point of generation until its final disposal. The entire waste generated from the health care facility is separated according to the specific treatment and disposal requirements to reduce the amount of waste that must be handled and treated as hazardous waste, to help reduce the risks of hazardous health care waste to workers, to lower the cost of treatment and disposal of health care waste and to make possible the recycling of non-hazardous general waste. Segregation must be applied strictly at the point of generation during collection, transport, storage and at the treatment site prior to final disposal.

All untreated HCW inside plastic liners shall be collected using standard trolley and deposited in waste storage area until transported to a designated on-site/off-site treatment facility. The storage area must satisfy all the requirements for an appropriate storage. The waste in plastic liners or waste bins shall be stored in a separate area, room or building of a size appropriate to the quantities of waste produced and there shall be a schedule of collection depending on the waste generated. In cases where the HCF lacks the space, daily collection and treatment shall be imposed prior to disposal.

Health care waste collection and transport must be an efficient movement of waste from point of generation to storage or treatment while minimizing the risk to personnel. This may be on-site, following designated route, or off-site collection and transport.

Her discussion and group activity provided the participants with the knowledge on how to implement proper segregation, collection, storage and transport health care wastes.

F. Mercury in Health Care Facility

Number of hours: 2 hours

Learning Objectives:

1. Learn the importance of properly segregating mercury wastes from the rest of the health care facilities wastes;
2. Identify the responsibilities of each health care facility in the construction of temporary storage for mercury wastes;
3. Learn how to construct and maintain the temporary storage for mercury wastes;
4. Identify appropriate committee structure that will maintain the temporary storage site, and
5. Identify necessary budgetary requirements for the construction and maintenance of storage area

Ms. Faye Ferrer talked about the Mercury in Health Care Facility. Her discussion focused on the virtue of Department of Health Administrative Order 2008-0021 (DOH AO21) or the Gradual Phase-out of Mercury in all Philippine Health Care Facilities and Institutions; health care facilities (HCF) all over the country have replaced mercury-containing thermometers and sphygmomanometers with safe and appropriate alternatives. The phase-out in 2010 marked the Philippines as the first developing country to order a phase-out of mercury devices in all of its hospital.

With the phase-out enforced, health care facilities are faced with the important task of proper temporary storage of these phased-out devices and ensuring that they would not be re-introduced to the environment again. The United Nations Development Programme Global Environment Facility (UNDP-GEF) Global Health Care Waste Project has produced a guidance document for the temporary storage of phased-out mercury waste in health care facilities.

Her discussion provided information to the participants on how to safely store phased-out mercury devices and how to take precautions in securing them. The participants also learned how proper management of wastes – toxic or non-toxic – will help improve each health care facility’s waste stream.

G. Hazardous Waste Storage Options: Mercury

Number of hours: 0.5 hours

Engr. Guilberto Borongan presented his experiences from observation tours and studies from developed countries on their storage protocols for mercury wastes. He underlined the importance of proper storage of collected mercury wastes. Germany has some of the most vast and modern facilities that can accommodate not only mercury but also other hazardous chemicals.

H. Health and Safety Practices in HCW Programs

Number of hours: 1 hour
Learning Objectives:
For the participants to be able to describe the health and safety practices in health care waste management based on its minimum elements.

Dr. Gilbert Par discussed the Health and Safety Practices in HCW Programs. The waste is produced in so many areas within the health care facility. In order to properly manage health care waste, having a team approach is essential. All members of the health facility play a critical role in the management of health care waste. Hence, all personnel should be made aware of their roles and responsibilities, as well as the procedures that apply to their work in order to manage health care waste safely and efficiently.

He presented the following items that comprise the “Minimum Program Elements of a Health Care Waste Management”, which health facilities should look into, in order to assure the health and safety, not only of their patients and clients, but of the health facility staff and the community itself:

1. Written plan
2. Clear responsibilities
3. Written, internal rules
4. Staff training
5. Protective clothing
6. Good hygiene practices
7. Vaccinated workers
8. Designated storage locations
9. Waste minimization
10. Waste segregation
11. Waste Treatment
12. Final disposal site
13. Periodic reviews

After his discussion, the participants were provided with knowledge on particular health and safety practices that needs to be observed in handling health care wastes.
I. Health Care Wastewater Management

Number of hours: 2 hours

Learning Objectives:

1. Characterize wastewater from health care facilities in terms of its composition and type;
2. Identify the different sources of wastewater in health care facilities;
3. Discuss the hazards/risks associated with wastewater from health care facilities;
4. Discuss the environmental and health impact of discharging untreated wastewater; and
5. Discuss the appropriate and specific technologies for the treatment and disposal of wastewater.

Professor Romeo Quizon presented the Management of Wastewater from Health Care Facilities. His discussion was focused on how the hazards posed by improper wastewater management have served as bases for the enactment of several National Legislations and Codes. The Sanitation Code of the Philippines (PD 856) and the Philippine Clean Water Act of 2004 (RA9275) have specific provisions for the proper collection, treatment and disposal of wastewater. However, the strict implementation of these legislations remains a challenge due to constraints in resources and many other concerns.

Wastewater from health care facilities poses greater risks to human health and the environment as compared to domestic wastewater. This is attributed to certain components of health care wastewater such as chemicals, pharmaceutical products, contagious biological agents and radioisotopes.

This module aims to present specific technologies for the treatment and proper disposal of wastewater. As an introduction, wastewater will be characterized according to its composition, type and sources. Environmental and health hazards associated with wastewater from health care facilities will be the take off point for the discussion on the management of wastewater. This will include appropriate technologies for the treatment and disposal of wastewater from health care facilities.

His presentation provided great interest to the participants on the importance of having their wastewater treated before discharging it in the environment.
J. Waste Treatment and Disposal

Number of hours: 1 hour

Learning Objectives:

1. Identify the appropriate treatment technologies and processes for health care waste;

2. Discuss the appropriate standard disposal system for each category of waste.

Engr. Corazon Vidad identified the Treatment and Disposal requirement for each type or category of waste. She discussed that for each waste category there is corresponding treatment and disposal requirement. Non-hazardous wastes, Infectious, Pathological, Chemical, Pharmaceutical, Radioactive and Sharps – all these wastes have corresponding treatment: autoclave, microwave, pyrolysis, chemical disinfection; and disposal: landfilling, and safe burial.

K. Institutionalization and Sustainability of HCW Management

Number of hours: 2 hours

Learning Objectives:

1. Identify requirements and strategies on how to institute and sustain a HCWM Program in each HCF;
2. Identify the duties and responsibilities of the Office of the Administrator of the HCF;
3. Identify the required composition of HCWM Committee and the Corresponding duties and responsibilities of each member;
4. Discuss the purpose of planning health care waste management in the health care facility level;
5. Identify communication and training intervention needed; and
6. Discuss the budgetary requirements.

The session on Institutionalization and Sustainability of Health Care Waste Management was presented by Engr. Aida C. Barcelona. She emphasized that the success in the implementation of Health Care Waste Management (HCWM) Programs depends on the
political will of the head of the health care facility (HCF) and the motivation, dedication and commitment of all the health care facility workers. Planning, directing and implementing depend on the capability of designated members of the Health Care Waste Management Committee (HCWMC) to sustain the program.

Any HCF has to comply with certain administrative requirements such as developing a comprehensive plan and organizing a HCWMC. Planning, directing and implementing depend on the capability of the designated members of the HCWMC to sustain the program. Appropriate HCWM practices depend largely on good administration and financial support as well as the active participation by trained and informed staff.

This module provided the participants with the knowledge on how to institute a HCWM program including practical framework in establishing HCWM Committee and strategies on how to sustain the HCWM program.

L. Treatment and Disposal Technologies for Medical Wastes in Developing Countries
Number of hours: 0.5 hour

Learning Objectives:
To discuss the treatment and disposal technologies for medical wastes.

Dr. Mohd Nasir Hassan, Regional Adviser of the World Health Organization – Western Pacific Regional Office, made a special presentation to the participants by discussing the treatment and disposal technologies being used in developing countries. His presence in the training provided inspiration to the participants. He expressed full support in providing quality care for the patients and at the same time taking care of the environment by doing proper treatment and disposal of medical wastes.

M. Case studies on HCW Technologies and Energy Efficiency in HCF
Number of hours: 1 hour

Learning Objectives:
1. Identify alternative technologies for health care waste management;
2. Discuss the concept of environmental footprint and energy efficiency in the context of HCWM;
3. Discuss the benefits of energy efficiency in the health care waste management process and in the management of health care facilities;
4. Identify possible energy efficiency improvements in their working facilities.

The session on HCW Technologies and Energy Efficiency in HCF was presented by Arch. Marco Silvestri. Some of the technologies he discussed included incineration (including pyrolytic incineration and rotary kilns), chemical disinfection, wet and dry thermal treatment (including autoclaving), microwave irradiation, land disposal (including encapsulation), and inertization (mixing waste with cement or other substances). He presented reports showing a comparative analysis, performance issues, environmental impacts, and cost for different technologies used in HCF. Also he included in his discussion other thermal-based technologies such as dielectric heating, use of high velocity heated air treatment, dry heating, depolymerization, and advanced thermal oxidation.

Innovative Health Care Waste Management technologies seek to improve the treatment process, reduce air pollutants emissions, and facilitate disposal, but also target environmental sustainability through a holistic approach that includes the reduction of resource consumption. Health care organizations must demonstrate the commitment to environmental issues by considering and implementing strategies to achieve environmental sustainability beyond the waste management itself. Thus, energy efficiency in HCF becomes a crucial component of health care services and activities, including the waste management process.

This module provided the participants with the knowledge of some alternative and innovative technologies for health care waste management, some of which were used to introduce the concept of energy efficiency and its application in health care facilities.

N. Innovative Practice of Health Care Waste in Asia

Number of hours: 1 hour

Learning Objectives:

1. Identify existing innovative practices on Health Care Waste Management at the HCF;
2. Identify innovative practices on source separation of HCW at HCF;
3. Inform about innovative practices on Waste Management Systems at HCF; and
4. Discuss the role of stakeholders in Health Care Waste Management systems.

The session on Innovative Practice of Health Care Waste in Asia showed that health care waste increases parallel with industrialization. Strong efforts to achieve safe and sustainable management of health care waste include raising awareness of the risks that infectious and hazardous health care waste pose to human health and the environment, especially among policymakers and communities living in the vicinity of sites where health care waste is separated, stored, transported, treated and disposed.

Leadership, commitment and active participation of every individual in the health care facility (HCF) are of high importance for the HCWM to be successful. The innovative practices showcase an appropriate HCWM system in HCF in Asia that can be replicated in HCF in the Philippines.

The video presentation of Engr. Guilberto Borongan provided insights to the participants and created great interest and challenge to institute HCWM into their system. Everybody wanted to have copy of the video presentation about the Bir Hospital implemented by Health Care Foundation in Nepal.

O. Health Care Facility Visit
Number of hours: 7 hours

Learning Objectives:

1. Establish an initial reference point for assessing waste management practices and techniques in a health care facility;
2. Compare the various performance indicators with the existing national and/or global standards, as applicable;
3. Describe current good practices and techniques and identify potential gaps;
4. Help define goals and milestones in order to gauge progress of the activities in relation with the health care waste project.
5. Determine initial resource needs to support the health care waste initiative.

A hospital visit or a walk-through survey was held on March 8, 2012 at Sta. Ana Hospital located in New Panaderos Street, Sta. Ana, Manila. The walk-through survey provided the information on the status of the health care waste management in a health care facility. The survey results of this walk-through shall be used as an initial step towards a more comprehensive process that shall be conducted by the participants upon returning to their respective facilities.
Guidelines for the Visit:

1. The participants were divided into four (4) groups of 8-9 members each group with assigned facilitator.

2. The specific schedule of activities during the visit was as follows:
   8:30 am: Departure of Participants from the training venue (City State Tower Hotel)
   9:30 am: Courtesy call to the Hospital Director and Staff
   10:00 am: Orientation session on the hospital facility by Sta. Ana Hospital Representative
   1:00 pm: Guided walk-through survey
   3:00 pm: Discussion/Wrap-up
   3:30 pm: Adjournment

General orientation of the facility was be conducted prior to ocular using the walk-through checklist. An assigned staff of the Sta. Ana Hospital acted as a resource person attending to the general data/information needs of the participants.

3. Four main areas of the hospital were visited (one area per group).
   a. Laboratory/Diagnostic Areas and Administrative Office
   b. Medicine/Pediatrics, and OB-gyne Wards
   c. Out-patient Department and Emergency Room
   d. Operating/Delivery Room and Dietary

4. After the group visit to their respective assigned areas all groups proceeded to the Central Waste Storage Area and Wastewater Treatment Facility

5. A walk-through survey (self-monitoring) form was used to guide the participants. For groups assigned in more than one area, another copy of the walk-through survey form was used.

All the four groups presented their output based on the given survey form. They rated the hospital based on the forms provided. Based on the assessment of all four groups, the hospital rating was high. The area that needs to be addressed promptly by Sta. Ana Hospital staff is the provision of soap and hand-drying equipment in all the hand-washing facilities. Insights were presented about the good points that are worth to be replicated in the participants' health facilities.
This activity provided good inputs to the participants. They learned how to do actual survey of the facility, looking into minute details that are necessary to improve the management of health care waste management, and making it compliant to the standards. This assessment tool will be very useful when they return to their respective health facilities. The output of their survey will be the basis in making their health care waste management plan.

P. Health Care Waste Management Plan

Number of hours: 1 hour

Learning Objectives:
1. Discuss the procedures in developing Health Care Waste Management Plan
2. Apply the procedures learned in developing Health Care Waste Management Plan

The last session was presented by Engr. Corazon Vidad. The presentation focused on having an initial assessment, which is the key to develop a comprehensive health care waste management plan (HCWMP). Each division/section in the organization must be involved in the development of the plan, for it to be understood and later to be followed. In developing the HCWM plan, there are three major concerns that must be addressed, namely: formulating the specific plan of actions involving health care facility (HCF) personnel and its clients; improvement of HCF facilities; and training and enhancement of skills necessary to have an effective handling of health care waste.

Her presentation provided guidance for the participants in the preparation of the HCWMP for their respective facilities. Preparation of this document is necessary to have effective management of health care waste and is also a requirement in the renewal of hospital license. The target for the implementation of the plan is within six (6) months. There will be a follow-through visit in the health facilities to see the changes made after the implementation of health care waste management program.

VI. TRAINING EVALUATION and CLOSING CEREMONY

The closing ceremony was facilitated by Group 4 and hosted by Ms. Gloria C. Africa. The group members gave their impressions about the different aspects of the training. The following are some of the highlights:
Mr. Ramil Raoet of Manila East Medical Center, Rizal gave good impressions and praises about the training particularly on the topics, the speakers, the food, the room accommodations, the training venue, and the event organizer.

Engr. Rene Chavez of Mary Mediatrix Medical Center Rizal commented on the relevant topics shared during the training and gave high regard to the resource persons along with their expertise.

Ms. April Ann Del Rosario of Emilio Aguinaldo College Medical Center in Cavite said she enjoyed the training as she was able to find new friends and social contacts among the participants. As newly appointed Infection Control Nurse the training and information that she got will be of great value to her work.

Ms. Salome Paycao of Quezon Medical Center Lucena City expressed her appreciation for the training and saw the great benefits from the things she learned. She also acknowledged her co-participants and quoted a passage in the Bible found in I Corinthians 12:12 which states that “...we are one body” and that we are part of God’s work.

Dr. Bayani Terciano of Luisiana District Hospital recapped the expectations that were formulated during the first day of the training and gave the conclusion that all expectations written were met -with some exceptions on punctuality of some participants- but the overall training was excellent.

After the sharing of impressions Engr. Pablo del Mundo of the Laguna Provincial Hospital rendered a special song. He sang it without accompaniment and everybody appreciated and applauded his good voice. Afterwards Rev. Jonathan C. Mendieta CEO of Citigate TravelPlus Dasma, the Event Organizer of the training expressed his appreciation for the excellent rating and comments given by the participants and other partners in the preparations and service given by Citigate to the HCWM training. He also mentioned that it was a historical moment and opportunity for Citigate to be part of the campaign in protecting the environment and preserving it for the next generation.

Engr. Corazon Vidad of DOH CaLaBaRZon in behalf of Dr. Edgardo Gonzaga, Director IV of Department of Health - Center for Health Development IVA expressed her wholehearted gratitude to RRC.AP and to Japan Ministry of Environment for the opportunity given to the Philippines and in particular to CaLaBaRZon Region for funding the training. She also thanked the participants who have sacrificed their time and effort in attending the HCWM training. She appreciated the enthusiasm of the participants to learn and think on how they will put all the learning into practice.
Engr. Guilberto Borongan of RRC.AP thanked the DOH CaLaBaRZon for facilitating the Training on HCWM, the CITIGATE TravelPlus Dasma for the preparation and excellent service, good accommodation and choosing a very conducive venue for the training. He also acknowledged and thanked the financial support of the Government of Japan through Ministry of the Environment; and thanked the participants for attending the training, with the hope that they will apply what they have learned, especially the practice of the 3R’s (Reduce, Reuse and Recycle) of which they are advocating and giving emphasis in the implementation.

Dr. Gilbert Par of DOH CaLaBaRZon on his closing remarks thanked and acknowledged everybody, especially their Head of Office - Dr. Edgardo Gonzaga for his support in this training. He cited the initiative of RRC.AP and Ministry of the Environment, Japan in providing financial support in the Training on HCWM. He cited the importance of the training and its application in the health facilities

Based on the impressions shared by the participants, they were very appreciative and happy that they attended this training. They were so inspired and wanted to catch the passion of the facilitators and resource persons in the implementation of HCWM in their respective areas.

At the final phase of the closing Ceremony Training Certificates were given to the participants who completed the five day course. The giving of certificates was hosted by Rev. Jonathan Mendieta of Citigate TravelPlus Dasma and certificates were awarded by Engr. Cogie Vidad, Dr. Gilbert Parr and Engr. Guilbert Borongan. Certificates of Appreciation were also given to the Resource Persons who gave their lectures throughout the training period.

Digital Copies of the whole training lectures, slides, photos, and videos were distributed to the participants by the Citigate Secretariat in exchange of their accomplished survey forms and before they left and check out of the venue.

VII. RECOMMENDATIONS

With the evident success of this training, the following are the recommendations to be considered so as to reinforce, sustain and widen the effects of its success not only to the participants of the HCWM training but also to the people within their areas of influence.
1. **Monitor the implementation of HCWM.**
   This can be done through a random visit in the health facilities, possibly within two months after the training. Activities that can be done in this monitoring visit are to check the status of their implementation, encourage them to continue the good work they started, see areas that needs improvement, and help them apply what they have learned.

2. **Capability building of other health facilities.**
   Considering the number of health facilities existing in CaLaBaRZon Region, there is a need to conduct similar trainings to other health facilities to create better impact and influence more the practice of sound management of health care wastes.

3. **Practice and advocacy on waste minimization and proper management of health care wastes.**
   The CHD 4A should take the lead in practicing and advocating waste minimization and proper health care waste management, being the lead agency in health, and in accordance to existing legal mandates and policies. (Please see Annex J: Report to Director Edgardo M. Gonzaga)

4. **Forming the HCWM Council**
   When the participants made significant progress in their implementation and found the worth and advantage of practicing HCWM, the recommendation is to form a HCWM council. By grouping them based on their location will create a support group that can provide help among each other. This council can conduct strategic consultations, possible sharing of resources, advocate sound management of health care wastes, and create environmental awareness to protect the environment.

   This HCWM council can also become a hub to promote programs not only for HCWM but also other environmental concerns. This can also open opportunities for future projects. The formation of such a community will also reinforce and strengthen the participant’s belief system that will lead to life forming habits. Such community may need some assistance and support from relevant local and
national government agencies in its start-up activities, but will be geared towards self-sustaining and self-propagating entity.
VIII. PRESENTATION MATERIALS
Health and Environmental Impacts of Health Care Waste

**DR. GILBERT PAR**
Department of Health
Center for Health Development-4A(CALABARZON)

**Module Objectives**

By the end of the training, the participants will be able to:

1. to define key terminology related to healthcare waste;
2. to identify the various types of healthcare waste; and
3. to identify the various health and environmental risks from healthcare wastes

**Healthcare waste (HCW)**

- a kind of waste generated mainly from hospitals, medical centers, healthcare establishments & research facilities in the diagnosis, treatment, immunization & associated research – WHO

**Healthcare waste (HCW)**

- 75-90%
  - healthcare general waste (HCGW)
  - similar to domestic waste
    - paper
    - plastic packaging
    - food preparation
    - have NOT been in contact with patients
  
- 10-25%
  - healthcare risk waste (HCRW)
  - infectious/hazardous waste
  - requires special treatment
  - poses risks both to human health & the environment

---

**Major sources of HCW**

- Hospitals
  - Private hospital
  - General hospital
  - District hospital

- Other healthcare establishments
  - Emergency medical care services
  - Healthcare centres and dispensaries
  - Obstetric & neonatology clinics
  - Outpatient clinic
  - Health centres
  - Transfusion centres
  - Military medical services

- Related laboratories and research centres
  - Medical and biological laboratories
  - Biotechnology laboratories & institutions
  - Medical research centres
    - Veterinary and agriculture research
    - Animal research & hospitals
    - Blood banks and blood collection centres
    - Nursing homes for the elderly
Classification of HCW by WHO

1. Infectious Waste
   - Waste suspected to contain pathogens
     - laboratory cultures
     - waste from isolation wards
     - tissues (swabs)
     - materials or equipment that have been in contact with infected patients
     - excreta

2. Pathological Waste
   - Human tissues or fluids
     - body parts
     - blood and other body fluids
     - fetuses

3. Sharps Waste
   - contains sharp edges
     - needles
     - infusion sets
     - scalpels
     - knives
     - blades
     - broken glass

4. Genotoxic Waste
   - contains substances which cause damage to DNA
     - waste containing cytostatic drugs (often used in cancer therapy)
     - genotoxic chemicals

5. Hazardous Chemical Waste
   - contains chemical substances
     - laboratory reagents
     - film developer
     - disinfectants that are expired or no longer needed
     - solvents

6. Pressurized Containers
   - containers used to store gases under pressure
     - gas cylinders
     - gas cartridges
     - aerosol cans
### Classification of HCW by WHO

- **7. Radioactive Waste**
  - contains radioactive substances
  - unused liquids from radiotherapy or laboratory research
  - contaminated glassware
  - packages or absorbent paper
  - urine and excreta from patients treated or tested with unsealed radionuclide

- **9. Heavy Metal Waste**
  - contains high content of heavy metals such as mercury
  - batteries
  - broken thermometers
  - blood-pressure gauges

### Classification of HCW by WHO

- **9. Hazardous Pharmaceutical Waste**
  - contains pharmaceuticals
  - pharmaceuticals that are expired or no longer needed
  - items contaminated by or containing pharmaceuticals (bottles, boxes)
  - expired vaccines

- **10. Highly Infectious Waste**
  - microbial cultures
  - stocks of highly infectious agents from Medical Analysis Laboratories & body fluids of patients with highly infectious diseases

### Classification of HCW, DOH vs WHO

<table>
<thead>
<tr>
<th>DOH</th>
<th>WHO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Infectious</td>
<td>1. Infectious</td>
</tr>
<tr>
<td>2. Sharps</td>
<td>2. Sharps</td>
</tr>
<tr>
<td>3. Pathological &amp; anatomical</td>
<td>3. Pathological</td>
</tr>
<tr>
<td>5. Chemical</td>
<td>5. Hazardous Chemical</td>
</tr>
<tr>
<td>6. Radiological</td>
<td>6. Pressurized Containers</td>
</tr>
<tr>
<td>7. Non-hazardous or general</td>
<td>7. Radioactive</td>
</tr>
<tr>
<td>8. Heavy Metal</td>
<td>8. Radioactive</td>
</tr>
</tbody>
</table>

### 1. Infectious Waste

<table>
<thead>
<tr>
<th>Segregation</th>
<th>Storage, collection and transport</th>
<th>Treatment</th>
<th>Disposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>(bin, plastic lining, labelling and signs)</td>
<td>Properly labelled and sealed storage area in healthcare facility</td>
<td>Perfusion, incineration on site &amp; off-site</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Properly collected and transported on site and off-site</td>
<td></td>
<td>Site burial (not available in the Philippines)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Landfill</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Microwave (high cost, not recommended for individual HCF)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Autodisintegration</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Chemical disinfection</td>
</tr>
</tbody>
</table>

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2. Sharps

<table>
<thead>
<tr>
<th>Waste management</th>
<th>Segregation</th>
<th>Storage, collection and transport</th>
<th>Treatment</th>
<th>Disposal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(box, plastic lining, labeling and signs)</td>
<td>- Puncture-proof container with wide mouth and cover</td>
<td>- Properly labelled and built storage area in healthcare facility</td>
<td>Concrete vault</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Plastic lining NOT applicable</td>
<td>- Properly collected and transported on-site and off-site</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Properly labelled 'SHARPS'</td>
<td>- Properly collected and transported on-site and off-site</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Tag indicating source and weight of waste generated, date of collection</td>
<td>- Properly collected and transported on-site and off-site</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- With biohazard symbol (optional)</td>
<td>- Properly collected and transported on-site and off-site</td>
<td></td>
</tr>
</tbody>
</table>

3. Pathological and Anatomical

<table>
<thead>
<tr>
<th>Waste management</th>
<th>Segregation</th>
<th>Storage, collection and transport</th>
<th>Treatment</th>
<th>Disposal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(box, plastic lining, labeling and signs)</td>
<td>- Ash, proof box with cover with plastic lining</td>
<td>- Properly labelled and built storage area in healthcare facility</td>
<td>Concrete vault</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Yellow plastic that can withstand autoclaving (Thickness 0.008mm)</td>
<td>- Properly collected and transported on-site and off-site</td>
<td>Landfill</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Suitable double storages area</td>
<td>- Properly collected and transported on-site and off-site</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Tag indicating source and weight of waste generated, date of collection</td>
<td>- Properly collected and transported on-site and off-site</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Biohazard symbol for biohazard (optional)</td>
<td>- Properly collected and transported on-site and off-site</td>
<td></td>
</tr>
</tbody>
</table>

4. Pharmaceutical

<table>
<thead>
<tr>
<th>Waste management</th>
<th>Segregation</th>
<th>Storage, collection and transport</th>
<th>Treatment</th>
<th>Disposal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(box, plastic lining, labeling and signs)</td>
<td>- Strong, leak-proof container with cover and plastic lining</td>
<td>- Properly labelled hazardous waste</td>
<td>Concrete vault</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Label plastic that can withstand autoclaving (Thickness 0.008mm)</td>
<td>- Properly collected and transported on-site and off-site</td>
<td>Landfill</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Properly labelled 'PHARMACEUTICAL WASTE' for hazardous waste</td>
<td>- Properly collected and transported on-site and off-site</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Tag indicating source and weight of waste generated, date of collection</td>
<td>- Properly collected and transported on-site and off-site</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Size varies depending on the volume of waste</td>
<td>- Properly collected and transported on-site and off-site</td>
<td></td>
</tr>
</tbody>
</table>

5. Chemical

<table>
<thead>
<tr>
<th>Waste management</th>
<th>Segregation</th>
<th>Storage, collection and transport</th>
<th>Treatment</th>
<th>Disposal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(box, plastic lining, labeling and signs)</td>
<td>- For liquid chemical waste: Disposal bottle that is made of amber-coloured glass, with at least 4L capacity that is strong, resistant and leak-proof</td>
<td>- Properly labelled and built storage area in healthcare facility</td>
<td>Concrete vault</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- For solid chemical waste: Yellow plastic, Thickness 0.008mm</td>
<td>- Properly labelled 'CHEMICAL WASTE'</td>
<td>Concrete vault</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Tag indicating source and weight of waste generated, date of collection</td>
<td>- Properly labelled 'CHEMICAL WASTE'</td>
<td>Concrete vault</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Size varies depending on the volume of chemical waste</td>
<td>- Properly labelled 'CHEMICAL WASTE'</td>
<td>Concrete vault</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Chemical degradation (for treated empty used bottles)</td>
<td>- Properly labelled 'CHEMICAL WASTE'</td>
<td>Concrete vault</td>
</tr>
</tbody>
</table>

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### 6. Radioactive

<table>
<thead>
<tr>
<th>Segregation (bin, plastic lining, labelling and sign)</th>
<th>Storage, collection and transport</th>
<th>Treatment</th>
<th>Disposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Radiation proof repositories, leak-proof and lead-lined container with plastic lining.</td>
<td>• Properly labelled and built storage area in healthcare facility</td>
<td>• Prolysis (not available in the PNRI)</td>
<td>• NOT applicable (collected by PNRI)</td>
</tr>
<tr>
<td>• Orange plastic (Thickness: 0.005 mm)</td>
<td>• Properly collected and transported on-site and off-site as specified by PNRI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Sizes vary depending on the volume of radioactive waste</td>
<td>• Stored in lead containers (delay to decay)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Properly labelled “RADIOACTIVE”</td>
<td>• collected off-site by PNRI</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 7. Non-hazardous or General

<table>
<thead>
<tr>
<th>Segregation (bin, plastic lining, labelling and sign)</th>
<th>Storage, collection and transport</th>
<th>Treatment</th>
<th>Disposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Leak-proof bins with outer and plastic lining.</td>
<td>• Properly labelled and built storage area in healthcare facility</td>
<td>• Not applicable</td>
<td>• Laterite (nonbiodegradable)</td>
</tr>
<tr>
<td>• Thick or Colourless (in biodegradable) and green (biodegradable) Thick new 0.005 mm</td>
<td>• Properly collected and transported on-site and off-site</td>
<td></td>
<td>• Composting (biodegradable)</td>
</tr>
<tr>
<td>• Tag indicating source and weight of waste generated, date of collection</td>
<td></td>
<td></td>
<td>• Animal feeds (food waste)</td>
</tr>
<tr>
<td>• Sizes vary depending on the volume of waste</td>
<td></td>
<td></td>
<td>• Recycling facilities (for recyclables)</td>
</tr>
<tr>
<td>• Recycle symbol optional for recyclable non-hazardous wastes</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Poor management of healthcare waste

- **WHO assessment in 22 developing countries, 2002**
  - The proportion of health-care facilities that do not use proper waste disposal methods ranged from 18% to 64%.
- **In 2000, the WHO estimated that injections with contaminated syringes caused:**
  - 21 million hepatitis B virus (HBV) infections
    - 32% of all new infections
  - 2M hepatitis C virus (HCV) infections
    - 40% of all new infections
  - 260,000 HIV infections
    - 5% of all new infections
Health Risks of Healthcare Waste

1. injury
   - puncture, abrasion, laceration

2. disease transmission

3. chemical and toxic exposures
   - corrosion, burn, intoxication

Persons at risk from poorly managed health care waste

- medical doctors, nurses, health-care auxiliaries, and hospital maintenance personnel;
- patients in health-care establishments or receiving home care;
- visitors to health-care establishments;
- workers in support services allied to health-care establishments, such as laundries, waste handling, & transportation;
- workers in waste disposal facilities (such as landfills or incinerators), including scavengers
Infections caused by exposure to HCW, causative organisms, & transmission vehicles

<table>
<thead>
<tr>
<th>Type of infection</th>
<th>Examples of causative organisms</th>
<th>Transmission vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastroenteritis</td>
<td>Enterobacteriaceae, e.g., salmonella, shigella spp.</td>
<td>Feces and/or vomit</td>
</tr>
<tr>
<td>Respiratory infections</td>
<td>Staphylococcus aureus, rhinovirus, Shigella flexneri</td>
<td>Inhalation, respiration</td>
</tr>
<tr>
<td>Ocular Infections</td>
<td>Haemophilus influenzae, neisseria gonorrhoeae, hantavirus</td>
<td>Eye infections</td>
</tr>
<tr>
<td>Central Infections</td>
<td>Streptococcus pyogenes, streptococcus spp.</td>
<td>Gastrointestinal</td>
</tr>
<tr>
<td>Skin Infections</td>
<td>Staphylococcus aureus</td>
<td>Pus</td>
</tr>
<tr>
<td>Arthritis</td>
<td>Neisseria meningitidis</td>
<td>Skin infections</td>
</tr>
<tr>
<td>Meningitis</td>
<td>Neisseria meningitidis</td>
<td>Meningitis</td>
</tr>
<tr>
<td>Acquired Immunodeficiency Syndrome</td>
<td>Human immunodeficiency virus (HIV)</td>
<td>Blood, sexual infections</td>
</tr>
<tr>
<td>Haematogenous Infections</td>
<td>Staphylococcus aureus</td>
<td>All body fluids and secretions</td>
</tr>
<tr>
<td>bakteremia</td>
<td>Streptococcus pyogenes, staphylococcus aureus, e. coli, vibrio cholerae, klebsiella pneumoniae, shigella flexneri</td>
<td>Blood</td>
</tr>
<tr>
<td>Candidiasis</td>
<td>Candida albicans</td>
<td>Blood and body fluids</td>
</tr>
<tr>
<td>Viral Hepatitis A</td>
<td>Hepatitis A virus</td>
<td>Blood</td>
</tr>
<tr>
<td>Viral Hepatitis B and C</td>
<td>Hepatitis B and C virus</td>
<td>Blood and body fluids</td>
</tr>
</tbody>
</table>

Environmental Risks of Healthcare Waste

- contamination of soil
- contamination of water supply
- air pollution

Health effects and potential hazards from clinical wastes

<table>
<thead>
<tr>
<th>Potential hazards</th>
<th>Health effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infections agents</td>
<td>Respiratory infections, encephalitis, skin infections, meningitis, AIDS,</td>
</tr>
<tr>
<td></td>
<td>HIV and hepatitis B and C from contaminated sharps</td>
</tr>
<tr>
<td>Radiactive</td>
<td>Cancer, burn and skin irritation, diarrhea, thirst, and vomiting</td>
</tr>
<tr>
<td>Sharps</td>
<td>Double risk: injury and potential transmission routes for HIV and hepatitis B and C from contaminated sharps</td>
</tr>
<tr>
<td>Pressurized vessels</td>
<td>Injury from explosion</td>
</tr>
<tr>
<td>Hazardous chemicals</td>
<td>Inhalation, burns and skin irritation, pollution of groundwater, surface water and the air, possibility of fire, poisoning</td>
</tr>
<tr>
<td>Pharmaceuticals</td>
<td>Infectious medical case from consumption of expired pharmaceuticals, pollution of groundwater, surface water and air</td>
</tr>
<tr>
<td>Genotoxic waste</td>
<td>Carcinogenic and mutagenic, skin or eyes irritation, nausea, headache, or dizziness</td>
</tr>
</tbody>
</table>

References

- 3R Asia South East Asia Expert Workshop, 30 August - 1 September, 2006 Kathmandu, Nepal.
- Environmental Guidelines for Small-Scale Activities in Africa, 2nd Ed, 2009
  - http://www.encapafrica.org/egssaa.htm
- Healthcare Waste Management
  - http://www.healthcarewaste.org
Module Objectives

At the end of the session, the participant will be able to:

1. Identify pertinent multilateral and international environmental agreements with relevance to health care waste management; and

2. Discuss key national laws, rules and regulations governing health care waste management

International Agreements

THE MONTREAL PROTOCOL ON SUBSTANCE THAT DEPLETE THE OZONE LAYER

- Adopted in Montreal, Canada on 16 Sept. 1987
- Came into force on 1 January 1989
- Final Objective: ELIMINATION OF OZONE DEPLETING SUBSTANCES
THE MONTREAL PROTOCOL ON SUBSTANCE THAT DEPLETE THE OZONE LAYER

**London Amendment in 1990**
- strengthened the control measures under the Montreal Protocol
- added provisions related to technology transfer and extended the coverage to new substances

**Copenhagen Amendment in 1992**
- speeded up the phase-out dates for many ODS
- added new substances to the list of controlled substances
  - hydrochlorofluorocarbons (HCFCs), methyl bromide
  - hydrobromofluorocarbons (HBFCs)

**Montreal Amendment in 1997**
- tightened restrictions on several destructive chemicals and included a phase-out schedule for methyl bromide.
- set up a licensing system to help Governments track international trade in chlorofluorocarbons (CFCs) and other controlled substances

**Beijing Amendment in 1999**
- hydrochlorofluorocarbons (HCFCs) are to be phased out in developed countries by 2030 and in developing countries by 2040

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THE BASEL CONVENTION

**Concerns**
- the trans-boundary movements of hazardous wastes including health care waste
- Countries that signed the Convention accepted the principle that “the only legitimate trans-boundary shipments of hazardous waste are exports from countries that lack the facilities or expertise to dispose safely of certain waste to other countries that have both the facilities and expertise”

---

**Principles Highlighted in the Convention**

1. **Polluters Pay Principle**
   - All producers of waste are legally and financially responsible for the safe and environmentally sound disposal of waste they produce.

2. **Precautionary Principle**
   - When the magnitude of a particular risk is uncertain, it should be assumed that this risk is significant, and measures to protect health and safety should be designed accordingly.
International Agreements

THE BASEL CONVENTION
4 Principles Highlighted in the Convention

3. DUTY OF CARE PRINCIPLE
   • Any person handling or managing hazardous substances or related equipment is ethically responsible for using the utmost care in that task.

4. PROXIMITY PRINCIPLE
   • The treatment and disposal of hazardous waste take place at the closest possible location to its source in order to minimize the risks involved in its transport.

International Agreements

• Targets cover emissions of the six main greenhouse gases:
  1. carbon dioxide (CO2)
  2. methane (CH4)
  3. nitrous oxide (N2O)
  4. hydrofluorocarbons (HFCs)
  5. perfluorocarbons (PFCs)
  6. sulfur hexafluoride (SF6)

International Agreements – THE KYOTO PROTOCOL

• Sets binding targets for reducing (GHG) emissions
• Major distinction between the Protocol and the Convention is that while the Convention encouraged industrialised countries to stabilize GHG emissions, the Protocol commits them to do so
• Adopted in Kyoto, Japan, on 11 December 1997 and entered into force on 16 February 2005.
• The detailed rules for the implementation of the Protocol were adopted at COP 7 in Marrakesh in 2001, and are called the "Marrakesh Accords."
International Agreements – THE STOCKHOLM CONVENTION ON PERSISTENT ORGANIC POLLUTANTS (POPs)

- Global treaty to protect human health and the environment from POPs
- POPs are chemicals with the following characteristics:
  - remain unchanged in the environment for long periods of time
  - accumulate in the fatty tissue of living organisms
  - Toxic to humans and wildlife
- Exposure to POPs can lead to serious health effects: cancer, birth defects, dysfunctional immune and reproductive systems, greater susceptibility to disease and even diminished intelligence.
Laws, Policies and Guidelines

- Certificate of Product Registration (subject to annual renewal)
- All HCW treatment equipment/devices should be validated through Performance Evaluation (testing waste samples collected after treatment)


General Provisions:
1. All Hospitals shall immediately discontinue the distribution of mercury thermometer
2. All Hospitals shall follow the guidelines for the gradual phase-out of mercury in health care facilities
3. All new Health Care Facilities applying for a License to Operate shall submit an inventory of all mercury-containing devices that will be used in their facilities and a corresponding mercury elimination program

National Laws, Policies and Guidelines

Office of Research and Development DENR


PhilHealth Benchbook
ENERGY AND WASTE MANAGEMENT

- Goal:
  The organization demonstrates its commitment to environmental issues by considering and implementing strategies to achieve environmental sustainability

- DOCUMENT REVIEW
  1. Issuances - memos, guidelines on waste disposal
  2. Contracts with waste handlers or disposal contractors, (if applicable)
  3. Hospital policy that conforms to the joint DOH-DENR circular on waste management for LGUs
1. Discharge Permit
   - PD 984 “Pollution Control Law”
   - DENR Adm.Order No. 35 s. 1990 “Effluent Regulations”
   - Republic Act No. 9275 “The Clean Water Act”

2. Environmental Compliance Certificate (ECC) / Certificate of Non-Coverage (CNC)
   - PD 1586 “Environmental Impact Statement System”

3. Registration of Waste Generator
4. Permit to Transport Hazardous and Hospital Waste
5. Quarterly Monitoring Report

RA 6969 “Act to Control Toxic Substances & Hazardous & Nuclear Wastes”

Republic Act No. 9275: The Clean Water Act Sec. 14 - Discharge Permits
- Owners or operators of facilities that discharge regulated effluents pursuant to this Act to secure a permit to discharge.
- Specify the quantity and quality of effluent that facilities are allowed to discharge.
- Encourage the adoption of waste minimization and waste treatment technologies.
- For industries without any discharge permit, they may be given a period of twelve (12) months after the effectivity of the IRR pursuant to this Act, to secure a discharge permit.

RA 6969 Under DAO 2004-36, classifies healthcare waste under Miscellaneous Waste as follows:

M501 (pathogenic and infectious wastes)
- includes pathological wastes i.e., tissues, organs, fetuses, bloods and body fluids, infectious wastes and sharps

M503 (pharmaceuticals and drugs)
- includes expired pharmaceuticals and drugs stocked at producers and retailers’ facilities.
Laws, Policies and Guidelines

Hospitals are classified as Hazardous Waste Generators and are required to:
- submit an accomplished registration form to the EMB Regional Office
- DENR I.D. Number shall be issued upon registration

Other requirements:
- designation of a Pollution Control Officer (PCO)
- use of authorized transporters and treaters
- confirmation of completion of treatment/disposal and emergency contingency plan.

   - R.A. 9275 "The Philippine Clean Water Act"

7. Segregation of solid wastes at the source using separate container for each type of waste from all sources
   - R.A. 9003 "Ecological Solid Waste Management Act of 2000"

8. Authority to construct for air pollution source installation such as boiler, generator set (prior to construction/installation)
   - R.A. 8749 "The Philippine Clean Air Act of 1999"

9. Permit to Operate for air pollution source installations such as boiler, generator set (prior to operation and renewed annually thereafter)
Laws, Policies and Guidelines

1. LLDA Clearance (ECC is a pre-requisite)
2. Discharge Permit
3. Pollution Control Officer

1. P.D. 813 (1975)
2. Executive Order No. 927 (1983) / DENR
3. Administrative Order No. 35 s. 1990 "Effluent Regulations"

Laws, Policies and Guidelines

Includes watershed of Rizal (13 towns) and Laguna (28 towns), chartered cities of Pasay, Caloocan, Quezon, Manila, Muntinlupa, Pasig, San Pablo, Tagaytay, Antipolo, Calamba and Tanzaan; towns of Sto. Tomas and Malvar in Batangas; Silang, Carmona and GMA in Cavite; Lucban in Quezon; and Taguig and Pateros in Metro Manila.

R.A. 4850 (1966) "Empowered to provide proprietary functions within Laguna de Bay"

Laws, Policies and Guidelines - Department of Labor and Employment

Under the OSH standards.
• Duty of the employers to give complete job safety instructions to all his workers, hazards to which the workers are exposed to and steps taken in case of emergency;
• Comply with the requirements of this Standards; and
• Use only approved devices and equipment in his workplace

Waste Prevention through adoption of Green Procurement Policy
Reduction at Source through Proper Segregation of Waste
Waste Minimization

Executive Order No. 301 "Establishing a Green Procurement Program for All Departments, Bureaus, Offices, and Agencies"
Healthcare Waste Minimization (3Rs Application)

Engr. Guilberto Borongan, ChE, MSUEM
Programme Officer
Regional Resource Center for Asia and the Pacific (RRC.AP)

Module Objectives

At the end of the session, the participant will be able to:

1. Identify challenges faced in Healthcare Waste Management at the HCF;
2. Discuss about the concept and importance of 3Rs in HCWM at the HCF;
3. Build awareness on 3R principles and its practices in HCF;
4. Identify the healthcare waste categories at the HCF;
5. Informed about existing regional framework on waste management;
6. Identify elements in carrying out recycling projects in HCF.

Contents

1. Overview of Healthcare Waste
2. Existing Regional Framework in SEA and East Asia
3. The Reduce, Reuse and Recycle (3Rs)
4. Healthcare Waste Categories

RRC.AP Projects related to Waste and 3R

- 3R Knowledge Hub (3RKH) Asia and the Pacific
  - URL: www.3rk.net

- Thematic Working Group on Solid and Hazardous Waste (Waste TWG) of the Regional Forum on Environment and Health in 14 countries in Southeast and East Asian

- Advanced Waste Management in Asia and the Pacific (AWMAP) or “National 3R Strategy” Cambado, Malaysia, Thailand and the Philippines
1. Overview of Healthcare Waste

**Definition**

"Medical waste" or "health-care waste" refers to all waste generated by health-care establishments.

- Approximately 75 to 90% of the total waste generated by these establishments does not pose any particular risk to human health or the environment.

**Healthcare Waste Characterization**

- Non Risk Waste (75-90%)
- Risk Waste (10-25%)

Remaining waste is regarded as hazardous and may create a variety of health risks if not managed and disposed of in an appropriate manner.

- Hazardous health-care waste includes infectious waste, sharps, anatomical and pathological waste, obsolete or expired chemical products and pharmaceuticals, and radioactive materials.

**Challenges**

- In many countries, including some developed countries, significant challenges persist with regard to the proper management and disposal of health-care waste.
- Medical waste is often mixed with general household waste, and either disposed of in municipal waste facilities or dumped illegally.
- Open burning and widespread deficiencies in the operation and management of small-scale medical waste incinerators result in incomplete waste destruction.
Overview of Healthcare Waste

Challenges

- Inappropriate ash disposal and dioxins emissions, which can be even 40,000 times higher than emission limits set forth in the Stockholm Convention
- All persons exposed to hazardous medical waste are potentially at risk of injuries and/or contamination through accidental exposure.

Healthcare Waste: Asian Perspective

- Wastes not segregated in many hospitals
- Disposed off together with municipal solid waste
- Openly burnt in some hospitals
- Few local initiatives taken by NGOs
- Medical waste segregation, recycling and reused by waste pickers

Regional Forum on Environment and Health

1. The First Ministerial Forum, August 2007 in Bangkok
   - Charter of the Regional Forum on Environment and Health in Southeast and East Asian Countries
   - Bangkok Declaration on Environment and Health
   - Workplans for Thematic Working Groups

2. The Second Ministerial Regional Forum, July 2010 in Jeju, Republic of Korea
   - Jeju Declaration
   - Strengthening Regional Forum’s role

2. Existing Regional Framework in SEA and East Asia
Background: The Organization Diagram

1. Ministerial Meeting; Every 3 years, Ministers from MOE, MOH
2. High-Level meeting; Every 18 months, High-Level officers
3. Advisory Board; Every year (Board members and Secretariat)
4. Secretariat; UNEP and WHO

Southeast Asian countries: Brunei Darussalam, Cambodia, Indonesia, Lao People’s Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Viet Nam

East Asian countries: China, Japan, Mongolia, and the Republic of Korea

Waste TWG

Established under the Regional Forum on Environment and Health in Southeast and East Asian countries

Objectives
- Ensure environmentally sound management of solid and hazardous waste, in particular municipal waste and medical waste, and promote the 3Rs
- Prioritize issues by analyzing status-quo of municipal waste and medical waste management in the member countries
- Provide useful information to raise policymakers’ awareness

Chair: Ministry of the Environment, Japan

3. The Reduce, Reuse and Recycle (3Rs)

Training on Health Care Waste Management - CHD-CALABARZON
3-9 March 2012, Citystate Tower Hotel, Ermita, Manila
Increase of Waste in World and Asia


Asia 38 million tons

Reducing – choosing to use things with care to reduce the amount of waste generated

Reusing – involves the repeated use of items or parts of items which still have usable aspects

Recycling – the use of waste itself as resources

Concept and importance of

The keys to building a sound material–cycle society lie in the promotion of the 3R

The environmentally sound management of waste, which is a prerequisite to the promotion of the 3R

Keywords for SMCS

Awareness-raising

Information sharing

Promotion of the 3Rs

Partnership

Incentives

Technology development

3R Developments in Asia

- Strengthening of domestic policies to implement the 3Rs
- Reduction of trade barriers
- Cooperation between developed and developing countries
- Cooperation among stakeholders
- Promotion of science and technology

### Development of 3R

<table>
<thead>
<tr>
<th>Year</th>
<th>Event/Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>G8 Sea Island Summit (U.S.) 3R Initiative was agreed upon</td>
</tr>
<tr>
<td>2005</td>
<td>Ministerial Meeting on the 3R Initiative (Tokyo) Assistance to National 3R Strategy Development started (Indonesia, Philippines, Thailand, Viet Nam, Bangladesh, Cambodia)</td>
</tr>
<tr>
<td>2006</td>
<td>Senior Officials Meeting on the 3R Initiative (Tokyo) Asia 3R Promotion Conference (Tokyo)</td>
</tr>
<tr>
<td>2007</td>
<td>2nd Senior Officials Meeting on the 3R Initiative (Brum, Germany) Asia 3R Promotion Conference (Tokyo)</td>
</tr>
<tr>
<td>2008</td>
<td>G8 Environment Ministers Meeting (Tokyo) &quot;Kobe 3R Action Plan&quot; agreed upon Asia 3R Promotion Conference (Tokyo)</td>
</tr>
<tr>
<td>2009</td>
<td>G8 Environment Ministers Meeting (Hana) Japan’s Proposal of Regional 3R Forum was appreciated Asia 3R Promotion Conference (Tokyo)</td>
</tr>
<tr>
<td>2009</td>
<td>3rd Regional 3R Forum in Kuala Lumpur, Malaysia Asia 3R Promotion Conference (Tokyo)</td>
</tr>
<tr>
<td>2010</td>
<td>Preparatory Meeting of the Inauguration of the Regional 3R Forum in Asia (Tokyo) Inaugural Regional 3R Forum in Asia, 2009</td>
</tr>
<tr>
<td>2011</td>
<td>3rd Regional 3R Forum in Singapore Inaugural Regional 3R Forum in Asia, 2009</td>
</tr>
</tbody>
</table>

### Role of Stakeholders

- There is a need for policy-makers and stakeholders to cooperate in order to achieve the 3Rs.

### Scope for 3Rs in Healthcare Waste

- Segregation and handling of generated waste
  - Segregation reduces the volume and toxicity of waste stream
- Proper procurement practices such as changing the products and materials can help to reduce the harm (mercury-based thermometer can be substituted by electronic sensing devices)
- Increasing awareness of hospital staffs, employee training in hazardous materials management and waste minimization
Infectious Waste's Separation

Example: Awareness Raising
Delivering talk at Hospital’s waiting lounge (quest to raise awareness on environment conservation and sources recovery amongst staff and the public)

Detrimental elements in carrying out recycling project

1. Lack of cooperation from some of the staff

   Solutions / Initiatives
   - Reinforcement and education through email and awareness campaigns and talks
   - Organise trips to visit landfills

2. Insufficient knowledge about recyclables

   Solutions / Initiatives
   - Provide pamphlets on recyclables
   - Display posters about hospital recyclables in every ward and department
   - Display the list of non-recyclables

Source: HOSPITAL LAM WAH EE, 2008
### Detrimental elements

3. Unaware about the importance of recycling

**Solutions / Initiatives:**
- Educate by giving talks on the importance of recycling
- Conduct awareness campaign by organising quiz, games, sing-a-long sessions, exhibitions

4. Some of the heads of departments also lack awareness about recycling

**Solutions / Initiatives:**
- Talks and emails to the heads of departments (including Matrons, Nursing Sisters & etc)
- Invite them to the gatherings

---

5. The recyclables are not segregated properly

**Solutions / Initiatives:**
- Educate the staff
- Partition the recycling store room according to categories
- Conduct Best Management Competitions in wards and departments
- Identify recycling corner in every ward/department

---

6. The recyclables are not placed at designated area in the storeroom

**Solutions / Initiatives:**
- Label the plastic bags in the departments/wards when sending recyclables to the storeroom
- Send reminders through heads of department and identify the problematic departments/wards

---

7. The recyclables and non-recyclables are mixed together

**Solutions / Initiatives:**
- Use transparent green plastic bags for recyclables and black plastic bags for general waste
- Appoint facilitator at every ward and department to facilitate the activities

8. Some of the Committee members are not committed

**Solutions / Initiative:**
- Impose a penalty system, to fine a particular amount of money if one fails to serve his/her duty as per roster

---

9. Staff do not want to attend the Recycling AGM due to fear of being elected as committee members

**Solutions / Initiatives:**
- Door gift, lucky draw and complimentary buffet lunch for participants

10. Recycling store room treated as a dumping ground

**Solutions / Initiatives:**
- Take photos of the messy condition and email to all departments / wards

11. Recycling bins treated as garbage bins

**Solutions / Initiative:**
- Educate staff and take photos of the non-recyclables and email to all departments / wards

---

Source: HOSPITAL LAM WAH EE, 2008
Detrimental elements

12. Lukewarm response from staff as some think that recycling should be the responsibility of the government

Solutions / Initiatives

- Conduct annual interdepartmental recycling competition to promote the activity
- Give 80% of the proceeds from the sale of household recyclables back to the staff
- Hold a weekly educational talk to the staff about global warming/climate change, etc.

Source: HOSPITAL LAMWAHEE, 2008

Detrimental elements

13. Recyclables are stolen from the store room or containers

Solutions / Initiatives:

- Provide authorisation letter to recycler or buyer to present to security check-point when leaving Hospital premises
- Install CCTV at Recycling store room

Source: HOSPITAL LAMWAHEE, 2008

Healthcare Waste – Current Scenario

Source: 3RKH, 2009

4. Healthcare Waste Categories

Source: 3RKH, 2009

Training on Health Care Waste Management - CHD CALABAZOS
1-9 March 2012, Cebuana Hotel, Ermita, Manila
Challenges Faced

- **Waste generation:**
  - Insufficient data on waste generation
  - Non uniformity in units used by countries eg: tons, litres
  - Inconsistency in data
- **Composition and characteristics of waste:**
  - Lack of adequate data
- **Current HCWM practices:**
  - Absence of micro level, country specific information
  - Information available is on solid waste in general-not specific on HCW
  - Available information is region specific -not for the whole country

**Institutional Setup**
- Not HCW specific
- Lack of clear definition of roles and responsibility
- Hence organizational flowchart is not complete

**Policy and Legislation**
- Very general, not HCW specific
- Role of the policies in HCWM is not clearly defined

**International and Regional Initiatives**
- Limited information
**Segregation, Collection, Storage and Transport of Healthcare Waste**

Engr. Aida Camacho - Barcelona, SE, MSE
Department of Health

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**Module Objectives**
At the end of the session, the participant will be able to:

1. Identify proper methods of segregation, coding and labeling of health care waste.
2. Discuss guidelines on proper storage of health care waste.
3. Identify requirements for a central waste storage facility.
4. Discuss guidelines on proper collection and transport of health care waste.
5. Identify requirements for packaging and vehicles for off-site collection of waste.

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**Definition of Health Care Waste**

Means waste generated as a result of ...
- Diagnosis, treatment or immunization of human beings or animals;
- Research pertaining to the above activities;
- Production or testing of biological products; and
- Other activities of healthcare facilities

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**HEALTHCARE FACILITIES**

Include among others…

1. Hospital and Medical Centers
2. Health Care Units/Clincs
   - Physician’s Offices
   - Dental Clinics
   - Alternative Medicine Clinics
3. Related Laboratories and Research Centers
4. Ambulances and Mobile Emergency Care
### SOURCES AND COMPOSITION OF WASTE

#### Major Sources | Composition
--- | ---
**Medical Wards**  
- Medicine  
- Pediatrics  
- OB-Gynecology  
- Surgery |  
- General waste (food wastes, paper, tetra packs)  
- Infectious waste  
  - Blood-soaked dressings  
  - Bandages  
  - Urine bag  
  - Blood or other body secretions  
- Sharps  
  - Used hypodermic needle, broken test tube  
- Pathological Waste  
  - Body fluids  

**Operating Rooms and Surgical Wards** |  
- General waste  
- Pathological (placenta, tissues, organs) and anatomical wastes (amputated body parts like legs and limbs)  
- Infectious Waste (contaminated gloves, packaging & disposable medical items in contact with blood)  
- Pharmacy  
  - General waste  
  - Expired, unused & contaminated pharmaceutical products  
  - Cytotoxic drugs  

**Laboratories** |  
- General waste  
- Pathological waste  
  - Tissue samples  
  - Microbiological cultures and stocks  
  - Blood and body fluids  
- Infectious Waste  
  - Contaminated gloves, tubing and containers  
- Sharps (syringes)  
- Chemical waste (reagents, disinfectants)  

**Emergency Room, Out-patient Department** |  
- General waste  
- Infectious waste  
- Sharps  

**Administrative Offices** |  
- General Waste  
  - Papers  
  - Empty bottles  
  - Tetra packs  
  - Food wastes  
  - Cardboards
### General Principles

1. Healthcare Wastes must be segregated, collected, stored and transported in a safe manner under consideration of the risk level, occupational safety rules and in accordance with existing laws, policies and guidelines;
2. The Healthcare Facility should have a Waste Management Officer (WMO) responsible for HCWM;
3. Hazardous and general waste must not be mixed up during collection, transport and storage;

### Importance of Waste Segregation

1. Public Health Significance
2. Facilitate waste recovery and recycling
3. Minimize waste that needs treatment
4. Increase productivity and Cost Saving

### General Principles

4. Staff must be well-trained on the risk and safety procedures on handling waste;
5. Appropriate labeling, signage, route and segregation system must be established; and
6. Central Waste Storage Area must be provided.

### Solid Waste Management in Health Care Facilities

- **Hierarchy of Waste Management**
  - Waste Minimization
  - Segregation
  - Storage
  - Collection & Transport
  - Treatment
  - Disposal
Waste Minimization Concepts/Strategies

- Waste Minimization
  - Reduction at Source
  - Re-use
  - Recycling

Strategies (Options) on HCW Minimization

1. Reduction at source
   - Improve housekeeping by reducing use of air fresheners and insecticides.
   - Use non-biodegradable cleaner instead of hazardous chemical cleaner.
   - Work with suppliers to reduce packing of materials (e.g., buy concentrated products, refill systems, and packages with recycled materials).
   - Replace Mercury thermometers with digital equipment.

2. Re-use
   - Finding for another use of a by-product.
   - Re-use product over again.
   - Patronize products that are reusable rather than disposable whenever possible.
   - Involve reliable standards for disinfection and sterilization of equipment.

3. Recycling
   - Segregating, selling and processing waste into something new for HCW that can be recycled:
     - Biodegradable materials
     - Plastics
     - Paper
     - Glass
     - Metals
Recyclable waste materials are being segregated at source by department.

Recyclable wastes are being segregated at source by department.

Recyclable papers are being re-use as filing folders and IEC materials.

Disposable concrete culvert/pipe was painted and re-use as waste receptacle/bin.
Benefits of Implementing Waste Minimization Program

By Minimizing Waste...

- Appropriate resource recovery and recycling can be applied
- The amount of infected waste to be disinfected is minimize

hence....

INCREASE PRODUCTIVITY AND COST SAVINGS

Categories of Health Care Waste

1. Infectious Waste
2. Sharps
3. Pathological and Anatomical Waste
4. Pharmaceutical Waste (including genotoxic, cytotoxic wastes)
5. Chemical Waste
6. Radioactive Waste
7. General Waste or Non-hazardous (dry/wet)

Solid Waste Management in Health Care Facilities

Hierarchy of Waste management

INCREASE PRODUCTIVITY AND COST SAVINGS
Guidelines on Health Care Waste Segregation

- Segregation
- Color coding
- Labeling of plastic liners/bags and waste bins
- Labeling (Indicate type and biohazard/radiation symbol and weight of waste)

Categories of Health Care Waste

1. Infectious Waste
2. Sharps
3. Pathological and Anatomical Waste
4. Pharmaceutical Waste (including genotoxic, cytotoxic wastes)
5. Chemical Waste
6. Radioactive Waste
7. General Waste or Non-hazardous (dry/wet)

Color-Coding of Plastic Liner

<table>
<thead>
<tr>
<th>COLOR</th>
<th>TYPE OF WASTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLACK/COLORLESS</td>
<td>General Waste (Non-Biodegradable)</td>
</tr>
<tr>
<td>GREEN</td>
<td>General Waste (Biodegradable)</td>
</tr>
<tr>
<td>YELLOW</td>
<td>Infectious Waste</td>
</tr>
<tr>
<td>YELLOW</td>
<td>Pathological &amp; Anatomical Waste</td>
</tr>
</tbody>
</table>

Color-Coding of Plastic Liners

<table>
<thead>
<tr>
<th>COLOR OF BAG/CONTAINER</th>
<th>TYPE OF WASTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOT APPLICABLE</td>
<td>Sharps</td>
</tr>
<tr>
<td>ORANGE</td>
<td>Radioactive Waste</td>
</tr>
<tr>
<td>YELLOW</td>
<td>Pharmaceutical Waste</td>
</tr>
<tr>
<td>YELLOW</td>
<td>Chemical Waste</td>
</tr>
</tbody>
</table>
## Labelling of HCW

<table>
<thead>
<tr>
<th>TYPE OF WASTES</th>
<th>PLASTIC LINERS</th>
<th>BINS</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFECTIOUS</td>
<td>TAG WITH SOURCE AND WEIGHT, DATE COLLECT</td>
<td>&quot;INFECTIOUS&quot; and with Biohazard Symbol</td>
</tr>
<tr>
<td>PATHOLOGICAL and ANATOMICAL</td>
<td>TAG WITH SOURCE AND WEIGHT, DATE COLLECT</td>
<td>Biohazard Symbol</td>
</tr>
<tr>
<td>SHARPS</td>
<td>PLASTIC LINING NOT APPLICABLE</td>
<td>&quot;SHARPS&quot; and with Biohazard symbol; source and weight, date</td>
</tr>
<tr>
<td>PHARMACEUTICAL</td>
<td>TAG WITH SOURCE AND WEIGHT, DATE COLLECT</td>
<td>&quot;PHARMACEUTICAL WASTE&quot; for drugs; &quot;CYTOTOXIC WASTE&quot; for genotoxic &amp; antineoplastic</td>
</tr>
<tr>
<td>CHEMICAL</td>
<td>FOR SOLID - TAG WITH SOURCE AND WEIGHT, DATE COLLECT FOR LIQUID - 4L Capacity amber-colored glass bottle</td>
<td>&quot;CHEMICAL WASTE&quot;</td>
</tr>
<tr>
<td>RADIOACTIVE</td>
<td>USA LINED CONTAINER WITH PLASTIC</td>
<td>&quot;RADIOACTIVE&quot; Radiation Symbol</td>
</tr>
</tbody>
</table>

## Waste Bags/Bins

- Plastic bag for infectious waste
- Collection/Transport Container

## Solid Waste Management in Health Care Facilities

- Waste Minimization
- Segregation
- Storage
- Collection & Transport
- Treatment
- Disposal

## Guidelines on Proper Storage of HCW

- Storage
- Central Waste Storage Facility/Area
- Delay to decay room/storage area for radioactive waste
Storage Facility/Area

Four Areas:
1. Black-Non-biodegradable
2. Green-Biodegradable
3. Yellow-hazardous waste
4. Phased-out mercury

Guidelines/ Requirements for a Central Waste Storage Facility

Central Waste Storage Facility/Area

Delay to decay room for radioactive waste

Solid Waste Management in Health Care Facilities

Hierarchy of Waste management

Segregation
Storage
Collection & Transport
Treatment
Disposal
Collection and Transport of HCW

On-site collection and transport
(Within the health care facility)

Off-site collection and transport
(From the health care facility to treatment and to disposal facility)

Guidelines on Proper On-Site Collection and Transport of HCW

Collection and transport

On-site collection and transport

- Done at least once a day (or if possible room-to-room basis shall be at least once every shift).
- Use of easy to load and unload wheeled trolleys or carts (has no sharp edges).

On-site Collection/Transport Vehicle

Easy to load and unload Push cart

Wheeled trolley/ Rolling container

Guidelines on Proper On-Site Collection and Transport

- GENERAL WASTE shall be collected on a room-to-room basis to the collection points, then to the designated collection storage or transfer stations using a packaged-type rolling container.
- PATHOLOGICAL and INFECTIOUS WASTES shall be collected using a separate air-tight container with inner plastic bag lining. It must not be mixed with other type of wastes unless it is treated.
- SHARPS shall be collected using a puncture-proof container which should be packed in a plastic bag properly labelled as “SHARPS”
Guidelines on Proper On-Site Collection and Transport

- RADIOACTIVE WASTE which are subject to delay-to-decay process under PNRI regulations and stored in a designated storage room.
- Collected off site by PNRI

Establishment of Strategic On-Site Collection Points

- Divide the hospital area along the collection route (Planning should avoid routing on congested area)
- Select suitable collection points
- Select collection storage/transfer station within the hospital compound (It must be accessible to municipal/private collection service and be located where there is minimum public objection)

Guidelines on Proper Off-Site Transport of HCW

- Off-site collection and transport
  - Done either by a DENR accredited transporter or city/municipal waste collector
  - Consignment note/manifest system
**Consignment Note**

The consignment note shall contain the following:

- Name, address and telephone number of the generator
- Type and quantity of waste transported
- Name, address, telephone number, accreditation number of the transporter
- Name, address and telephone number of an authorized representative of treatment/disposal facility

---

**Guidelines on Proper Off-Site Collection and Transport**

1. **REQUIREMENTS FOR PACKAGING FOR OFF-SITE COLLECTION**
   - All bags or containers should be labeled with basic information written directly on bags/containers or on preprinted labels
   - Basic information on labeling
     - Type/category of HCW
     - Date of Collection
     - Volume/quantity
     - Precautionary measures
     - Emergency measures
     - Destination

---

**1. REQUIREMENTS FOR COLLECTION AND TRANSPORT VEHICLE**

Collection vehicle used to transport hospital waste shall:

- Be suitable in size
- Have a totally enclosed car body with the driver seat separated
- Be well maintained and clean
- Be properly marked indicating name and address of the waste carrier and hazards signs.
- Have special kit in case of accident

---

**Off-site Collection/Transport Vehicle**

Properly marked transport vehicle
<table>
<thead>
<tr>
<th>Routing</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ Route Planning: Waste shall be transported through the quickest and shorter possible route.</td>
</tr>
<tr>
<td>➢ Efficient and effective collection route system:</td>
</tr>
<tr>
<td>✓ Collection schedule by zone</td>
</tr>
<tr>
<td>✓ Assign personnel responsible by area</td>
</tr>
<tr>
<td>✓ Avoid passing along congested area</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Module Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>At the end of the session, the participant will be able to:</td>
</tr>
<tr>
<td>1. Identify proper methods of segregation, coding and labeling of health care waste.</td>
</tr>
<tr>
<td>2. Discuss guidelines on proper storage of health care waste</td>
</tr>
<tr>
<td>3. Identify requirements for a central waste storage facility</td>
</tr>
<tr>
<td>4. Discuss guidelines on proper collection and transport of health care waste.</td>
</tr>
<tr>
<td>5. Identify requirements for packaging and vehicles for off-site collection of waste.</td>
</tr>
</tbody>
</table>
STORAGE FOR PHASED-OUT MERCURY WASTES IN HEALTH CARE FACILITIES

FAYE V. FERRER
Environmental Health Campaigner
Safer Chemicals Campaign
Health Care Without Harm
www.noharm.org/seasia

Dangers of Mercury introduced in the Philippines

- In January 2006, HCWH conducted the First Southeast Asian Mercury in Health Care Conference.
- Former DOH Secretary Francisco Duque III announced an Administrative Order on the phase-out of mercury is to be drafted.
- Health Care Facilities have pledged to move for a phase-out of mercury in their facilities.

Mercury-use by Philippine Health Care Facilities

- Based on the PHA’s 2009 list, there are 99,708 bed capacity provided by 1,851 hospitals in the country.
- Hospitals have a policy of giving out one mercury thermometer per patient admission or discharge kit.
- Most of the thermometers either break during their stay or are taken home never knowing their fate.
- Breakages are common occurrences that never gets reported inside or outside of the hospital.
- Disposal is done either through dumpsites, landfill or incinerators.

Mercury Phase-out Timeline

- Memo on Mercury Spills Management was released to guide health care facilities on proper clean-up of small mercury spills.
- Rapid Mercury Assessment on several DOH controlled hospitals was conducted to test their mercury levels.
- First Quarter of 2008 - Committee to draft AO on mercury phase-out was formed.
- In July 2008, Secretary Duque signed DOH AO21.
- In September 2008, DOH AO21 took effect.
DOH Administrative Order 2008-0021

Gradual Phase-out of Mercury in all Philippine Health Care Facilities and Institutions

A two-year phase-out on the use of mercury containing thermometers and sphygmomanometers.

Hospitals are to form Mercury Management Team as part of the Health Care Waste Management Committee.

Inventory of existing mercury containing devices.

Inform vendors of preference to use alternatives.

Patient, and patient companion education on the dangers of mercury.
Status of Implementation of DOH AO 21

There were 972 compliant hospitals representing 53% of the total number of hospitals (1,851) in the Philippines. (PHA 2009)

Breakdown of 972 per region

<table>
<thead>
<tr>
<th>Region</th>
<th>PHA List of Hospitals</th>
<th>Implemented AO 21</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>4B</td>
<td>63</td>
<td>56</td>
<td>89</td>
</tr>
<tr>
<td>8</td>
<td>75</td>
<td>60</td>
<td>80</td>
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<tr>
<td>12</td>
<td>106</td>
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<td>1</td>
<td>130</td>
<td>95</td>
<td>73</td>
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<td>CM</td>
<td>59</td>
<td>45</td>
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</tr>
<tr>
<td>Region 4A</td>
<td>242</td>
<td>165</td>
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</tr>
<tr>
<td>Region 10</td>
<td>111</td>
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<td>13</td>
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</tr>
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<td>83</td>
<td>39</td>
<td>47</td>
</tr>
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<td>28</td>
<td>12</td>
<td>43</td>
</tr>
<tr>
<td>Region 11</td>
<td>116</td>
<td>46</td>
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</tr>
<tr>
<td>7</td>
<td>106</td>
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<td>9</td>
<td>133</td>
<td>51</td>
<td>38</td>
</tr>
<tr>
<td>9</td>
<td>75</td>
<td>14</td>
<td>18</td>
</tr>
<tr>
<td>6</td>
<td>87</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>1,851</td>
<td>972</td>
<td></td>
</tr>
</tbody>
</table>

Challenges Encountered

STORAGE
- Proper storage are not implemented by some facilities, some do not know how to implement one.
- Concerns on the safety of maintaining on-site storage were raised.
- Some facilities practiced recovery and placing all elemental mercury in one container.
- Others, before implementation of AO21 gave out all mercury containing devices to patients to avoid storage.

Practices in Storage
Practices in Storage

Siting

- Secure restricted area (to prevent theft)
- Readily accessible to mercury waste handlers
- Separate from regular or infectious waste storage areas

Design

- Enclosed area (roof and walls)
- Locked door
- Proper size (based on amount of waste to be stored plus space for materials movement)
- Ventilation
  - Exhaust vent leads to the outside
  - Exhaust air is released away from people and crowded areas
  - Exhaust vent is not near any air intake vents
  - Ventilation control that can block air circulation back into the facility
  - Exhaust fan capable of \((600/Q)\) air changes per hour where \(Q\) is the room volume in cubic meters
Design

- Seamless smooth flooring made of impervious material, for example:
  - Epoxy-coated cement
  - Polyurethane coated floor
  - Seamless rubber
  - Polyester flooring
- Bunding or spill containment tray on the floor below the waste containers
- Volume of the spill tray or inside the bund wall should be at least 125% of the stored mercury volume
- Storage areas should be kept cool and dry: < 25°C and < 40% humidity

Design

- Spill kit, PPE and wash area should be near (but not in) the storage area
- Personal protective equipment (PPE):
  - Several pairs of rubber or nitrile gloves
  - Respiratory protection (see next slide)
  - Safety goggles or protective eyewear
  - Coveralls, apron, and other protective clothing
  - Bunding or spill containment tray on the floor below
- Containers:
  - Air-tight, sealable plastic bags (small and large sizes, thickness: 2 to 6 mils, or 50 to 150 microns)
  - Small, air-tight, rigid plastic container with some water or vapor suppression agent
  - Air-tight, puncture-resistant, rigid plastic or steel jar or container with a wide opening
  - Disposable shoe covers

Design

- Personal protective equipment (PPE):
  - Respiratory protection:
    - Fit-tested full- or half-facepiece air-purifying respirator with mercury vapor cartridges, or
    - Face mask with sulfur or iodide impregnated activated carbon, or face mask made of sandwiched activated charcoal-impregnated cloth (Note that face masks that do not seal tightly around the face could allow contaminated air to enter through the edges), or
    - Other specialty mask or respirator designed particularly for mercury, or
  - If no specialty masks are available: a face mask with a 0.3 micron HEPA filter to capture amalgam particles and mercury-laden dust (unfortunately, regular masks will NOT protect against mercury vapor)

Design

- Spill kit contents:
  - Step-by-step instructions
  - Containers:
    - Air-tight, sealable plastic bags (small and large sizes, thickness: 2 to 6 mils, or 50 to 150 microns)
    - Small, air-tight, rigid plastic container with some water or vapor suppression agent
    - Air-tight, puncture-resistant, rigid plastic or steel jar or container with a wide opening
    - Disposable shoe covers

Design
Design

- Spill kit contents:
  - Tools for removing mercury
    - Flat-nose
    - Plastic-coated playing cards or thin pieces of plastic
    - Small plastic scoop or plastic dust pan
    - Tweezers
    - Eyedropper or syringe (without the needle)
    - Duct tape or sticky tape
  - "Danger: Mercury Waste" labels to put on waste containers

- Spill kit contents:
  - Vapor suppression agents:
    - Sulfur powder (available from pharmacies)
    - Zinc or copper flakes (available from hardware stores)
    - Commercial absorbent pads or vapor suppressants
    - Brush to remove powder or flakes

Design

- Spill kit contents:
  - Materials for decontamination
    - Vinegar, hydrogen peroxide, and cotton swabs for final cleaning when using sulfur powder
    - Decontaminant solution or commercial decontaminant
    - Piece of soap and paper towels
    - Decontamination solutions can be made of sodium thiosulfate solution (photographic fixer); or a mixture of sodium thiosulfate and EDTA.

- Decontaminant solution or commercial decontaminant

Signage and Labeling

- Entry and exit doors marked with warning signs: "Danger: Hazardous Mercury Waste" and the skull-and-crossbones symbol
- Containers labeled “Hazardous Mercury Waste” plus a description of the contents and the initial date of storage
Containers for Different Types of Mercury Waste

- General approach
  - Primary container that prevents breakage
  - Secondary container that prevents release of mercury if the contents break
  - Label on the primary container and label on the secondary container if it is not transparent
  - Spill containment tray directly under the containers

Examples

- Amalgam waste
- Elemental mercury waste
- Fluorescent lamps

Practices

- All personnel involved in collection, storage, transport, and supervision of mercury waste should receive special training on mercury waste management including spill cleanup.
- Material Safety Data Sheets and International Chemical Safety Cards on mercury should be discussed with employees.
- The most senior staff involved in a cleanup is responsible for ensuring replenishment of the contents. Spill kits should have a signed sheet indicating when they were used and replenishment.
Practices

> The storage space should be inspected every month to check for leaks, corroded or broken containers, improper methods of storage, ventilation, the condition of the PPE and wash area, spill kit contents, and updated records.

> Inventory records should be kept of the types of mercury waste, descriptions, quantities in storage, and initial dates of storage.

> No smoking or eating in and around the storage space.

Example Large Hospital

- 1000 unbroken thermometers
  - Wrapped in plastic bag and taped to form compact volume
  - Taped thermometers placed in 3L stainless steel can with plastic bubble wrap [primary container]
  - Can is labeled
  - Can is placed in a 4L, 75 micron transparent sealable plastic bag [secondary container]
- 20 unbroken sphygmomanometers
  - Placed in their original cases with labels [primary container]
  - Cases taped together in groups of four
  - Taped cases placed in 100 micron colored garbage bag with label [secondary container]
- 500 broken thermometers
  - Placed in a 3L stainless steel can with tight lid [primary container]
  - Can placed in a 4L, 75 micron transparent sealable plastic bag [secondary container]

Example Large Hospital

- 350 liters of non-sharp cleanup waste (rags, towels, etc.)
  - Placed in 75 micron sealable plastic bags with labels [primary container]
  - Bags placed in two 220L plastic drums with gasketed latching lid with secondary container
- 40 ml of elemental mercury
  - Placed in a 100 ml wide-mouthed 0.3mm PET container with water [primary container]
  - Container placed in a 6ml transparent re-sealable bag on a spill tray [secondary container]
- 1.5 liters of dental amalgam
  - Placed in marked 2L PET bottle with dry vapor suppressant [primary container]
  - Bottle placed in 75 micron transparent resealable bag on a spill tray [secondary container]
Example Large Hospital

- 1,280 T8 fluorescent lamps
- Placed in UN-approved, labeled drums

Storage room:
- 3 x 3 meter locked room in the basement
- Basement is off-limits to patients and visitors
- "Danger: Mercury Waste" and poison symbol on the door
- Exhaust fan on one wall capable of 22 ACH
- Air is blown out above the roof line facing an empty yard
- Mechanical damper plates in the AC vent
- Smooth floor with polyurethane paint and flexible plastic bunding strip around the area where the mercury waste is stored
- Cabinet with a spill kit, PPE, MSDSs, a copy of the inventory, and other records located outside the storage room

Example Small Hospital

- Small quantities of old thermometers, 1 or 2 sphygmomanometers, some dental amalgam
- Packaged using primary and secondary containers as above

Storage:
- Refrigerator in a locked room
- “Danger: Mercury Waste” and poison symbol on refrigerator door
- Fan stored by the window facing an empty yard
- Plastic tray at the bottom shelf of the refrigerator
- Cabinet with a spill kit, PPE, MSDSs, a copy of the inventory, and other records located outside the room

Example: San Lazaro Hospital

- Sphygmomanometer - 74 pcs (intact & broken)
- Thermometers - 36 pcs (intact & broken)
- PPE used in clean-up of Hg spill
Mercury in Air Study

**SURVEY OF MERCURY CONCENTRATIONS IN AMBIENT AIR INSIDE HEALTHCARE FACILITIES**

**INTRODUCTION AND OBJECTIVES**

One of the goals of the UNDP CEP Project on Healthcare Waste is to promote a reduction in the generation of hazardous waste and to assess the impact of the implementation of environmentally sound waste management practices on the generation of mercury waste and the use of non-mercury alternatives.

The purpose of the survey is to gather data in order to assess potential mercury exposure to workers and patients in different parts of healthcare facilities. A study was conducted to determine mercury concentrations in healthcare facilities and facilities receiving healthcare waste.

The data collected from different project countries could be used to make recommendations for ongoing occupational exposure assessments, specific safer handling practices for mercury waste, or the need to develop a national plan for mercury waste.
Areas where to measure

- Dentistry department especially where amalgam is mixed
- Pediatric ward
- Male and female adult wards
- Nurses’ stations
- Biomedical laboratory
- Emergency department
- Outpatient department
- Engineering and maintenance department where mercury sphygmomanometers may be repaired or calibrated
- Healthcare waste storage area
- Storage area for mercury device and fluorescent lamps
- Area around an operating healthcare waste incinerator
- Pharmacy
- Storage area for cleaning solutions and disinfectants

Some Elements of Transport Guidelines

- Packaging requirements
  - Special permit/license for transporter
    - Certified training, proof of liability insurance, submitted emergency response plans, spill kits, PPE, etc.
  - Registered vehicle
    - Passed inspection
    - Closed design, correct size for the intended load
    - Bulkhead between driver cabin and body
    - System to keep load secure during transport
    - Spill kit, first-aid kit, fire extinguisher
    - Placard
  - Routing plan, contingency plan, emergency phone, etc.

Jerome J405

Ambient Air Sampling in Five (5) Private Hospitals

- Almost all readings registered 0.00 µg/m³
- Small readings on previous storage areas for broken mercury.

Siting of an Interim Storage Facility

- At least 150 meters away from schools, hospitals, homes, food processing, agricultural operations, rivers or lakes, fisheries
- Secure area
- Accessible to vehicles transporting mercury waste
Design of an Interim Storage Facility

- Size should handle maximum anticipated volume of mercury waste, plus shelving space, aisles, etc.
- Measures to withstand floods, earthquakes, typhoons, and other natural disasters
- Closely controlled access with an intrusion detection and alarm system
- Air conditioning to control temperature and humidity
  - Heat, smoke and fire detection and alarm system, plus a fire suppression system

Design of an Interim Storage Facility

- At least four distinct and separate functional areas:
  - Receiving area for receiving and presorting waste, re-labeling if necessary, and signing documents
  - Inspection area for checking for leaks, repackaging, secondary containment, and re-labeling if necessary
  - Storage area specific for mercury waste
  - Administrative and record-keeping area

Design of an Interim Storage Facility

- Drains connected to a separate wastewater collection system
- Equipped with PPE, spill cleanup kits, first-aid medical supplies, and wash areas
- Receiving area
  - Signs
  - Presort table for incoming waste; a cart made of impervious material; spill kits; emergency containers for leaking containers; PPE; and a separate table or counter for documentation

Design of an Interim Storage Facility

- Inspection area
  - Engineered spill-control features including containment dikes or bunding on the floor
  - Mercury vapor detection monitor or detection tubes
  - Local exhaust ventilation, such as a fume hood, connected to an activated carbon filter
  - Spill control tray or containment device over which the waste should be inspected
  - Emergency containers, packaging, labels, spill kits, and PPE
Design of an Interim Storage Facility

- Storage area
  - Warning signs on all doors
  - Continuous or periodic monitoring of mercury levels
  - Spill control features including floor sealant and containment dikes
  - Shelving and storage racks not above shoulder height
  - Lighting, aisle space, stacking, arrangements of containers, and labeling designed to facilitate inspection and future transport to terminal storage

Other Procedures for Interim Central Storage

- Manifest system
- Licensing
- Hazardous waste management plan including storage and labeling guidelines, and staff training
- Periodic monitoring, weekly inspection, record-keeping, periodic reporting
- Health surveillance, medical monitoring of workers

Summary Points

- Remember: surface tension, mobility, volatility, toxicity of mercury
- Redundancy: primary container to prevent leaks, secondary container in case the primary container breaks, bund or tray
- Use proper PPE when handling mercury
- Seek practical solutions consistent with the basic principles needed to protect health and environment
Module Objectives

At the end of the session, the participant will be able to:

1. Discuss the concept about Mercury and other Hazardous Waste Storage options
2. Informed about existing underground permanent storage or disposal facility.

Contents

1. Mercury and Other Hazardous Waste Storage
2. Background: EU Storage Obligation for Metallic Mercury
3. Salt Rock: Concept of Complete Inclusion
4. Herfa-Neurode Underground Disposal Facility

Mercury and Other Hazardous Waste Storage: General Options

- Warehousing
- Underground Disposal
- Deep Injection

Source: Thomas Brasser, GRS, Germany 2010

Not considered: Surface Landfill
Additional Option: Stabilization
Mercury Storage: Warehousing - Features

- Investment app. 10 Mio US$
- Waste still in biosphere
- Dry climate required
- Safety dependent on political & economic constraints
- US concept for app. 100 yrs.
- No permanent solution

Mercury Storage: Deep Injection - Features

- Investment costs unknown
- No control after injection
- Long-term safety assessment problematic
- Suitable geological situation needed
- Several applications worldwide (but no Hg) with different success

Mercury Storage: Underground Disposal - Features

Permanent storage in underground mines is generally regarded as a safe disposal concept for hazardous wastes.

- Investment costs strongly variable (e.g., new facility / abandoned mine)
- Long-term safety assessment (broad experience)
- Suitable geological situation needed (e.g., salt, hard rock - optionally combinations)
- Several facilities with positive experiences since decades (esp. in rock salt formations)
- Operational safety must be guaranteed
- Combination with other hazardous wastes recommended

Background: EU Storage Obligation for Metallic Mercury

Regulation allows only few storage options, e.g.:

- **Temporary or**
- **Permanently in**
  - Salt mines* or in
  - Deep underground hard rock formations**

* adapted for the disposal of metallic mercury
** providing a level of safety and confinement equivalent to that of salt mines

Source: Thomas Brasser, GRS, Germany 2010
**Why Rock Salt?**

Large and stable cavities

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**Salt Rock: Concept of Complete Inclusion**

<table>
<thead>
<tr>
<th>Aquifer</th>
<th>Overburden</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isolating</td>
<td></td>
</tr>
<tr>
<td>Salt Rock</td>
<td></td>
</tr>
<tr>
<td>Disposal Mine</td>
<td></td>
</tr>
<tr>
<td>Rock Zone</td>
<td></td>
</tr>
</tbody>
</table>

Some aspects to be considered:
- Orientation
- Thickness
- Porosity
- Fluid flow
- Mode of occurrence
- GW-conditions

Source: Thomas Brasser, GRS, Germany 2010

---

**Waste Isolation Multibarrier System (2)**

Overburden

- Shaft sealing
- Drift sealing
- Borehole sealing

Waste & Canister

Backfill

---

**Potash mining**

1. potash layer

2. potash layer

Mining with room-and-pillar-system

Source: Thomas Brasser, GRS, Germany 2010
Mode of operation in an underground disposal facility

Operational procedure of the State of the Art underground disposal facility

1. Generator / Owner of the waste must obtain the facility’s approval
   - description and analysis of the composition of the waste to the regulations authorities
2. After a first check at the disposal site, the documents have to be sent to the relevant authorities for approval and acceptance of the waste.
3. Wastes may be transported to the underground waste disposal facility by means of trucks or rail.
   - Before the vehicles reach the entrance area, they have already passed a radioactivity control.
4. At reception, the waste documents, the delivered amounts and the packaging are checked and random samples of the waste are analysed (dissolving, visual inspection, chemical composition). The waste is only unloaded if it is identified as indicated in the waste documents and fulfills specific waste acceptance criteria. Otherwise, the disposal of the waste is rejected.
5. After acceptance, control and determination of the conformity, the waste is cleared for storage. It is then unloaded from the delivery vehicle by, for example, forklifts, and is transported to its final destination. At the shaft entrance, the waste enters the underground transport system to the storage area.
Solid stabilized mercury (mercury sulphide) as well as mercury-containing wastes are waste types that are accepted at several underground waste disposal facilities in Europe. They may be stored in drums or big bags.

6. The waste is then stacked accordingly at its final place of storage, i.e., the respective chamber, drift or other part of the mine area.

Wastes are separated by 17 material groups:
- Alkaline wastes
- Alkaline wastes, moisture sensitive
- Acid wastes
- Acid wastes, moisture sensitive
- Cyanides (acid / alkaline)
- Mercury (acid / alkaline)
- Organic wastes (acid / alkaline)
- Hydroxide sludges
- Capacitors
- Transformers (Cu / Fe)
- Parts of transformers (Cu / Fe)
- Other wastes

Source: Thomas Brasser, GRS, Germany 2010
Report: Options for the environmentally sound management of surplus mercury in Asia and the Pacific

Thank you for your attention!
Module Objectives

By the end of the training, the participants will be able to describe the health and safety practices in health care waste management based on its minimum elements.

Objective: Describe the health and safety practices in HCWM based on its minimum elements

1. Written plan
2. Clear responsibilities
3. Written, internal rules
4. Staff training
5. Protective clothing
6. Good hygiene practices
7. Vaccinated workers
8. Designated storage locations
9. Waste minimization
10. Waste segregation
11. Waste Treatment
12. Final disposal site
13. Periodic reviews

1. Written waste management plan
   - Plan describes practices for handling, storing, treating, & disposing of hazardous & non-hazardous waste
   - drawn up after doing a comprehensive assessment of waste handling at the facility.
   - Indicates the types of worker training required

PLAN FIRST!
2. Clearly assigned staff responsibilities.

- Make responsibilities clear so that workers feel accountable for how well tasks are completed & so that no step in the process is overlooked.

3. Written, internal rules

- Formalize desired practices, as written rules may be better maintained.

4. Staff trained in safe handling, storage, treatment, & disposal.

- to ensure staff are aware of all hazards they might meet
- to ensure correct response to spills, injury, & exposure
- to ensure that they are practicing good hygiene, safe sharps handling, proper use of PPE, proper packaging & labeling of waste, & safe storage of waste

5. Protective clothing available.

- Workers need specific types of clothing to protect themselves when moving & treating various types of collected infectious waste:
  - surgical masks
  - gloves
  - aprons
  - boots
6. Good hygiene practices.

- Even if protective clothing is worn, some organisms will get on workers’ hands & faces.

- Thus, workers need to wash their hands & faces regularly with soap & water.

How to Handwash?

WASH HANDS WHEN VISIBLY SOILED! OTHERWISE, USE HANDRUB

Duration of the entire procedure: 40-60 seconds

http://www.who.int/gpsc/5may/How_To_HandWash_Poster.pdf

How to Handrub?

RUB HANDS FOR HAND HYGIENE! WASH HANDS WHEN VISIBLY SOILED

Duration of the entire procedure: 20-30 seconds

http://www.who.int/gpsc/5may/How_To_HandRub_Poster.pdf
7. Vaccinated workers

- Workers should be vaccinated against:
  - hepatitis B
  - influenza
  - measles, mumps, & rubella
  - varicella
  - tetanus, diphtheria, & pertussis
  - meningococcal disease

---

### Healthcare Personnel Vaccination Recommendations

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Recommendations in brief</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatitis B</td>
<td>Give 3-dose series (one #1 now, #2 in 1 month, #3 approximately 5 months after #2). Give HBV, Obbs, and HAV vaccines at least 2 months apart.</td>
</tr>
<tr>
<td>Influenza</td>
<td>Give 1 dose of influenza vaccine annually. Give inactivated influenza vaccine intramuscularly or live attenuated influenza vaccine (LAIV) intranasally.</td>
</tr>
<tr>
<td>MMR</td>
<td>For healthcare personnel (HCPs) born in 1957 or later without serologic evidence of immunity, give 2 doses of MMR, 4 weeks apart. For HCP born prior to 1957, see below. Give 2 doses.</td>
</tr>
<tr>
<td>Tetanus, diphtheria, pertussis</td>
<td>Give inactivated vaccine of one shot per year of HCPs who have not previously given. Give Td booster every 10 years thereafter. Give IM.</td>
</tr>
<tr>
<td>Meningococcal</td>
<td>Give 1 dose to microbiologists who are routinely exposed to isolates of N. meningococci. Give IM or SC.</td>
</tr>
</tbody>
</table>

---

**Healthcare Personnel!** Are your vaccinations up-to-date?

- Hepatitis
- Influenza
- Hepatitis
- Measles, mumps, & rubella
- Varicella
- Tetanus, diphtheria, & pertussis
- Meningococcal disease

---

7. Vaccinated workers

- Workers should be vaccinated against:
  - hepatitis B
  - influenza
  - measles, mumps, & rubella
  - varicella
  - tetanus, diphtheria, & pertussis
  - meningococcal disease

---

### Vegetable Waste Management

<table>
<thead>
<tr>
<th>Recommended Adult Immunization Schedule—United States</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VACCINE</strong></td>
</tr>
<tr>
<td>Influenza</td>
</tr>
<tr>
<td>Tetanus, diphtheria, pertussis (Tdap)</td>
</tr>
<tr>
<td>Mumps, measles, rubella (MMR)</td>
</tr>
<tr>
<td>Pneumococcal polysaccharide</td>
</tr>
<tr>
<td>Hepatitis A</td>
</tr>
<tr>
<td>Hepatitis B</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
8. Temporary storage containers in designated locations.

- Hazardous healthcare wastes
  - store only for short periods; <24 hrs
  - put in a labeled, covered container in a fixed location (specific corner of the room)
  - do not store near patients or food

9. Minimization, reuse, & recycling procedures

- Unnecessary disposal of valuable chemicals & pharmaceuticals can be avoided through good inventory practices:
  a) Use the oldest batch first.
  b) Never open a new container before the last one is finished.
  c) Prevent products from being thrown out during routine cleaning.
  d) Check the delivery to make sure materials are not about to expire.

- Minimizing
  e) Where possible & safe, use reusable syringes & needles:
    • generates approximately 0.5-2% of the waste of using disposables; &
    • costs 5 to 15 times less.
  f) Minimize use of products containing PVC plastics.

10. A Waste Segregation System

- Sorting & separating waste reduce the volume of waste by 75-90%.

- Segregate categories:
  - hazardous liquids
  - chemicals & pharmaceuticals
  - PVC plastic
  - materials containing heavy metals

- sharps
  - collected in separate puncture-proof containers

- Treatment options available to small-scale facilities for hazardous
  - disinfection - most important function of treatment
  - incineration?
  - autoclaving of infectious waste
  - encapsulation of sharps
  - small facilities could look into piggy-backing w/ bigger facilities

12. A final disposal site.

- Facilities must have a place to dispose of waste that cannot be treated, & the residues from treated waste.
  - disposal in a public landfill may be the only option for some
  - small-scale facilities are recommended to bury waste on site
    - pit lined with clay or a similarly impermeable material
      - to prevent contamination of ground water

13. A schedule for periodic review of adherence to the plan & effectiveness of the plan

- A program schedule must be established for regular follow-up to ensure planned practices are:
  - in place;
  - being carried out correctly; &
  - actually minimizing risk, damage, & disease.

References

- EGSSAA Part II Chapter 9 Healthcare Wastes
- Environmental Guidelines for Small-Scale Activities in Africa, 2nd Ed, 2009
  - http://www.encapafrica.org/egssaa.htm
- Healthcare Waste Management
  - http://www.healthcare-waste.org
- Immunization Action Coalition. Technical content reviewed by the Centers for Disease Control and Prevention, February 2012.
- Recommended Adult Immunization Schedule 2012
- Your 5 Moments for Hygiene
  - http://www.who.int/gpsc/5may/Your_5_Moments_For_Hand_Hydration_Poster.pdf
HEALTHCARE WASTEWATER MANAGEMENT

Prof. Romeo R. Quizon, MSc. Eng’g
Department of Environmental and Occupational Health
College of Public Health, University of the Philippines Manila

Learning Objectives

At the end of the session, the participants should be able to:
- characterize wastewater from healthcare facilities in terms of its composition and type;
- identify the different sources of wastewater in healthcare facilities;
- discuss the hazards/risks associated with wastewater from healthcare facilities;
- discuss the environmental and health impact of discharging untreated wastewater; and,
- discuss the appropriate and specific technologies for the treatment and disposal of wastewater.

Sanitation Code of the Philippines (PD 856)

- Requirements in the Operation of Industrial Establishments (RULE V)
  - Section E: Disposal of Industrial Wastes
    - All toxic and hazardous wastes including nuclear wastes incident to the operation of the industrial plant shall be collected, stored or disposed of in a manner that will prevent health hazards, nuisance and pollution in accordance with the guidelines set by DENR (RA 6969).
    - All industrial establishments discharging toxic wastes shall submit a copy of the method of treatment approved and certified by the EMB-DENR.

Philippine Clean Water Act (RA 9275)

- Ch. 2 Art 1 Sec 8 – Domestic Sewage Collection, Treatment and Disposal
  - That all establishments including industrial complex and similar establishments must be connected to a sewerage system.
- Sec. 12 – Categories of Industry Sector
  - The Department shall revise and publish a list of categories of industry sector for which effluent standards will be provided for each significant wastewater parameter.
Philippine Clean Water Act (RA 9275)

**SEC. 14. Discharge Permits.** The Department shall require owners or operators of facilities that discharge regulated effluents pursuant to this Act to secure a permit to discharge. The discharge permit shall be the legal authorization granted by the Department to discharge wastewater: Provided, That the discharge permit shall specify among others, the quantity and quality of effluent that said facilities are allowed to discharge into a particular water body, compliance schedule and monitoring requirement.

**Definition**

Wastewater in health care facilities

– any water that has been adversely affected in quality by anthropogenic influence during the provision of healthcare services.


**WASTEWATER**

- USED WATER
- WASTE IN LIQUID FORM CONTAINING POLLUTANTS

**COMPOSITION OF WASTEWATER**

99.99 % liquid

0.01 % solid
Types

**Black water**
- “Sewage”
- heavily polluted wastewater
- fecal mater, urine, significant food residues or toxic chemicals.

**Grey water**
- “Sullage”
- low polluted wastewater
- residues from washing, bathing, laboratory processes, laundry, or technical processes (cooling water or rinsing of x-ray films).

**Sources of wastewater**
- Toilets
- Kitchens
- Laundry Rooms
- Laboratory Rooms

**Exercise:**

<table>
<thead>
<tr>
<th><strong>Health Facility Area: Toilet</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Wastewater Component</td>
</tr>
<tr>
<td>1.</td>
</tr>
<tr>
<td>2.</td>
</tr>
</tbody>
</table>
WATER POLLUTANTS

1. Wastewater Fraction

- **Solid Fraction**
  - HUMAN AND ANIMAL EXCRETA
  - Pathogenic Organism
  - Insecticides & Heavy Metals

- **Organic Fraction**
  - 75% of SS & 40% of FS
  - Compounds w/c possess one carbon atom

- **Toxic Component**

- **Nutrient N+P**
  - Nitrogen & Phosphorus essential to the growth of photista & plants

- **Wastewater**

- **Nitrogen & Phosphorus**
  - Essential to the growth of photista & plants

- **Diseases**

- **Accumulation**

WATER POLLUTANTS

2. Environmental and Health Impact

- Oxygen Depletion
- Turbidity
- Diseases
- Eutrophication
- Accumulation

WATER POLLUTANTS

3. Treatment Option

- **Preliminary/Primary**
- **Secondary Tx**
- **Tertiary Treatment**

- Pond/Disinfection
- Treated Effluent

PRELIMINARY TREATMENT

- Chemical wastes are not allowed to be discharged into the sewer/WTP
- Infectious wastes must be first disinfected
- Screening
- Grease removal
- Amalgam removal
SLUDGE DEWATERING

TERTIARY TREATMENT

- Dissolved inorganic
  - Reverse osmosis
  - Distillation
  - Oxidation of NH$_4^+$ to NO$_3^-$ and denitrification of NO$_3^-$ to N$_2$, both by biological processes
TERTIARY TREATMENT

- Heavy Metals
  - Reverse osmosis
  - Distillation
  - Adsorption
WASTE STABILIZATION PONDS

ANAEROBIC POND

FACULTATIVE POND

SLUDGE LAYER

PATHOGENS

BOD LOST AS GAS

BOD
**FACULTATIVE POND**

*BOD LOST AS GAS*

**SYMBIOTIC RELATIONSHIP OF ALGAE AND BACTERIA**

- **Algae**
  - New cells
  - Sunlight
  - Oxygen
  - AERobic Layer
  - CO₂, nutrients

- **Bacteria**
  - Organic matters
  - New cells
  - AANAerobic Layer

**MATURATION POND**
MECHANISMS FOR FAECAL COLIFORM DIE-OFF IN WSP

Sunlight

Rapid Photosynthesis

High DO

pH > 9

Photo-oxidation

Increased Pond Temperature

Faecal Bacterial Die-Off

MATURATION POND

EFFLUENT STANDARDS: Conventional and Other Pollutants in Protected Waters Category I and II and in Inland Waters Class C

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Protected Waters Category I</th>
<th>Protected Waters Category II</th>
<th>Inland Waters Class C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>°C</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>pH (range)</td>
<td></td>
<td>6.0-9.0</td>
<td>6.0-9.0</td>
<td>6.5-9.0</td>
</tr>
<tr>
<td>COD mg/L</td>
<td></td>
<td>100</td>
<td>60</td>
<td>150</td>
</tr>
<tr>
<td>Settleable Solids (1-hour)</td>
<td>mg/L</td>
<td>0.3</td>
<td>0.3</td>
<td>0.5</td>
</tr>
<tr>
<td>5-Day 20 °C BOD mg/L</td>
<td></td>
<td>50</td>
<td>30</td>
<td>80</td>
</tr>
<tr>
<td>Total Suspended Solids</td>
<td>mg/L</td>
<td>70</td>
<td>50</td>
<td>90</td>
</tr>
<tr>
<td>Total Dissolved Solids</td>
<td>mg/L</td>
<td>1,200</td>
<td>1,000</td>
<td>-</td>
</tr>
<tr>
<td>Surfactants (MBAS) mg/L</td>
<td></td>
<td>5.0</td>
<td>2.0</td>
<td>7.0</td>
</tr>
<tr>
<td>Oil/Grease (Petroleum Ether Extract) mg/L</td>
<td></td>
<td>5.0</td>
<td>5.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Phenolic Substances as Phenols mg/L</td>
<td></td>
<td>0.1</td>
<td>0.05</td>
<td>0.5</td>
</tr>
<tr>
<td>Total Coliforms MPN/100mL</td>
<td></td>
<td>5,000</td>
<td>3,000</td>
<td>15,000</td>
</tr>
</tbody>
</table>

DENR DAO 35 SERIES of 1990
THE NEED FOR WASTEWATER TREATMENT

• PROTECT RECEIVING WATERS FROM *FAecal Contamination*

• PROTECT RECEIVING WATERS FROM *OxyGen Depletion* AND *Ecological Damage*

• PRODUCE MICROBIOLOGICALLY SAFE EFLUENTS FOR *AgricultURAL AND AQUACULTURAL REUSE*

Factors to be Considered in the Establishment of an On-Site WTP

- Regulatory requirements
  - Environmental Compliance Certificate
  - Accredited Pollution Control Officer
  - Working Plan signed by Professional ME
  - Engineering Report
  - Submission of Quarterly Self-Monitoring Report

Factors to be Considered in the Establishment of an On-Site WTP

- Location of the treatment and disposal facility
- Space availability
- Infrastructure requirements
- Locally available equipment and parts
- Treatment efficiency
Factors to be Considered in the Establishment of an On-Site WTP

- Reuse of treated wastewater
- Sludge and septage disposal
- Training requirement for operation
- Investment and operating cost

Factors to be Considered in the Establishment of an On-Site WTP

- Operation and Maintenance
  - Awareness among management and staff on wastewater problems
  - Physical Asset Management
  - Preventive Maintenance Program
  - Basic tools to carry out regular maintenance
  - PPE and safety equipment/measures
  - Trained operators and workers
  - Budget for operational and maintenance costs

WATER-RELATED DISEASES

- WATER BORNE
- WATER WASHED
- WATER BASED
- WATER INSECT RELATED

THANK YOU!!!
WASTE TREATMENT & DISPOSAL

HEALTHCARE WASTE MANAGEMENT SYSTEM
- Non Hazardous Waste
- Infectious Waste
- Sharps

Non-Hazardous or General Waste

- About 75-90% of the waste produced by healthcare providers is non-hazardous or general waste.
- Uncontrolled dumping and improper waste handling causes a variety of problems (e.g., water contamination, breeding site of insects and rodents, flooding, etc.)
SPECIFIC OBJECTIVES

1. Identify the appropriate treatment technologies and processes for healthcare waste;
2. Discuss the appropriate standard disposal system for each category of waste.
Non-recyclable/Non-Biodegradable Waste

Source: DOH HCWM Manual, 2011

Infectious Waste

- Infectious Agent - A microbial organism with the ability to cause disease. Infectious agents are bacteria, viruses, fungi, and parasites.
Infectious Waste
These are wastes that are most likely to contain pathogens (bacteria, viruses, parasites, or fungi) in sufficient concentration or quantity to cause diseases in susceptible hosts, which includes:

- cultures and stocks of infectious agents from laboratory work;
- waste from surgeries and autopsies on patients with infectious diseases.

Infectious Waste (con’t)

- waste from infected patients in isolation wards (e.g. excreta, dressings from infected wounds);
- waste that has been in contact with infected patients undergoing hemodialysis (e.g. dialysis equipment such as tubing and filters, disposable towels).

Source: DOH HCWM Manual, 2011

Infectious Waste (con’t)

- infected animals from research laboratories.
- any other instruments or materials that have been in contact with infected persons or animals.

Source: DOH HCWM Manual, 2011
How much Infectious Waste do we generate?

<table>
<thead>
<tr>
<th>HGW Generation in NCR, Region 3 &amp; 4, (DOH and Other Hospitals)</th>
<th>DOH Hospitals</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Hospitals (including DOH)</td>
<td></td>
</tr>
<tr>
<td>No of Hosp</td>
<td>No of Beds</td>
</tr>
<tr>
<td>Philippines</td>
<td>2,068</td>
</tr>
<tr>
<td>NCR</td>
<td>200</td>
</tr>
<tr>
<td>Region 3</td>
<td>214</td>
</tr>
<tr>
<td>Region 4</td>
<td>321</td>
</tr>
</tbody>
</table>

Generation Rate: 0.39 kg/day (ADB-JCA Study 2008)

Hazards from Infectious Waste

- Infectious waste may contain variety of pathogenic organisms.
- These organisms may be present in blood and other tissues.
- Pathogens in infectious waste may enter the human body through (a) puncture, abrasion, or cut in the skin; (b) through the mucous membrane; (c) by inhalation; and (d) by ingestion.

Labeling, Markings, and Color-Coding of Waste Bins and Plastic Liners

- The purpose of color coding is to facilitate waste segregation, storage, collection, transport, treatment and disposal.

<table>
<thead>
<tr>
<th>TYPE OF WASTE</th>
<th>MARKINGS AND LABELLING OF PLASTIC LINER</th>
<th>TYPE AND COLOR OF PLASTIC LINER</th>
<th>MARKINGS AND LABELLING OF BIN</th>
<th>TYPE OF BIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infectious waste</td>
<td>Property-labeled “INFECTION WASTE” Source and weight of waste generated, size of collection, Biohazard symbol optional</td>
<td>Yellow plastic, half withstand autoclaving Thickness 0.80mm Sample sizes: XL size, 35cm x 32cm x 45cm, also varies depending on the volume of wastes</td>
<td>Property-labeled “INFECTION WASTE” and with biohazard symbol</td>
<td>Draining, lock-proof bin with cover</td>
</tr>
</tbody>
</table>
In the implementation of a color coding system, the following practices shall be imposed in the HCF:

- Highly infectious waste must be disinfected at source.
- Anatomical waste including recognizable body parts, placenta waste and fetus are disposed through safe burial or cremation.
- Pathological waste must be refrigerated if not collected/treated within 24 hours.
- Due to the current state of many landfills, it is advisable to shred or crush treated sharps waste before transport to landfill.

Specifications of Waste Bins and Plastic Liners

- Should be made of sturdy and leak-proof material.
- Bins shall have well-fitting lids.
- Both the bins and the plastic liners shall be preferably of the same color for the type of waste intended to be placed.
- Plastic liners shall withstand autoclaving at 121°C - 130°C.
- Recommended thickness of plastic liners is 0.009mm. Only bins for general wastes shall be placed in public area.

- Bins for general waste shall be placed away from hazardous waste to prevent cross contamination.
- Aerosol containers can be collected together with the general waste.
Waste Transport

- Consignment Note
- All HCW should be transported only by a DENR-accredited transporter (except non-hazardous HCW)
- The authorized transporter shall maintain a completed consignment note of all HCW for treatment or disposal and updated transport permit.

The consignment note shall include, but is not limited to the following information:

- The name, address, telephone number, and accreditation number of the transporter, if the transporter is the generator
- The type and quantity of HCW transported
- The name, address, and telephone number of the generator

Waste Treatment

- The purpose of treating HCW is to change the biological and chemical character of the waste to minimize its potential to cause harm.
• Sterilization is defined as a 6log10 survival probability of the most resistant microorganism of concern in a given process.

• Disinfection is defined as low, intermediate or high depending on the survival probability of specific microbial groups.

• Infrastructure and space requirements (investment and operational cost)
• Locally available treatment options for final disposal
• Training requirements for operation of the method
• Cost of operation and maintenance considerations
• Location/surrounding of the treatment site and disposal facility
• Regulatory requirements
• Social and political acceptability

Selection Criteria of Healthcare Waste Treatment Technology

• Treatment efficiency
• Occupational health, safety and environmental considerations
• Volume and mass reduction
• Types and quantity of wastes for treatment and disposal/capacity of the system

<table>
<thead>
<tr>
<th>HCW TREATMENT TECHNOLOGY</th>
<th>DESCRIPTION</th>
<th>APPLICABILITY</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyrolysis</td>
<td>Thermal decomposition of HCW in the absence of supplied molecular oxygen in the destruction chamber or in HCW is converted into gaseous, liquid, or solid form.</td>
<td>All types of waste except mercury waste</td>
<td>Costly. Not yet available in the country</td>
</tr>
<tr>
<td>Autoclave</td>
<td>Uses steam sterilization to render waste harmless and is an efficient wet thermal disinfection process. (For autoclaves that do not sterilize waste, cycle-changing indicator strips may be inserted into the yellow bag in the middle of each load and that the strip shall be checked to ensure that steam penetration has occurred).</td>
<td>All types of waste except anaesthesiological pathological expired pharmaceuticals, drugs, cytotoxic, chemical, radioactive waste, and mercury waste</td>
<td>Relatively low investment and operating costs. And has no significant environmental adverse impact</td>
</tr>
<tr>
<td>Treatment Method</td>
<td>Description</td>
<td>Applicability</td>
<td>Remarks</td>
</tr>
<tr>
<td>------------------</td>
<td>-------------</td>
<td>---------------</td>
<td>---------</td>
</tr>
<tr>
<td>Microwave</td>
<td>Waste is exposed to microwaves that raise the temperature to 180°C (356°F) for at least 30 minutes. Pathogens are destroyed by high heat which inactivates enzymes and structural proteins. Sterilization of waste is done before disinfection.</td>
<td>The process is inappropriate for the treatment of anatomical waste and animal carcasses, and will not efficiently treat chemical or pharmaceutical waste.</td>
<td>The system has a relatively high investment and operating costs. Not recommended for individual HCFs.</td>
</tr>
</tbody>
</table>

**Safe Burial at HCF Located in Remote Areas**

- Safe burial as a disposal method is applicable only to treated infectious waste, pathological and anatomical waste, encapsulated/inertized pharmaceutical wastes, and encapsulated/inertized solid chemical wastes.
The Safe Burial Site shall:

- Have an accessibility limited to authorized personnel.
- Be lined with a material of low permeability, such as clay or HDPE, to prevent pollution of any shallow groundwater that may subsequently reach nearby wells.
- Only allow hazardous HCW to be buried. (burying general waste fill-up available space quickly).

- Each layer of waste covered with soil to prevent odor and proliferation of rodents and insects.
- Not located in flood prone areas.
- Be secured (e.g. fenced with warning signs).
- Downhill or down-gradient from any nearby wells and about 50 meters away from bodies of water.
- Have the bottom of the pit at least 1.5 meters above the ground water table.
HCW Management: Infectious Waste

HCW Management: Pathological/Anatomical Waste

- As a biohazard material, injuries from sharps waste can pose significant occupational and public health concern.
- By penetrating the skin it is possible for this waste to spread blood-borne pathogens.
- The general public can also be directly or indirectly at risk to injuries from sharps waste.
- High risk of exposure to infections such as HIV/AIDS and Hepatitis B and C among healthcare workers.

- In 2000, sharps injuries in healthcare workers were estimated to cause about 66,000 HBV, 16,000 HCV and 200-5000 HIV infections among health-care workers (Prüss-Ustun et al. 2005).

- For healthcare workers the fraction of infections due to percutaneous occupational exposure to HBV, HCV and HIV are 37%, 39% and 4% respectively.

- More than 2 million healthcare workers are exposed to percutaneous injuries with infected sharps every year (WHO, 2009).

### Definition

- Sharps include needles, syringes, scalpels, saws, blades, broken glass, infusion sets, knives, nails and any other items that can cause a cut or puncture wounds.

- Whether or not they are infected, these items are usually considered as highly hazardous HCW.

### Labeling, Markings and Color-Coding of Plastic Liners and Bin

<table>
<thead>
<tr>
<th>TYPE of WASTE</th>
<th>PLASTIC LINERS</th>
<th>BIN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MARKINGS AND LABELLING OF PLASTIC LINER</td>
<td>TYPE AND COLOR OF PLASTIC LINER</td>
</tr>
<tr>
<td>Sharps</td>
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<td>Not applicable</td>
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<tr>
<td></td>
<td></td>
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</tbody>
</table>

Sharps:
- Properly labelled “SHARPS”
- Source and weight of waste generated, date of collection with biohazard symbol (optional)
Safe Burial at HCF Located in Remote Areas

- Safe burial as a disposal method is applicable only to treated infectious waste, pathological and anatomical waste, encapsulated/inertized pharmaceutical wastes, and encapsulated/inertized solid chemical wastes.

Concrete Vault

This method is especially suitable for the disposal of used sharps and syringes.

The following steps shall be observed:

- Select a site that is isolated and at least 150 meters away from the water supply sources and dwelling units.
- Dig a pit (minimum size of 1 m x 1 m x 1.8 m depth), enough to accommodate sharps and syringes for an estimated period of time without reaching the groundwater level.
Concrete Vault

- Construct concrete walls and slabs of the pit.
- Provide slab with opening or manhole for easy deposition of collected sharps and syringes.
- The manhole shall be extended a few centimeters above the soil surface to overcome infiltration of surface water.
- Deposit the collected safety boxes filled with used sharps and needles inside the concrete vault.
- Install a security fence around the site with signage.

HCW Management: Sharps
Institutionalization and Sustainability of Health Care Waste Management

Engr. Aida Camacho - Barcelona, SE, MSE
Department of Health

Module Objectives

At the end of the session, the participant will be able to:

1. Identify requirements and strategies on how to institute and sustain a HCWM program in each HCF;
2. Identify the duties and responsibilities of the Office of the Administrator of the HCF;
3. Identify the required composition of HCWM Committee and the corresponding duties and responsibilities of each member;
4. Discuss the purpose of planning healthcare waste management in the health care facility level;
5. Identify communication and training intervention needed; and
6. Discuss the budgetary requirements.

Administrative Requirements and Strategies

1. Organization of a Healthcare Waste Management Committee (HCWMC)
2. An up-dated healthcare waste management plan (HCWMP) that incorporates monitoring procedures;
3. Allocation of sufficient financial and personnel resources to ensure effective and efficient implementation of the HCWMP
4. Adequate training for key members and designate the staff responsible for coordinating and implementing training courses for HCF staff; and
5. Development of information, education, and communication (IEC) program/materials

Administrator and/or Head of the HCF

Shall ensure the following:

- Organization of a Healthcare Waste Management Committee (HCWMC)
  - should be fully represented by all medical, nursing, and administrative services in the HCF
- Designation of a Waste Management Officer (WMO) or its equivalent/ Pollution Control Officer (PCO)
  - to supervise and coordinate the HCWM program planning and its subsequent implementation
Administrator and/or Head of the HCF

Shall ensure the following:

- An up-dated healthcare waste management plan (HCVMP) that incorporates monitoring procedures
- Allocation of sufficient financial and personnel resources to ensure effective and efficient implementation of the HCVMP

Administrator and/or Head of the HCF

Shall ensure the following:

- Appointment/designation of alternate member in the event of personnel leaving key positions in the HCWMC or temporarily assign responsibility to another staff member until another one can be formally appointed/designated

Administrator and/or Head of the HCF

Shall ensure the following:

- Adequate training for key members and designate the staff responsible for coordinating and implementing training courses
- Speedy resolution of complaints and other related legal matters

Administrator and/or Head of the HCF

Shall ensure the following:

- Good working relationship with other related agencies by proper referral, consultation and cooperation concerning HCWM
- The effective management of healthcare waste depends on good administration and organization of HCWMC
Healthcare Waste Management Committee (HCWMC)

HCWM Committee: Responsibilities

- Formulate a policy formalizing the commitment of the HCF to proper management of its waste with the goal of protecting health and the environment;

- Establish baseline data and develop the HCF’s HCWM plan which shall include a minimization plan, training, and written guidelines on waste management;

HCWM Committee: Responsibilities

- Implement the HCWM plan;

- Ensure adequate financial and human resources for implementation of the HCWM plan;

- Conduct regular committee meetings and submit minutes of meetings;

- Regularly monitor and evaluate the efficiency and effectiveness of the HCWM plan;

- Ensure strict compliance to existing laws, policies and guidelines;

- Review and update the policy, plans, and guidelines on an annual basis.
Healthcare Waste Management Committee

- Shall have a Core Team to be composed of at least a minimum of five (5) members.
- Head/Administrator of the HCF - shall be the Chairperson.

HCWMC Core Team

1. Administrator of the HCF as Chairperson
2. Designated Waste Management Officer as Co-Chair
3. Designated Infection Control Officer
4. Designated Pollution Control Officer
5. Head of Finance/ Budget Officer

Core Team shall be supported by key personnel in HCF

Healthcare Waste Management Committee

Core team - shall have the following duties and responsibilities:

- Organize and establish the HCWM sub-committees or group who will directly implement the HCWM policies and guidelines within specific units of the HCF
- Prepare the budgetary planning for the logistic requirements to implement the HCWM program within the HCF
- Provide assistance to all units relative to the proper orientation of all staff;

Healthcare Waste Management Committee

Core Team - shall have the following duties and responsibilities:

- Formulate policies and guidelines in the implementation of the different programs including granting of incentives for noted best practices
- Approve request for unit activities and programs which will include training
- Document and prepare report on regular basis
Administrator of the HCF as Chairperson

Group Work

Current HCWM Org. Structure and Experiences

Issues/Concerns

Recommendations

Healthcare Waste Management Committee

1. Administrator of the HCF designated as Chairperson of the HCWM Committee shall –

   - be responsible in ensuring that the HCW shall be managed in accordance with the national policies and guidelines;

   - formally appoints/designates dedicate personnel as Waste Management Officer and Pollution Officer and other core members of the HCWMC indicating the specific duties and responsibilities, including their accountabilities;
Healthcare Waste Management Committee

- directs and controls the implementation of the different programs and activities of the HCVWMC
- conducts regular review of the policies subject for revision and assessment

Waste Management Officer (WMO)

2. Waste Management Officer (WMO) designated as Co-Chair of the HCVWMC shall:
   - be responsible for the day to day operation and monitoring of the waste management system in the hospital;
   - directly responsible to the Head/Administrator of the HCF;

Healthcare Waste Management Committee

- establish linkage with the Infection Control Officer, the Chief Pharmacist, and the Radiation Officer in order to become familiar with the correct procedures for handling and disposing of pathological, pharmaceutical, chemical and radioactive waste.
Healthcare Waste Management Committee

Waste Management Officer -

- Ensures that the internal regular collection of waste, proper waste segregation, collection and transport are properly observed;

- Observes and directs the provisions of continuous availability of waste bins, plastic liners, personal protective equipment, and collection bins/carts, and direct supervision of collection crews;

Healthcare Waste Management Committee

Waste Management Officer -

- Checks and directs correct use of central storage facility, which shall be kept locked but is accessible to authorized staff at all times;

- Coordinates and monitors waste treatment, disposal operations, waste transport for both on-site and off-site;

Healthcare Waste Management Committee

Waste Management Officer -

- Coordinates with the Senior Nursing Officer and Department Heads to ensure that nursing staff and medical assistants as well as doctors and other qualified clinical staff are aware of their responsibilities for segregation and storage of waste;

Healthcare Waste Management Committee

Waste Management Officer -

- Ensures that written emergency procedures are available and that personnel are aware of the action to be taken in the event of an emergency. Investigate and review reported incidents concerning the handling of healthcare waste.
Healthcare Waste Management Committee

3. Infection Control Officer (ICO)/Safety Officer (SO) - Shall have the following duties and responsibilities:

- Maintains linkage with the WMO on a continuous basis and provide advice concerning the control of infection and the standards of the waste disposal system;
- Identifies training requirements according to staff grade and occupation;
- Organizes and supervises staff training courses on safe waste management;
- Liaises with the department heads and Senior Nursing Officer regarding training of staff;
- Handles the overall responsibility for chemical disinfection, sound management of chemical stores, and chemical waste minimization; and,
- Ensures that all chemicals used in the HCF have Material Safety Data sheet (MSDS)
Pollution Control Officer (PCO)

Healthcare Waste Management Committee

Pollution Control Officer (PCO) -
- Attends to the requirements of the HCF prior to the construction or installation of pollution control facilities including the application and securing of necessary pollution permits and renewal;

Healthcare Waste Management Committee

4. Pollution Control Officer (PCO) -
Shall be responsible for the HCF compliance on the requirements mandated by EMB, DENR and other regulatory agencies. He/she shall have the following duties and responsibilities:
- Attends to the requirements of the HCF prior to the construction or installation of pollution control facilities including the application and securing of necessary pollution permits and renewal;
- Monitors activities pertaining to the installation or construction of pollution source and control facilities thereby ensuring their compliance with air, noise and water quality standards; the PCO and the head of the HCF shall be held responsible for any violations of PD 984 and its implementing rules and regulations committed by the establishment where the officer is employed;
Healthcare Waste Management Committee

Pollution Control Officer (PCO) -
- Supervises the proper operation and maintenance of pollution control facilities of the establishment or agency;
- Reports within reasonable time to the EMB-DENR the breakdown of any pollution control facility, and the estimated and the actual date of completion/repair and operation;

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Healthcare Waste Management Committee

Pollution Control Officer (PCO) -
- Promptly submits validated/certified as correct by the General Manager periodic reports as stipulated in section 7 hereof or as required by the EMB-DENR;
- Acts as liaison officer and maintain linkage with the DOH, DENR, EMB and other designated PCO of other agencies including the local government unit PCO;

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Healthcare Waste Management Committee

Pollution Control Officer (PCO) -
- Keeps himself abreast with the requirements of the Department and the latest available technology on the prevention, control and abatement of pollution; and
- Attends the meetings for PCO’s which may from time to time be called by the monitoring agency.

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Head of Finance/Budget Officer
Healthcare Waste Management Committee

5. Head Finance/ Budget Officer

shall be responsible in assuring the provision of continuous logistics and inclusion in the annual development plan for maintaining and sustaining the programs and activities being implemented by the HCWM Committee.

Division Heads, Department Heads and Other Key Personnel

Division Heads of the Medical, Nursing and Administrative Services

Division Heads of the Medical, Nursing and Administrative Services shall:

- Ensure strict compliance of their respective staff in the policies and guidelines being implemented by the HCVMC;
- Disseminate policies and guidelines down the line including all the support staff in the HCF;
- Conduct regular orientation and reorientation among their HCF workers;
- Maintain linkage with the designated WMO;
Healthcare Waste Management Committee

**Department Heads** shall be responsible within their respective areas of concern in ensuring that all members of their department are aware of the HCWP as to segregation and storage procedures and that strict compliance has been observed.

- Ensure that all doctors, nurses, and clinical and non-clinical professional staff in their departments are aware of the segregation and storage procedures and that all personnel comply with the highest standards in HCWM;
- Liaise with the WMO to monitor working practices against failures or mistakes;

Healthcare Waste Management Committee

**Department Heads**

- Ensure that key staff members in their departments are given training in waste segregation and disposal procedures; and
- Encourage medical and nursing staff to be vigilant so as to ensure that hospital attendants and ancillary staff follow correct procedures at all times.

Healthcare Waste Management Committee

The Senior Nursing Officer is responsible for the training of nursing staff, medical assistants, hospital attendants, and ancillary staff in the correct procedures for segregation, storage, transport, and disposal of waste.

He/she shall therefore:

- Liaise with the WMO and the advisers (Infection Control Officer, Chief Pharmacist, and Radiation Officer) to maintain the highest standards in healthcare waste management;
# Healthcare Waste Management Committee

## The Senior Nursing Officer

- Coordinate with the Department Heads on training activities, and on other waste management issues specific to particular departments.

## The Chief Pharmacist

The Chief Pharmacist is responsible for the sound management of pharmaceutical storage and for pharmaceutical waste minimization.

He/she shall:
- Liaise with the Department Heads, the WMO, the Senior Nursing Officer and give advice, in accordance with the national policy and guidelines, on the appropriate procedures for pharmaceutical waste disposal;

## The Chief Pharmacist

The Chief Pharmacist shall:
- Coordinate continuous monitoring of compliance with procedures for the storage and disposal of pharmaceutical waste;
- Ensure that personnel involved in pharmaceutical waste handling and disposal receive adequate training; and
- Ensure safe utilization of genotoxic products and the safe management of genotoxic waste.

## The Radiation Officer

The Radiation Officer shall:
- Ensure proper management of radioactive waste;
- Be responsible to liaise with the Department Heads, the WMO, the Senior Nursing Officer and give advice on the appropriate procedures for radioactive waste disposal including its continuous monitoring;
- Ensure that involved personnel receive radioactive adequate training.
**Healthcare Waste Management Committee**

**The Head of the General Services** including the unit heads of housekeeping and janitorial services shall:

- assist in the preparation of the HCWMP
- maintain cleanliness and orderliness of the HCF premises for aesthetic reasons
- initiate a sanitary manner of implementing the pre-treatment processes, appropriate collection system/procedures and disposal of waste either by TSD or municipal system

**Head of the General Services**

- Establish baseline data, ensure generation of data for regular reporting and monitoring, and maintain proper filing system and update program records
- Maintain constant good working relationship with all HCF personnel for their support and full participation in implementing the program

**Healthcare Waste Management Committee**

**Head of the General Services**

- Enhance or provide continuous training program for housekeeping/janitorial services on waste management and government policies

**Maintenance and Ground Services** shall:
- assist in the proper collection, pre-treatment and disposal of HCW
- carry out directly the activities related to the operation and maintenance of pre-treatment, collection and disposal system as soon as possible with importance to the drainage system and plumbing facilities of the establishment
- attend immediately to problems arising from the repair/installation of waste equipment
The Motor Pool and Ground Services shall:

- assist in the provision of vehicle for transporting healthcare waste to transfer station or disposal sites
- prepare and plan the collection system routes and frequency of collection of HCW

The HCF Engineer or the designated in-charge of engineering services shall:

- be responsible for installing and maintaining waste storage facilities and handling equipment that comply with the specifications of the national guidelines
- be accountable for the adequate operation and maintenance of any on-site waste treatment equipment

- Inspect and schedule maintenance work on vehicles used for transporting HCW;
- Observe proper infection control measures in the maintenance of vehicles used for the transportation of HCW.

- be responsible for compliance with mandatory requirements of Pollution Control
- be responsible for the staff involved in waste treatment thereby ensuring that the staff designated to operate the on-site waste treatment facilities are trained in their operation and maintenance.
Healthcare Waste Management Plan

Three (3) Major Concerns

1. Specific plan of actions formulated to respond to each concern - shall include in its indicators the involvement of all the HCF personnel and its clients

2. Improvement of HCF facilities

3. Training of personnel

Communication and Training
Communication and Training

- All HCF, the Department of Health, and EMB-DENR have the responsibility and "duty of care" for the environment and public health, particularly in the institutionalization of awareness among HCW and the general public.

- Every member of the HCF and the community has the right to be informed about the potential health hazards associated to HCW.

- Inadequate handling of HCW may have serious public health consequences and impact on environment health protection.

Communication and Training

- Public awareness through formal or informal education plays an important role in HCWM.

- Development of information, education and communication (IEC) programs and materials shall be given due course.

Objectives of Communication and Training

- To foster responsibility among hospital patients and visitors to HCF regarding hygiene and HCWM.

- To prevent exposure to HCW and related health hazards.
Objectives of Communication and Training (con’t)

- To increase awareness of the impact of HCW on environment and ecology
- To influence behavior of patients, watchers, healthcare facilities workers to implement proper HCWM

Considerations in Developing IEC Tools

- Specific targeted participants, including their level of understanding and involvement in the implementation of the HCWM plan;
- Availability of funds and logistics to sustain the program;
- Support of the HCF management to the program

Communication and Training

- Use of media - announcement or commercial ads featured in radios, movies, television, newspaper, magazines and the internet
- Conduct series of orientation/re-orientation seminars, trainings and workshops among HCW, community and health teachings among hospital patients, watchers and other clients using the IEC materials and didactic exercises.

Communication and Training

- Issuances of written HCF policies to disseminate the information and awareness among HCW.
- There shall be corresponding sanctions to be implemented for non-compliance of the issued policies to ensure strict compliance.
Training on Health Care Waste Management - CHD CALABARZON
5-9 March 2012, Citystate Tower Hotel, Ermita, Manila

Training: Target Personnel

- HCF managers and administrative staff responsible for implementing regulations on HCWM
- Medical doctors
- Nurses and assistant nurses
- Cleaners, porters, auxiliary staff, and waste handlers

Basic training program for healthcare staff

- Information on and justification for all aspects of the HCW policy
- Information on the role and responsibilities of each healthcare staff member in implementing the policy
- Technical instructions, relevant for the target group, on the application of waste management practices

Training of Healthcare Personnel

- All personnel must receive initial and annual training.
- A trained individual must be available during training sessions.
Suggested Training Package for Each Target Group

For Healthcare Personnel

- The training course shall provide an overview of the waste management policy and underlying rationale and information on practices relevant to the trainees' responsibilities.

- Waste segregation is a key element for this training in waste management.

Recommended Training Package

For Healthcare Personnel

- All staff who produce healthcare waste shall be responsible for its segregation, and shall therefore receive training in the basic principles and practical applications of segregation.

Recommended Training Package

For Waste Handlers

- Topics covered may include the waste management policy, health hazards, on-site transportation, storage, safety practices, and emergency response.
Recommended Training Package

For Healthcare Waste Management Operators

- Information on the risks associated with the handling of HCW.
- Procedures for dealing with spillage and other accidents.
- Correct use of protective clothing.

Recommended Training Package

For Waste Handlers

- Among staff who routinely handle healthcare waste, awareness of the need for safety may decrease with time, which will increase the risk of injury.
- Periodic refresher course is therefore recommended.

Recommended Training Package

For Staff who Transport the Waste

- Use of PPE
- Documentation and recording of HCW

- The drivers and waste handlers shall be aware of the nature and risk of the transported waste, and shall be able to carry all procedures for handling, loading, and unloading of waste bags and bins.
- dealing with spillage or accidents.
Recommended Training Package

For Treatment Plant Operators

- General operation of the treatment facility
- Health, safety, and environmental implications of treatment operations
- Technical procedures for plant operation

Orientation Module for Patients

- HCF shall provide patients and watchers an orientation of the healthcare waste management policies and system of the hospital as part of the admission procedure.

Recommended Training Package

For Treatment Plant Operators

- Emergency response, in case of equipment failures and alarms
- Maintenance of the plant and record keeping
- Surveillance of the quality of emissions and discharges, according to the specifications

Orientation Module for Patients

Shall include, at the minimum:

- Policies on HCWM relevant to patients and watchers such as the ban on styrofoam and non-reusable plastic food containers, proper segregation of waste
- Impact of improper segregation and Styrofoam/non-reusable plastic food containers on health, safety and environment
Budgetary Requirements

**Investment and Operations Costs**

- The “polluter pays” principle mandates each HCF to be financially liable for the safe management of its HCW.

- The costs of separate collection, appropriate packaging, and on-site handling are internal to the establishment while the costs of off-site transport, treatment, and final disposal are external and paid to the contractors who provide the service.

The costs that will be incurred by HCF include:

1. Waste Segregation and On-Site Handling
   - Proper segregation and on-site handling of wastes includes the costs for the following materials, goods and services:
   - Waste bins, color-coded plastic liners that shall be placed in appropriate places in the hospital, transport trolleys ad collection bins.

The costs that will be incurred by HCF in managing HCW include:

1. Waste Segregation and On-Site Handling
   - Proper labels for the waste bins, tags for the plastic liners, and signage /posters.
   - Training of personnel to place wastes in the appropriate container and to handle them in a safe manner
   - IEC materials
Budgetary Requirements

- Storage spaces for HCW within the HCF, spill kits and measures to secure and protect the wastes when needed.
- PPE needed to safely and properly handle wastes.
- Occupational health and safety measures such as immunization.

Budgetary Requirements

1. Waste Segregation and On-Site Handling
   - Sealers for plastic liners and packaging the wastes for transport if the treatment facility is sited a distance from the establishment.
   - Transportation borne by the HCF.
   - Operating and maintenance costs including salaries and wages.

Budgetary Requirements

- Segregation of wastes effectively reduces the amount of waste needed for transport to (if located off-site), treatment, and disposal at the treatment facility.
- Investments in training and equipment may not be offset by lower treatment costs.

Budgetary Requirements

2. Waste Treatment

   Establishing and operating an on-site waste treatment facility include the investment and operating costs.
   - Non-burn waste treatment technology and its accessories and related processes (e.g., shredder) and additional processes such as encapsulation and inertization in cases where the waste treatment system do not deactivate chemical and toxic agents.
Budgetary Requirements

- Microbiological testing equipment and supplies
- Installation and facility costs: installation labor, facility modifications - cement pad(s), curb cuts, sewers, electricity, space, security, etc.

Budgetary Requirements

- Costs of pollution control equipment if required to control emissions and effluents from the facility (e.g., wastewater treatment plant)
- Construction of temporary storage and hauling areas for treated wastes

Budgetary Requirements

- Direct labor costs: number of employees needed to operate the treatment and disposal equipment
- “Down time” costs: including repair (parts and labor), and alternative treatment
- Operating costs if the facility uses special chemicals and catalysts

Budgetary Requirements

- Utility Costs
  - Permitting and compliance fees: water and air quality monitoring fees, Environmental Clearance Certificate (ECC) and registration with DENR as waste generator, treater and/or transporter
  - Fines: depending upon permitting requirements, National and Local regulations, violations of permits or emissions may result in fines
**Budgetary Requirements**

- All transportation, processing and tipping fees
- Supply costs – Personal protective equipment, spill supplies, special bags (for example, some autoclaving systems require particular bags), collection containers (boxes or reusable containers)

**Budgetary Requirements**

- Community approval costs if a public hearing is required
- Sterilization equipment

**Budgetary Requirements**

**Waste Treatment**

- In cases where the HCF enters into a contract with a DENR-accredited TSD, the costs that will be incurred by the HCF will be the charges of the waste treater and the associated transportation costs.
- Investment in on-site treatment facilities may be costly but allows the HCF to control the manner by which the waste is treated and the costs associated with treatment.

**Budgetary Requirements**

2. **Waste Treatment**

- Off-site treatment facilities, when available, may be more costly in the long run but allows the HCF to concentrate on its basic occupational function and not on operations it is not built to do, which is the treatment of wastes.
Budgetary Requirements

3. Disposal

- Disposal to a sanitary landfill is considerably more costly than disposal in open dumpsites.
- Sanitary landfills may charge a higher fee for wastes coming from medical establishments.

Budgetary Requirements

Disposal (con’t)

Some costs for disposal of treated waste that shall be considered when an on-site facility is used include the following:

- Construction of temporary storage and hauling areas for treated wastes
- Costs related to wastes not handled by the hauler
- Cost of encapsulation, inertization, septic vault

Budgetary Requirements

Disposal (con’t)

- In evaluating treatment options, costs with relation to final disposal shall be inputted since some treatment systems can almost eliminate wastes altogether (pyrolysis) but some even increase the weight of wastes (steam systems without dryers).
- Care shall also be taken to render the wastes unrecognizable.

- Labor costs for hauling, labelling, waste documentation, security, and maintenance of temporary storage areas.
- Hauling costs
- Transport containers
- Landfill tipping fees
Measures to Reduce Costs

1. Comprehensive planning
   - Development and implementation of a comprehensive HCWM plan, which includes the recommendations listed below on on-site management.
   - Designing all elements of the system to be of adequate capacity in order to obviate the need for subsequent costly modifications.

Measures to Reduce Costs

Comprehensive planning (con’t)

- Anticipating future trends in waste production and the likelihood of legislation becoming more stringent
- Planning collection and transport in such a way that all operations are safe and cost-efficient

Measures to Reduce Costs

2. On-site management: source reduction, recycling and re-use

- Comprehensive management of chemicals and pharmaceuticals stores, which includes centralized purchase and use of chemicals and pharmaceuticals and centralized monitoring of chemical flows within the HCF.
- Improved waste identification to simplify segregation, treatment, and recycling.
Measures to Reduce Costs

2. On-site management: source reduction, recycling and re-use

- Reduction of the amount of material used to accomplish tasks. Examples are the use of email instead of paper and the use of smaller amounts of disinfectant to clean rooms.

3. Adequate treatment and disposal method

- Selection of a treatment and disposal option that is appropriate for waste type and local circumstances.
- Use of treatment equipment of appropriate type and capacity.
- Possible cooperation between local HCF.

4. Measures at personnel level

- Establishment of training programmes for workers to improve the quality and quantity of work.
- Protection of workers against occupational risks.

5. Documentation

- Documentation of waste management and assessment of the true costs makes it easier to identify priorities for cost reduction and to monitor progress in the achievement of objectives.
Options for Financing

- HCWM may be financed through:
  - in-house funds of the HCF
  - revenues from recyclable waste
  - loans from credit facilities
  - through sub-contracting, partnership or joint venture with other institutions providing TSD services (sharing WTP, waste treatment, mercury storage)

Module Objectives

At the end of the session, the participant will be able to:

1. Identify requirements and strategies on how to institute and sustain a HCWM program in each HCF;
2. Identify the duties and responsibilities of the Office of the Administrator of the HCF;
3. Identify the required composition of HCWM Committee and the corresponding duties and responsibilities of each member;
4. Discuss the purpose of planning healthcare waste management in the health care facility level;
5. Identify communication and training intervention needed; and
6. Discuss the budgetary requirements.

Summary

Sustainable HCWM implementations depends on adequate organization and administration, and requires adequate financing and active participation by trained and informed staff.
Treatment and Disposal Technologies for Medical Wastes in Developing Countries

Mohd Nasir Hassan, PhD
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WESTERN PACIFIC REGION

Where do We Start?
Definition >>> Legal Implications >>> What are medical wastes and what are not ???

Health Care Wastes
(All Wastes (unwanted and discarded) generated from all Health-Care Establishments
(complete list)

Medical Wastes (10-30 %)
Cross Contamination
Infectious
Blood
Body parts
Laboratories
Infectious materials

Injury & Harm
Needles
Other sharp objects

Toxic and Hazardous
Cytotoxic wastes
Chemicals
Pharmaceutical Wastes

Solid Wastes

Most Developing Countries: No legal Definition !

Medical Waste Water

Pathological Wastes: Body Parts

Medical wastes: How Much Produced ?
- 1.0-1.5 kg/bed/day in a large hospital,
- 0.3 kg/bed/day in a small hospital.

Used Blood Samples
Blood

Laboratory Cultures
Sharps

Used Chemicals
Medical Wastes in Developing Countries
Challenge No 1: Failed to Understand the Risk (Health and Environment)

Health & Environment
Infectious, Toxic and Hazardous
Not Properly Managed
Acute and Chronic Health Impacts
Basic Management Principles

Storage → Collection → Transport → Treatment → Disposal

Challenge No 2:
A Technology May Not Work Every Place

Appropriate Technology
Failed to understand the principles of medical waste management

Risk Management
- Managing the exposure
- Managing the concentration

Risk Characteristics:
- Actual condition
- Transformation
  - chemical changes (incineration)
  - biological changes
  - (biotransformation)
Challenge No 3:
Economic Constraints

- Poor
- Less Important Sector (least priority until ???)
  >>> financial resources not properly allocated

Very Minute Budget for:
- Storage bags/containers
- Temporary Storage Room
- Poor Transportation Systems
- Haphazard Treatment + Poor Operation and Maintenance
- Extremely Unsanitary Disposal

Challenge No 4:
Policies, Strategies and Plan of Action

- No Policy, Guidelines on Medical Waste Management
  + Cross-cutting responsibilities

  Intermediate Systems:
  - Regulations
  - Guidelines
  - Technology can be improved

  Advanced Systems:
  - Regulations
  - Technical Guidelines
  - Adequate resources

  Poor Systems:
  - Regulations
  - Guidelines
  - Not implemented

  Very Poor Systems:
  - No Regulations
  - No Guidelines
  - Not implemented

Developing Countries:

In 2002 of 22 developing countries:

18 to 64 % of health care facilities with poor health-care waste management
Pathological Wastes: Body Parts Or ??

Black Bags are Meant for General Wastes

Food Wastes + Sharps !!!!!

Over-used Sharp Containers

80-85% is general, non-hazardous waste but often not segregated – need to deal with them as hazardous waste.
Is this APPROPRIATE

Medical Wastes are Stored in Open Containers

CAN YOU READ THIS ???

DANGER
RADIATION SOURCE
DO NOT WORK WITHIN SIX FEET OF THIS INSTALLATION
NOTIFY MEDICAL SUPERINTENDENT IF THE INSTALLATION IS DAMAGED

WILL YOU APPROVE THIS ???
The Way Forward

<table>
<thead>
<tr>
<th>POLICY</th>
<th>TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrative Requirements/Guide</td>
<td>Technical Requirements</td>
</tr>
<tr>
<td>(Regulations/Guidelines/Standard Operating Procedures)</td>
<td>(Regulations/Guidelines/Standard Operating Procedures)</td>
</tr>
<tr>
<td>Health-care Establishments Covered by Regulation</td>
<td>Segregation</td>
</tr>
<tr>
<td>(Govt + Private)</td>
<td>Infectious materials</td>
</tr>
<tr>
<td>Responsible Agency ???</td>
<td>Sharps</td>
</tr>
<tr>
<td>Reporting</td>
<td>Chemicals</td>
</tr>
<tr>
<td>Consignment Notes</td>
<td>Pharmaceuticals</td>
</tr>
<tr>
<td>(Tracking System)</td>
<td>Collection</td>
</tr>
<tr>
<td>Offence and Violation</td>
<td>Storage Area</td>
</tr>
<tr>
<td>Emergency Response</td>
<td>[Preliminary Treatment]</td>
</tr>
<tr>
<td>Small Health-Care Establishments</td>
<td>Transportation</td>
</tr>
<tr>
<td>(Health Centres/Islands)</td>
<td></td>
</tr>
</tbody>
</table>
### Guiding Principles

**Organizational Guidelines:**

- a. Dedicated waste management team.
- b. Clear and practical organization.
- c. Underpinning legislation or guidelines or regulations.
- d. Affordable.
- e. Full participation

**Technical Guidelines:**

- a. Elimination or reduction of risk.
- b. Toxicity reduction.
- c. Volume reduction.
- d. Waste producers responsibilities.
- e. Cradle to grave management.
- f. Training

<table>
<thead>
<tr>
<th>Type of Wastes</th>
<th>Colour of Container and Markings</th>
<th>Type of Container</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infectious wastes, pathological wastes</td>
<td>Yellow, marked “INFECTIOUS”</td>
<td>Strong, leak-proof plastic bag, or container capable of being autoclaved</td>
</tr>
<tr>
<td>Sharps</td>
<td>Yellow, marked “SHARPS”</td>
<td>Puncture-proof container</td>
</tr>
<tr>
<td>Chemical and pharmaceutical wastes</td>
<td>Brown, marked “HAZARDOUS”</td>
<td>Plastic bag or container</td>
</tr>
<tr>
<td>Wastes with High Content of Heavy Metals</td>
<td>Brown, marked with the specific heavy metal content and “HAZARDOUS”</td>
<td>Puncture and corrosive proof container, separate containers for different heavy metal contents.</td>
</tr>
<tr>
<td>Radioactive and Genotoxic wastes</td>
<td>Red, marked with “RADIOACTIVE SYMBOL”</td>
<td>Lead box, labelled with radioactive symbol</td>
</tr>
<tr>
<td>Pressurised containers</td>
<td>Black</td>
<td>Plastic bag, could mix with the general wastes</td>
</tr>
<tr>
<td>General Waste</td>
<td>Black</td>
<td>Plastic bag</td>
</tr>
</tbody>
</table>
Incineration: Most Countries Resort to Burning of Wastes

**Advantages:**
- Destruction (risk)
- Volume reduction
- Flexible (can handle most types of medical wastes)

**Disadvantages**
- Costly
- Environmentally sensitive: Emissions, Ashes
- Maintenance -- sophisticated
- Limited effective life-time

- Score: Extremely Risky
- Verdict: Unless specifications/regulations are met (environment + health requirements)
  - **NOT ENCOURAGED**
- Strict requirements:
  - Temperature
  - Double combustion
  - Emission treatment
  - Auto-shut down
- **So What is the Appropriate Technology**
  - Simple high temperature systems
  - Sophisticated high tech system
  - Combination

---

<table>
<thead>
<tr>
<th>Substance</th>
<th>Daily Average (mg/Nm³)</th>
<th>Hourly Average (mg/Nm³)</th>
<th>4-hour Average (mg/Nm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total dust</td>
<td>5</td>
<td>10</td>
<td>-</td>
</tr>
<tr>
<td>Total organic carbon</td>
<td>5</td>
<td>10</td>
<td>-</td>
</tr>
<tr>
<td>Chlorine compounds</td>
<td>5</td>
<td>10</td>
<td>-</td>
</tr>
<tr>
<td>Fluorine compounds</td>
<td>1</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Sulfur oxides as SO2</td>
<td>25</td>
<td>50</td>
<td>-</td>
</tr>
<tr>
<td>Nitrogen oxides as NO2</td>
<td>100</td>
<td>200</td>
<td>-</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>90</td>
<td>100</td>
<td>-</td>
</tr>
<tr>
<td>Mercury</td>
<td>-</td>
<td>-</td>
<td>0.05</td>
</tr>
<tr>
<td>Cadmium and thallium</td>
<td>-</td>
<td>-</td>
<td>0.05</td>
</tr>
<tr>
<td>Lead, chromium, copper, and Manganese</td>
<td>-</td>
<td>-</td>
<td>0.5</td>
</tr>
<tr>
<td>Nickel and arsenic</td>
<td>-</td>
<td>-</td>
<td>0.5</td>
</tr>
<tr>
<td>Arsenopyrite, cobalt, vanadium and tin</td>
<td>-</td>
<td>-</td>
<td>0.5</td>
</tr>
<tr>
<td>Dioxins and furans</td>
<td>-</td>
<td>-</td>
<td>0.1</td>
</tr>
<tr>
<td>Oxygen content</td>
<td>-</td>
<td>-</td>
<td>At least 6 % at any moment</td>
</tr>
</tbody>
</table>
DIOXINS, FURANS, CO-PLANNER PCBS

- Polychlorinated dibenzo-para-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs), polychlorinated biphenyls (PCBs).
  - Persistence, bioaccumulate.
  - Related to combustion at low temperature, plastics (esp. PVC).
    - Lower than 800°C
    - Especially in the range of 250-450°C
    - Temperature not uniform.
  - Presence in bottom ash, fly ash, emissions.

Safe Levels of Dioxins

- WHO:
  - Provisional Tolerable Monthly Intake (PTMI)
    - 70 picograms/kg body-weight (10^-12g).
  - Emission Limits:
    - Europe 0.1 ngTEQ/m³ (Toxicity Equivalent)

Criteria for Selection:

- Environment:
  - Emissions.
  - Residues.
- Technical:
  - Efficiency
  - Parts, components and maintenance.
  - Technological: proven (commercialised); experimental (pilot).
- Costs:
  - Capital
  - Operating

Incinerators

Before YES

- Good Practices in Incineration Design, Construction and Operation (eg. pre-heating, not overloading, temperature above 800°C), maintenance, lowest emissions.
- Waste segregation and waste minimisation.
- Good practice tools (dimensional construction plans, operational guidelines).
- Operator Training and Management Support.
- Avoid materials containing Chlorine (some blood bags, IV Bags, IV tubes), heavy metals (mercury).

Technology Management

- Site of incinerators.
- Detailed Engineering Design:
  - Residence Time, Temperature, treatment of emissions.
- Operation & Maintenance.
- Disposal of Ash.
- Training
  (Problems due inadequate training, waste segregation and poor maintenance)
**Intervention**

**BASIC SYSTEMS:** Countries without any policies + Systems

- Develop Policies, Regulations, Strategies, Action Plans
- Separation: Colour Coding Storage Areas
- Simple Treatment
- Inertisation Encapsulation
- Controlled Landfill (Secured Landfill)

**Medium**

(Countries have regulations but technically and financially incapable)

- Financial Assistance
- Develop Pilot Hospitals, Health Centres
- Nation-Wide System

**High**

(Countries with regulation + systems)

Research and Development:

- Technology
- Systems: Public Vs Private

**3 Rs**

- Systems to reduce the amount of waste produced
- Systems to reduce toxic contents so that we can promote reuse
- Systems that eliminate risks to allow recycling
Summary

- Proper health-care waste management must start with proper definition.
- Three challenges:
  - Fail to understand the risks posed by wastes.
  - Inappropriate technology
  - Lack of financial resources.
- Waste management:
  - Managerial responsibilities
  - Technical guidelines/specifications

Cont.

- Essential elements:
  - Segregation.
  - Colour schemes + additional specifications for containers.
  - Collection.
  - Treatment and disposal.

Cont.

- Incineration:
  - Only system that destruct wastes.
  - Problems
    - Poor operation and maintenance.
    - Poor training.
  - Technical requirements:
    - Temperature (preferably >1000°C)
    - Residence time (2 seconds)
    - Emission treatment
    - Ash disposal

3 levels of interventions

- Basic
- Intermediate
- Advanced
- Basic:
  - National policies/strategies/plan + costs
  - Source segregation
  - Colour coding + appropriate containers + labels
  - Basic and easy treatment systems.
  - Capacity building
Case Studies of Health Care Waste Management Technologies and Energy Efficiency in Health Care Facilities

Arch. Marco Silvestri, Regional Resource Centre for Asia and the Pacific (RRC.AP)

Module Outline

Health Care Waste Management technologies seek to improve the treatment process, reduce air pollutants emissions, and facilitate disposal, but also target environmental sustainability through a holistic approach that includes the reduction of resource consumption.

Goals are to limit public health impacts and reduce the ‘footprint’ on the environment of health care services.

Energy efficiency measures reduce the environmental impact and contribute to a better working environment for the staff and more comfortable and relaxing spaces for the enhanced healing of the patients while granting financial savings.

Module Objectives

At the end of the session, the participant will be able to:

1. Identify alternative technologies for health care waste management;

2. Discuss the concept of environmental footprint and energy efficiency in the context of HCWM;

3. Discuss the benefits of energy efficiency in the health care waste management process and in the management of health care facilities;

4. Identify possible energy efficiency improvements in their working facilities.

Overview of WHO treatment classification

- Incineration (including pyrolytic incineration and rotary kilns)
- Chemical disinfection
- Wet and dry thermal treatment (including autoclaving)
- Microwave irradiation
- Land disposal (including encapsulation)
- Inertization (mixing waste with cement or other substances)

Source: Safe Management of Wastes from Health Care Activities, WHO 1999
Overview of HCWM Technologies

Thermal Processes
Rely on heat (thermal energy) to destroy pathogens in the waste. This category is further subdivided into low-heat, medium-heat, and high-heat thermal processes.

Chemical Processes
Employ mainly disinfectants (but also ozone) and involve shredding to enhance exposure.

Irradiative Processes
Involve electron beams or UV irradiation (as a supplement to other technologies). Require shielding.

Biological Processes
Use enzymes to destroy organic matter. Only a few technologies have been based on these processes.

Mechanical Processes
(shredding, mixing, compacting, encapsulation, etc.) supplement and enhance other treatments. Used to make the waste unrecognizable or to destroy sharps.

Thermal-based Technologies

Low Heat Thermal Technologies
- autoclaving
- microwave
- pyrolysis
- depolymerization
- advanced thermal oxidation
- incineration

Medium and High Heat Thermal Technologies
- high-velocity heated air
- pyrolysis
- depolymerization
- advanced thermal oxidation
- incineration

Incineration and pyrolysis
Unlike combustion, which is exothermic (generates heat), pyrolysis is endothermic (requires heat) and involves a different set of chemical reactions that produce different reaction products, such as methane and hydrogen.

Incineration
- Emissions control
- Incinerated waste is burned at high temperatures (typically above 1000°C) in an oxygen-rich environment to destroy organic materials and pathogenic agents.
- Used for waste incineration in many countries.
- Requires extensive emission control systems to limit the release of pollutants.

Pyrolysis
- Emissions control
- Organic waste is heated in an oxygen-depleted environment to produce volatile organic compounds and char.
- Used in waste-to-energy plants.
- Requires advanced technologies to control emissions and ensure proper combustion.

Thermal Destruction (incineration)

Performance
- Emissions control
- Incinerated waste is burned at high temperatures (typically above 1000°C) in an oxygen-rich environment to destroy organic materials and pathogenic agents.
- Used for waste incineration in many countries.
- Requires extensive emission control systems to limit the release of pollutants.

Environmental Impact
- Emissions control
- Incinerated waste is burned at high temperatures (typically above 1000°C) in an oxygen-rich environment to destroy organic materials and pathogenic agents.
- Used for waste incineration in many countries.
- Requires extensive emission control systems to limit the release of pollutants.

Economics
- Emissions control
- Incinerated waste is burned at high temperatures (typically above 1000°C) in an oxygen-rich environment to destroy organic materials and pathogenic agents.
- Used for waste incineration in many countries.
- Requires extensive emission control systems to limit the release of pollutants.
**Advanced Autoclaving**

These systems function as autoclaves but combine steam treatment with pre-vacuuming and various kinds of mechanical processing.

- Improving the transfer of heat into the waste.
- Achieving more uniform heating of the waste.
- Rendering the waste unrecognizable.
- Making the system a continuous process.

These systems function as autoclaves but combine steam treatment with pre-vacuuming and various kinds of mechanical processing. Improving the transfer of heat into the waste, achieving more uniform heating of the waste, rendering the waste unrecognizable, making the system a continuous process.

**Other Thermal-based Technologies**

In dielectric heating, compacted waste is exposed to high voltage electric fields, but the process raises security issues.

For high velocity heated air treatment, shredded waste is gathered in an airtight chamber where it is exposed to high-velocity heated (over 170 °C) that mixes and exsiccates it.

Dry heating is used only for small amounts sharps and soft patient care waste.

In depolymerization, waste is exposed to high-energy microwaves in a nitrogen atmosphere to break down the organic material at temperatures high enough to cause chemical changes and chemical decomposition on the molecular level.

Advanced thermal oxidation is a dual-chamber incineration where waste is burned using an oxygen-rich fast-burn process (unlike pyrolysis). Combustion gases are rapidly quenched using liquid mist injectors.

**Microwave**

- **Microwave**

<table>
<thead>
<tr>
<th>Technology</th>
<th>Performance</th>
<th>Environmental Impact</th>
<th>Cost (US$)</th>
<th>Waste Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microwave</td>
<td>Performance</td>
<td>Environmental Impact</td>
<td>Cost (US$)</td>
<td>Waste Code</td>
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<tr>
<td>Microwave</td>
<td>Performance</td>
<td>Environmental Impact</td>
<td>Cost (US$)</td>
<td>Waste Code</td>
</tr>
</tbody>
</table>

- **Chemical-based Technologies**

Chemical treatment is a process that uses chemicals to decompose waste, converting it into a less hazardous form. Chemicals are typically added to the waste to facilitate the decomposition process, which can be accelerated by heat, pH adjustment, or other means.

Advanced thermal oxidation is a dual-chamber incineration, and combustion gases are rapidly quenched using liquid mist injectors.
Mechanical Processes

Source: Treatment Alternatives to clerical Waste Disposal. USAID/PATH 2005

Training on Health Care Waste Management - CHD CALABARZON
5-9 March 2012, Citystate Tower Hotel, Ermita, Manila

Costs and Recommendation Case Studies

Items to be considered for the calculation of cost-effectiveness:

- capital investment
- operating costs (including requirement of skilled operators)
- maintenance costs (including availability of spare parts)
- safety risks and costs
- kind of waste that can be treated by the devices
- disposal costs of resulting waste
- upgrading costs (including operators’ trainings)
- life span of devices
- environmental impact (costs on the environment)
Environmental Costs: the Ecological Footprint

Environmental pollution causes costs (damaged crops, human health, etc.)

Environmental costs are not externalities (‘polluter pays’)

To reduce environmental costs one must reduce the Ecological Footprint, the amount of biologically productive land and sea area necessary to supply the resources consumed by human activity.

Energy in the Philippines

Energy consumption can implicate high levels of air pollution. The Philippines have high levels of grid dispersion and conventional thermal energy is the main source of electricity. Energy efficiency can contribute to reduce air pollution.

Energy Efficiency in Health Care Facilities

Standard operating procedures for most hospitals require significant energy use (heating water, indoor temperature and humidity control, lighting, ventilation and clinical processes) with associated significant greenhouse gas emissions.

Hospitals can implement many measures to improve energy efficiency while satisfying the energy requirements of these important energy-consuming end-uses.

Energy efficiency measures are the easiest and most important first step that hospitals can take to cut costs, reduce emissions, and improve human and environmental health.

Energy Efficiency Improvements

- Supply side energy efficiency (plants can produce more electricity with less resources).
- End-side device energy efficiency (devices can perform equally or better with less electricity).
- Cogeneration or CHP (Combined Heat and Power), uses the heat that is generally a by-product of the electrical generating process.
Energy Efficiency in Health Care Facilities

Using cogeneration, or combined heat and power (CHP) technology facilities can generate onsite electricity and capture waste heat from its treatment process as thermal energy.

This can double energy efficiency by eliminating losses associated with the grid delivery of electricity.

In addition, CHP technology increases reliability, as power can continue uninterrupted when the grid fails.

Energy Efficiency in Health Care Facilities

Cooling and Ventilation:
- Turning air conditioners a few degrees up
- Use energy efficient cooling systems
- Use heat exchangers for ventilation

Heat exchangers use the cold exhaust air that is pumped outdoors, to cool down the warmer fresh air that is pumped indoors.

Energy Efficiency in Health Care Facilities

Lighting:
- Fenestration design to improve use of daylight
- Switching to light-emitting diode (LED) bulbs

LED additional advantages include:
- Reduced waste (over 10 times longer life-span)
- No heat produced
- Better intensity and light quality
- Shadow correction

Green design and retrofitting to reduce energy waste:
- Automated occupancy sensors
- Insulation
- External shadings
- Double-glazed windows
- Green roof
- Window area
- Natural ventilation
- Orientation
- Equipment labeling
Module Objectives

At the end of the session, the participant will be able to:

1. Identify existing innovative practices on HCWM at the HCF;
2. Identify innovative practices on source separation of HCW at HCF;
3. Informed about good practices on Waste Management System at HCF;
4. Discuss the role of stakeholders in HCWM system.

Innovative Practice in Healthcare Waste in Asia

Engr. Guilberto Borongan, ChE, MSUEM
Regional Resource Center for Asia and the Pacific (RRC.AP)

Contents

1. Healthcare Waste Management in Japan
2. Innovative Practice on HCWM in Hospital Lam Wah EE, Penang, Malaysia
3. Innovative Practice on Infectious Waste Management in Nonthaburi, Thailand
4. Innovative Practice on Waste Management System in Bir Hospital, Kathmandu, Nepal
5. Points to Ponder
Role of Stakeholders

Infectious Waste’s Separation

Infectious Waste
[needles]
Infectious Waste
[non-needles]
Non-infectious Waste
[non-burnable]

Judgement

[Way 1] Appearance
1. Blood, blood serum, blood plasma and body fluid (including semen)
2. Pathologic waste (organs, tissues, skin, etc.)
3. Waste used in tests and experiments related to pathogenic microbes
4. sharp objects with blood, etc.

[Step 2] Place
- Medical treatment, examination, etc.
- Operation
- ICU (Intensive Care Unit)
- Emergency Room

[Step 3] Infectious Disease
Waste generated after the medical treatment and examination for the infectious disease

Non-infectious wastes
Special Containers for infectious Waste

- For Sharps such as injection needles and surgical knives
  - Rigid and leak-resistant container made by steel or plastics
- For solid waste
  - Rigid, double-walled plastic bag or robust container
- For liquid and sledge
  - Leak-resistant containers

Bio-hazard Marking

Each Container is identified with bio-hazard marking. Bio-hazard marking has three different colors based on the nature of the containments:

- **Red**: for bloods or sludge infectious waste
- **Orange**: for solid waste
- **Yellow**: for sharps

2. Innovative Practice on HCWM in HOSPITAL LAM WAH EE Penang, Malaysia

Recycling at Hospital Lam Wah EE

- 523 Beds
- 1300 staff
Types of wastes

- Recycle waste
- Clinical waste
- General waste

The Duties/Responsibilities of Recycling Project Committee

- Bimonthly meetings
- Each Committee Member is in charge of an activity
- All Committee members take turns to do sorting and verifying
- Sorting - Sort out the recyclable items according to their categories one day before the sale
- Verifying - Verify the weight of recyclable items
- Promote recycling activities including Reduce & Reuse

Waste Segregation

Sorting hospital recyclables
(Every Tuesday)

Verifying hospital recyclables
(Every Wednesday)

RM 30 penalty will be imposed upon any member who fails to serve on the day rostered for his/her duty. But if the member is able to find a replacement to fulfill this duty, the RM 30 penalty is waived!

The following recyclable items are collected:

1) Old Newspapers
2) Books / Magazines / Loose Papers
3) Cardboards
4) Clear Plastics
5) Coloured Plastics
6) Drip Bottles
7) Glass Bottles
8) Tins/Cans / Cooking Oil Bottles
9) Aluminium Cans
10) Plastic Bags
11) Wearable Old Clothes
12) Old Car Batteries

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3-9 March 2012, Citystate Tower Hotel, Ermita, Manila
"Garbage turns into GOLD"

<table>
<thead>
<tr>
<th>Date</th>
<th>Total Weight</th>
<th>Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jul-Dec 2002</td>
<td>21,017.90 kg</td>
<td>RM 3,653.19</td>
</tr>
<tr>
<td>Jan-Dec 2003</td>
<td>56,929.20 kg</td>
<td>RM13,503.18</td>
</tr>
<tr>
<td>Jan-Dec 2004</td>
<td>82,583.90 kg</td>
<td>RM19,133.12</td>
</tr>
<tr>
<td>Jan-Dec 2005</td>
<td>84,184.16 kg</td>
<td>RM22,155.70</td>
</tr>
<tr>
<td>Jan-Dec 2006</td>
<td>94,106.55 kg</td>
<td>RM24,647.74</td>
</tr>
<tr>
<td>Jan-Dec 2007</td>
<td>92,887.31 kg</td>
<td>RM23,974.51</td>
</tr>
<tr>
<td>Jan-Sep 2008</td>
<td>79,785.70 kg</td>
<td>RM22,480.60</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>510,491.01 kg</strong></td>
<td><strong>RM130,158.62</strong></td>
</tr>
</tbody>
</table>

*about US$ 7,000/yr

• As of 30 Sep 2008, the hospital recovered 510,491.01 kg of resources from going to landfills.

• As of 30 Sep 2008, the hospital have turned garbage into gold, RM130,158.62.

Source: HOSPITAL LAM WAH EE, 2008

Mercury Elimination

Phased out the use of clinical thermometer which contains mercury

They are now using digital ear thermometer

Source: HOSPITAL LAM WAH EE, 2008

Use of Environmentally Products

Cafeteria uses Ecopack, a biodegradable and environment friendly food container
Motivated others through presentations at conventions and workshops including talks on recycling to schools, colleges, NGOs, factories, hotels, hospitals and the local governments.

Delivering talk at Hospital’s waiting lounge (to raise awareness on environment conservation and sources recovery amongst staff and the public).

HLWE Recycling Project has been listed as one of the Good Practitioners on Solid Waste Management in Malaysia in June 2008 by the Ministry of Housing and Local Government.

Recycling Facilities:
- Recycling bins
- Container for cardboard
- Recycling corner in wards
- Recycling notice board
3. Innovative Practice on Infectious Waste Management in Nonthaburi, Thailand

Infectious Waste Management in Nonthaburi, Thailand

Started in February 2004

Collection fee:
- ≤ 2 kgs or ≤ 13 liters: 10 USD / month
- ≥ 2 kgs or ≥ 13 liters or every 2 kgs or every 13 liters: 7 USD / month

covering 33 health facilities with 1 collecting truck

Source: Mrs. Pornsri Kictham, Infectious Waste Management in Nonthaburi Regional Workshop on Health Care Waste Management, Kathmandu, Nepal, 7-9 December 2011

Capacity: 4 m³
Capacity: 6 m³
Capacity: 3 m³

4 Infectious Collecting Trucks

Collection Activities
- Health care centers
- Medical, dental and veterinary clinics

Monday, Wednesday, and Friday

Source: Mrs. Pornsri Kictham, Infectious Waste Management in Nonthaburi Regional Workshop on Health Care Waste Management, Kathmandu, Nepal, 7-9 December 2011

Hospital and institutes – Everyday

Source: Mrs. Pornsri Kictham, Infectious Waste Management in Nonthaburi Regional Workshop on Health Care Waste Management, Kathmandu, Nepal, 7-9 December 2011
Quantity of Infectious Waste with corresponding fees

<table>
<thead>
<tr>
<th>Year</th>
<th>Healthcare facilities</th>
<th>Weight (Kg)</th>
<th>Fee (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Collection</td>
</tr>
<tr>
<td>2004</td>
<td>33</td>
<td>44,148</td>
<td>10,843</td>
</tr>
<tr>
<td>2005</td>
<td>63</td>
<td>151,348</td>
<td>41,914</td>
</tr>
<tr>
<td>2006</td>
<td>66</td>
<td>261,578</td>
<td>78,473</td>
</tr>
<tr>
<td>2007</td>
<td>68</td>
<td>287,904</td>
<td>68,627</td>
</tr>
<tr>
<td>2008</td>
<td>85</td>
<td>373,364</td>
<td>74,078</td>
</tr>
<tr>
<td>2009</td>
<td>93</td>
<td>400,400</td>
<td>112,490</td>
</tr>
<tr>
<td>2010</td>
<td>98</td>
<td>405,510</td>
<td>104,013</td>
</tr>
<tr>
<td>2011</td>
<td>114</td>
<td>499,835</td>
<td>114,537</td>
</tr>
</tbody>
</table>

Source: Mrs. Pornsri Kictham, Infectious Waste Management in Nonthaburi Regional Workshop on Health Care Waste Management, Kathmandu, Nepal, 7-9 December 2011

4. Innovative Practice on Waste Management System in Bir Hospital, Kathmandu, Nepal

Healthcare Waste Management at Bir Hospital

Bir Hospital in Kathmandu, Nepal is the nation’s oldest medical institute. Established in 1889, it has since developed into the National Academy of Medical Sciences (NAMS).

The HCWM at Bir works with three large components that support each year:
- Waste management
- Injection safety and
- Mercury elimination

Segregation waste at source

- Identified central point in the ward where four buckets of different colors are kept.
- Colors code for the segregation of bottles and cans, paper, plastic and biodegradable are in place.
Segregation waste at source

Each ward is equipped with a waste segregation trolley, which is used by nurses and other medical personnel to separate risk waste from non-risk waste. The trolley also contains a needle destroyer and receptacles for the proper disposal of needles and syringes after use.

Waste treatment and storage center

The waste treatment and storage center is separated into two distinct areas for risk and non-risk waste.

Waste treatment: Steam based technology

Syringes are packaged in drums. After packaging, all infectious waste is treated prior to final disposal via one of three processes:
- Steam based technology that is autoclaving
- Chemical treatment
- Biological treatment

Waste treatment and storage center

Treated or disinfected HCW are separated into recyclable and non-recyclable items. The recyclables are sent to the storage area and non-recyclables are sent to the municipal waste stream.
Chemical treatment
- Genotoxic wastes from cancer patients are stored separately and treated chemically.
- This waste includes equipment, such as saline bottles, vials, IV lines and syringes used in chemotherapy. 5% sodium hypochlorite is used to denature genotoxic cancer drugs.
- After chemical treatment, it is processed and sent for recycling.
Food wastes are fed to the on site biogas digester for biogas production (use for sterilization) along with organic fertilizer as by product – use for composting.

As a result...

- Approximate waste collection costs were USD 6,000 per year at Bir Hospital. It is likely that this can soon be reduced to half, or USD 3,000 per year.
- Currently, Bir is sending 34% of the waste for recycling and 30% for biogas digestion.
- Bir Hospital is earning almost USD 6,000/year.
- This innovative practices can be replicated to hospitals or healthcare facilities in the Asian region.

Video Presentation of the Innovative Practice at Bir Hospital
HEALTH CARE WASTE MANAGEMENT PLAN

Engr. CORAZON Z. VIDAD, SE, MEnvMan
Department of Health – Center for Health Development IVA

Module Objectives

At the end of the session, the participant will be able to:

1. Discuss the procedures in developing Health Care Waste Management Plan
2. Apply the procedures learned in developing Health Care Waste Management Plan

HEALTH CARE WASTE MANAGEMENT PLAN

Three major concerns:

1. Specific plan of actions which shall include the involvement of all HCF personnel and its client;
2. Improvement of HCF facilities; and
3. Training and enhancement of skills necessary to have an effective handling of HCW.

Procedures for Developing the Health Care Waste Management Plan

Step 1: Assessment of waste generation and waste disposal. The assessment shall include:

- Average daily volume of waste generated per category within a given period of time;
- Site and location of the HCF vis a vis the existence of accredited TSD within the locality;
- Assessment of any future changes in the facility, departmental growth or the establishment of new departments.

Note: Data from the waste generation survey shall be a basis of the waste management plan.
Procedures for Developing the Health Care Waste Management Plan (HCWMP)

Step 2: Review of existing HCWM policies and procedures being implemented.

To have a clear overview of this concern, the following activities have to be included in the plan, namely:

a. Understanding of existing policies, laws and regulations related to HCWM;

b. Review of the present waste management system to include where the waste is generated, what types of waste are being generated, how and where it is stored and the cost effectiveness of the current handling processes; and

d. HCWM plan

Content:

- From point of generation up to its final disposal including flow chart, route plans and schedules
- Different activities and persons responsible for handling the specific activities
- Milestones or strategies to move the current HCWM system into the system envisioned in the plan
- Waste minimization plan
- Procurement plan
- Education, training, information and communication activities

Step 3: Formulation and drafting of HCWMP

d. HCWM plan

Content:

- Every HCF worker must be aware of:
  - Policies, rules and regulations
  - Significant health and environmental impacts of their work activities
  - Their roles and responsibilities
  - Procedures that apply to their work and the importance of conforming with the requirements as well as the consequences of not following the requirements.
Step 3: Formulation and drafting of HCWMP

d. HCWM plan

Content:
• Timetable and the responsible persons for the development of training materials
• Orientation for patients and watchers
• HCF worker protection and safety
  • Plans for HCF worker’s occupational health and safety program
  • Emergency management for possible related risks or accidents during the process.
• Infection Control policies and procedures to be observed in handling HCW specifically infectious and mercury waste

Step 4: Prepare Financial Requirement

• Indicate in the annual work and financial plan for health care waste management the following:
  1. Cost for the operation and maintenance for waste treatment facilities
  2. Supplies and materials used for collection, transport, treatment and disposal
  3. Training and orientation of personnel and clients
  4. Cost for other activities related to the implementation of health care waste management program.

Step 5: Monitoring and evaluation –

Action plan for the conduct of regular monitoring of the implementation and submission of required reports.

• Self-monitoring tools
• Assessment of findings
• Submission of recommendations
• Follow-up of status.
IX. ANNEXES
## PARTICIPANT’S DIRECTORY

<table>
<thead>
<tr>
<th>NAME</th>
<th>DESIGNATION</th>
<th>OFFICE/HOSPITAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ms. Aida M. Odon</td>
<td>Administrative Officer IV</td>
<td>Apacible Memorial District Hospital, Nasugbu, Batangas</td>
</tr>
<tr>
<td>Ms. Gloria C. Africa</td>
<td>Supervising AO</td>
<td>Batangas Regional Hospital, Batangas City</td>
</tr>
<tr>
<td>Engr. Cornelio G. Maranan</td>
<td>Engineer III, Head Maintenance Section</td>
<td>Batangas Regional Hospital, Batangas City</td>
</tr>
<tr>
<td>Mr. Mark Glenn H. Casaljay</td>
<td>Nurse I</td>
<td>CarSigma District Hospital, General Mariano Alvarez (GMA), Cavite</td>
</tr>
<tr>
<td>Engr. Lowell D. Lee</td>
<td>Environmental and Safety Management Officer/Pollution Control Officer</td>
<td>De La Salle University Medical Center, Dasmariñas City, Cavite</td>
</tr>
<tr>
<td>Dr. Danilo L. Aguilera</td>
<td>Chief of Hospital</td>
<td>Don Juan Mayuga Memorial Hospital, Lemery, Batangas</td>
</tr>
<tr>
<td>Ms. Joy V. Gutierrez</td>
<td>Administrative Officer V</td>
<td>Don Juan Mayuga Memorial Hospital, Lemery, Batangas</td>
</tr>
<tr>
<td>Photo</td>
<td>Name</td>
<td>Position</td>
</tr>
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<tr>
<td><img src="194" alt="Photo" /></td>
<td>Dr. Antonio C. Hernandez</td>
<td>Chief of Hospital</td>
</tr>
<tr>
<td><img src="195" alt="Photo" /></td>
<td>Ms. Ruth I. Delos Reyes</td>
<td>Administrative Officer II</td>
</tr>
<tr>
<td><img src="196" alt="Photo" /></td>
<td>Dr. Arnulfo O. Imperial</td>
<td>Chief of Hospital I</td>
</tr>
<tr>
<td><img src="197" alt="Photo" /></td>
<td>Ms. Adelina A. Lopez</td>
<td>Administrative Officer IV</td>
</tr>
<tr>
<td><img src="198" alt="Photo" /></td>
<td>Ms. April Ann B. del Rosario</td>
<td>Infection Control Nurse</td>
</tr>
<tr>
<td><img src="199" alt="Photo" /></td>
<td>Engr. Arnulfo A. Alcañiz</td>
<td>Engineer III</td>
</tr>
<tr>
<td><img src="200" alt="Photo" /></td>
<td>Ms. Teresita B. Cruz</td>
<td>Administrative Officer IV</td>
</tr>
<tr>
<td><img src="201" alt="Photo" /></td>
<td>Ms. Susan L. Geronimo</td>
<td>Nurse I</td>
</tr>
<tr>
<td>Engr. Pablo V. Del Mundo, Jr.</td>
<td>Pollution Control Officer</td>
<td>Laguna Provincial Hospital, Sta. Cruz, Laguna</td>
</tr>
<tr>
<td>-------------------------------</td>
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<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Engr. Virginia L. Fabros</td>
<td>Engineer III</td>
<td>Laguna Provincial Health Office, Sta. Cruz, Laguna</td>
</tr>
<tr>
<td>Mr. Crispin M. Coliat</td>
<td>Head Maintenance Department</td>
<td>Lipa Medix Medical Center, Lipa City, Batangas</td>
</tr>
<tr>
<td>Dr. Bayani H. Torciano</td>
<td>Chief of Hospital</td>
<td>Luisiana District Hospital, Luisiana, Laguna</td>
</tr>
<tr>
<td>Mr. Ramil B. Raoet</td>
<td>Supervisor General Services</td>
<td>Manila East Medical Center, Taytay, Rizal</td>
</tr>
<tr>
<td>Engr. Rene P. Chavez</td>
<td>Environment, Health, Safety Officer</td>
<td>Mary Mediatrix Medical Center, Lipa City, Batangas</td>
</tr>
<tr>
<td>Mr. Gat-Joriz N. Alatiit</td>
<td>Infection Control Nurse</td>
<td>Ospital ng Biñan, Biñan City, Laguna</td>
</tr>
<tr>
<td>Ms. Lita A. Culingasan</td>
<td>Administrative Officer V</td>
<td>Panlabawigang Pagamutan ng Laguna, San Pablo City, Laguna</td>
</tr>
<tr>
<td>Mr. Dennis D. Guico</td>
<td>Infection Control Nurse/Pollution Control Officer</td>
<td>Santa Rosa Community Hospital, Sta. Rosa, Laguna</td>
</tr>
<tr>
<td>Engr. Susan S. Evangelista</td>
<td>Engineer II</td>
<td>Quezon Medical Center, Lucena City, Quezon</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------------</td>
<td>-------------------------------------------</td>
</tr>
<tr>
<td>Ms. Salome N. Paycao</td>
<td>Assistant Chief Nurse</td>
<td>Quezon Medical Center, Lucena City, Quezon</td>
</tr>
<tr>
<td>Ms. Dulce A. Daleon</td>
<td>Administrative Officer</td>
<td>Tayabas Community Hospital, Inc., Tayabas, Quezon</td>
</tr>
<tr>
<td>Ms. Estrella E. Peñones</td>
<td>Chief Nurse</td>
<td>Tayabas Community Hospital, Tayabas, Quezon</td>
</tr>
<tr>
<td>Mr. Ricardo P. Corado</td>
<td>Infection Prevention and Control Nurse</td>
<td>Unciano Medical Center, Antipolo, Antipolo City, Rizal</td>
</tr>
<tr>
<td>Dr. Susana C. Castillo</td>
<td>Medical Officer III</td>
<td>Center for Health Development IV-A, Quezon City</td>
</tr>
<tr>
<td>Engr. Peter T. Herrera</td>
<td>Engineer III</td>
<td>Center for Health Development IV-A, Quezon City</td>
</tr>
<tr>
<td>Engr. Jojo G. Franco</td>
<td>SIV/Regional Health Physicist</td>
<td>Center for Health Development IV-A, Quezon City</td>
</tr>
</tbody>
</table>
### TRAINING ON HEALTH CARE WASTE MANAGEMENT
Center for Health Development-CALABARZON
5-9 March 2012
Citystate Tower Hotel, Ermita, Manila

<table>
<thead>
<tr>
<th>Date/Time</th>
<th>Activities</th>
<th>Responsible Person</th>
</tr>
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<tbody>
<tr>
<td><strong>Day 1: March 5, 2012</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11:00 – 13:00</td>
<td>Registration/Billeting Activities/Lunch</td>
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<tr>
<td>13:00 – 13:30</td>
<td>Opening Program</td>
<td>Engr. Corazon Vidad</td>
</tr>
<tr>
<td></td>
<td>Prayer and National Anthem</td>
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<tr>
<td></td>
<td>Opening Address</td>
<td>Engr. Guilberto Borongan</td>
</tr>
<tr>
<td></td>
<td>Welcome Address</td>
<td>Dr. Edgardo M. Gonzaga</td>
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<td>Introduction of Participants</td>
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<td>Pre-Test</td>
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<td>13:30– 14:30</td>
<td>Leveling of Expectations</td>
<td>Engr. Corazon Vidad</td>
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<td>Orientation of the Training Course</td>
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<td>14:30– 15:30</td>
<td>Health and Environment Impacts Health Care Waste (HCW)</td>
<td>Dr. Gilbert Par</td>
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<tr>
<td>15:30 –16:00</td>
<td>Coffee Break/Group Photo Session</td>
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<td>16:00 –16:45</td>
<td>Health and Environment Impacts Health Care Waste (con't.)</td>
<td>Dr. Gilbert Par</td>
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<tr>
<td>16:45–18:00</td>
<td>Legislation, Laws and Policies related to HCW Management</td>
<td>Engr. Corazon Vidad</td>
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<td><strong>Day 2: March 6, 2012</strong></td>
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<td>08:30–09:00</td>
<td>RECAPITULATION</td>
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<td>09:00–10:30</td>
<td>Healthcare Waste Minimization (3Rs Application)</td>
<td>Engr. Guilberto Borongan</td>
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<td>Coffee Break</td>
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<tr>
<td>10:45–12:00</td>
<td>Segregation, Collection, Storage, and Transport of HCW</td>
<td>Engr. Aida Barcelona</td>
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<tr>
<td>12:00–13:00</td>
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<tr>
<td>13:00–15:15</td>
<td>Segregation, Collection, Storage, and Transport of HCW (cont.)</td>
<td>Engr. Aida Barcelona</td>
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<tr>
<td>15:15–15:30</td>
<td>Coffee Break</td>
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<tr>
<td>15:30 –16:00</td>
<td>Mercury in Health Care Facility</td>
<td>Ms. Faye Ferrer</td>
</tr>
<tr>
<td>16:00 – 16:30</td>
<td>Hazardous Waste Storage Options: Mercury</td>
<td>Engr. Guilberto Borongan</td>
</tr>
<tr>
<td>16:30–17:30</td>
<td>Health and Safety Practices in HCW Programs</td>
<td>Dr. Gilbert Par</td>
</tr>
<tr>
<td>18:00 –21:00</td>
<td>Social Function</td>
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<td><strong>Day 3: March 7, 2012</strong></td>
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<tr>
<td>08:30–09:00</td>
<td>RECAPITULATION</td>
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<tr>
<td>09:00 –10:00</td>
<td>Healthcare Wastewater Management</td>
<td>Prof. Romeo Quizon</td>
</tr>
<tr>
<td>10:00–10:15</td>
<td>Coffee Break</td>
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</tr>
<tr>
<td>10:15–11:15</td>
<td>Healthcare Wastewater Management (Cont.)</td>
<td>Prof. Romeo Quizon</td>
</tr>
<tr>
<td>11:15–12:00</td>
<td>Waste Treatment and Disposal</td>
<td>Engr. Corazon Vidad</td>
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<tr>
<td>12:00–13:00</td>
<td>LUNCH</td>
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<tr>
<td>13:00–15:00</td>
<td>Institutionalization and Sustainability of HCW Management</td>
<td>Engr. Aida Barcelona</td>
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<td>15:00 –15:15</td>
<td>Coffee Break</td>
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<tr>
<td>15:15 –16:15</td>
<td>Case Studies on Healthcare Waste Management</td>
<td>Dr. Mohd Nasir Hassan</td>
</tr>
<tr>
<td>16:15–17:00</td>
<td>Case studies on HCW Technologies and Energy Efficiency in HCF</td>
<td>Arch. Marco Silvestri</td>
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<tr>
<td>17:00 –18:00</td>
<td>Innovative Practice in Healthcare Waste in Asia/ Video Presentation</td>
<td>Engr. Guilberto Borongan</td>
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<tr>
<td><strong>Day 4: March 8, 2012</strong></td>
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<tr>
<td>08:30</td>
<td>Departure to Sta. Ana Hospital, Sta. Ana, Manila</td>
<td></td>
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<tr>
<td>09:30 –15:30</td>
<td>Healthcare Facility Visit: Sta. Ana Hospital</td>
<td></td>
</tr>
<tr>
<td>16:30</td>
<td>Arrival at the hotel</td>
<td></td>
</tr>
<tr>
<td>15:45 – 18:00</td>
<td>Preparation of Report on Healthcare Facility: Sta. Ana Hospital</td>
<td></td>
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<tr>
<td><strong>Day 5: March 9, 2012</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08:30–10:00</td>
<td>Sharing of Insights/ Discussion of Healthcare Facility Visit</td>
<td>Participants</td>
</tr>
<tr>
<td>10:30–10:45</td>
<td>Coffee Break</td>
<td></td>
</tr>
<tr>
<td>10:45–11:30</td>
<td>Health Care Waste Management Plan</td>
<td>Engr. Corazon Vidad</td>
</tr>
<tr>
<td>11:30 –12:00</td>
<td>Evaluation of the Training and Post Test</td>
<td></td>
</tr>
<tr>
<td>12:00–12:15</td>
<td>Check-out Time</td>
<td></td>
</tr>
<tr>
<td>12:15–13:00</td>
<td>Closing Ceremony</td>
<td></td>
</tr>
<tr>
<td>13:00</td>
<td>LUNCH</td>
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</tbody>
</table>
## PARTICIPANTS EXPECTATIONS

<table>
<thead>
<tr>
<th>Station 1: Expectations from the Training</th>
<th>Station 2: Expectations from Resource Persons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Knowledge on key terminologies in Health Care Waste Management</td>
<td>1. Acquire updates on Health Care Waste Management</td>
</tr>
<tr>
<td>2. Updates on laws and regulations in Health Care Waste Management</td>
<td>2. Enhance knowledge on Health Care Waste Management</td>
</tr>
<tr>
<td>3. Formulate Health Care Waste Management Plan</td>
<td>3. Lively</td>
</tr>
<tr>
<td>4. Applicable training design</td>
<td>4. Mastery of subject matter</td>
</tr>
<tr>
<td></td>
<td>5. Practical answers to queries</td>
</tr>
<tr>
<td></td>
<td>6. With sense of humor</td>
</tr>
<tr>
<td></td>
<td>7. Patient and accommodating</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Station 3: Expectations from Myself</th>
<th>Station 4: Expectations from Co-participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To know something about waste management.</td>
<td>1. Cooperation from the group – insights and constructive criticisms</td>
</tr>
<tr>
<td>2. To learn new technologies on Health Care Waste Treatment.</td>
<td>2. Sharing of best practices from their respective institutions</td>
</tr>
<tr>
<td>3. Active participation</td>
<td>3. Friendly</td>
</tr>
<tr>
<td>4. Punctual</td>
<td>4. To know proper segregation</td>
</tr>
<tr>
<td>5. Assertive about environmental condition</td>
<td>5. Information dissemination to health care facilities</td>
</tr>
<tr>
<td>6. To be able to apply the knowledge learned from the training.</td>
<td>6. Observe punctuality</td>
</tr>
<tr>
<td>7. To learn and be able to impart knowledge to co-workers.</td>
<td></td>
</tr>
</tbody>
</table>
Group Output: Healthcare Wastewater Management

Group Discussion on Environmental/Health Impacts of Wastewater coming from Different Sources

Group 1: Kitchen

<table>
<thead>
<tr>
<th>Wastewater Components</th>
<th>Environmental/Health Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Grease and Oil</td>
<td>1. Clogging of drainage system</td>
</tr>
<tr>
<td>2. Detergent</td>
<td>2. Hazardous effect on environment</td>
</tr>
<tr>
<td>3. Animal blood</td>
<td>3. Possible transmission of diseases from contaminated animals</td>
</tr>
<tr>
<td>4. Left over soup</td>
<td>4. Result to overflow of water</td>
</tr>
<tr>
<td>5. Hand dirts (result of handwashing)</td>
<td>5. Microorganism colonization</td>
</tr>
</tbody>
</table>

Group 2: Toilet

<table>
<thead>
<tr>
<th>Wastewater Components</th>
<th>Environmental/Health Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Urine, feces, saliva, blood, secretions</td>
<td>1. Bacterial contamination, transmission of disease, water pollutant</td>
</tr>
<tr>
<td>2. Cleaning agents (Chlorine, muriatic acid, cleanser, bath soap and shampoo)</td>
<td>2. Contaminate ground water, affects marine life, and result to respiratory problems</td>
</tr>
<tr>
<td>3. Extracted dirts from the floor, walls, and bowls of the toilet</td>
<td>3. Contamination and pollution</td>
</tr>
<tr>
<td>4. Dirt from the body; scrubs from wounds, dry skin; falling hair</td>
<td>4. Contamination and pollution</td>
</tr>
</tbody>
</table>

Group 3: Laundry

<table>
<thead>
<tr>
<th>Wastewater Components</th>
<th>Environmental/Health Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Blood</td>
<td>1,2,3. Water pollution, land or soil pollution, destruction of aquatic life, and infection or disease.</td>
</tr>
<tr>
<td>2. Urine/Feces</td>
<td>4,5,6. Water pollution, land or soil pollution, destruction of aquatic life, infection or disease, and poisoning.</td>
</tr>
<tr>
<td>4. Chemicals</td>
<td></td>
</tr>
<tr>
<td>5. Oil and grease</td>
<td></td>
</tr>
<tr>
<td>6. Detergents/Reagents</td>
<td></td>
</tr>
<tr>
<td>7. Dirt</td>
<td></td>
</tr>
</tbody>
</table>
## Group 4: Laboratory

<table>
<thead>
<tr>
<th>Wastewater Components</th>
<th>Environmental Impacts</th>
<th>Health Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Urine</td>
<td>Air pollution</td>
<td>Water borne diseases</td>
</tr>
<tr>
<td>2. Blood</td>
<td>Water pollution</td>
<td>Poisoning</td>
</tr>
<tr>
<td>3. Fecal matter</td>
<td>Soil pollution</td>
<td>Intoxication</td>
</tr>
<tr>
<td>4. Body fluids</td>
<td></td>
<td>Skin disease</td>
</tr>
<tr>
<td>5. Sputum</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Soaking solutions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Disinfectants</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Annex E

### Group Output: Institutionalization and Sustainability of HCW Management

1. Cavite and Rizal Group

<table>
<thead>
<tr>
<th>Current HCWM Organizational Structure &amp; Experiences</th>
<th>Issues/Concerns</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Organization</td>
<td>No regular meetings</td>
<td>Conduct regular meeting quarterly. Management committee will issued memorandum having appropriate sanction for those who do not attend.</td>
</tr>
<tr>
<td>2. Fast transition of staffs</td>
<td>Knowledge deficit of new staffs</td>
<td>Early training for the replacing staff.</td>
</tr>
<tr>
<td>3. Infection control</td>
<td>PPE’s are not well budgeted</td>
<td>Allocate enough budget</td>
</tr>
<tr>
<td>4. Collection of waste</td>
<td>Delayed collection on infectious waste.</td>
<td>Mandatory Regular collection of HCW as per DENR guidelines</td>
</tr>
<tr>
<td></td>
<td>Waste segregation at source is not followed.</td>
<td>Dedicated monitoring of section heads and clear policy on waste segregation and imposing sanctions.</td>
</tr>
<tr>
<td>5. Management Support</td>
<td>No support from management</td>
<td>Full support and complete involvement of the management.</td>
</tr>
</tbody>
</table>
2. Quezon Group

<table>
<thead>
<tr>
<th>Current HCWM Organizational Structure &amp; Experiences</th>
<th>Issues/Concerns</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Members of HCWM committee has been identified</td>
<td>Formation of HCWM committee; waiting for issuance of Official Personnel Order</td>
<td>For the HCWM committee to be formalized; for budget allocation by the PHO</td>
</tr>
<tr>
<td>2. Hospitals have PCO designate and HCWM plan, in compliance to regulatory policies</td>
<td>No formal training for PCO and health staff on HCWM; inadequate training of utility personnel</td>
<td>Provide training for PCO</td>
</tr>
<tr>
<td></td>
<td>Plan not fully implemented due to inadequate funding</td>
<td>Allocate budget for HCWM plan in 2013</td>
</tr>
<tr>
<td></td>
<td>No piggy-backing by birthing homes, RHUs, health centers in HCWM</td>
<td>For the DOH to regulate HCWM not only of hospitals but all health care facilities (RHUs, birthing homes, dental clinics, clinical laboratories)</td>
</tr>
<tr>
<td></td>
<td>Inadequate awareness among hospital staff and patients on waste segregation</td>
<td>Centralize the transport and treatment of HCW at the provincial level</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Conduct regular health promotion activities on HCWM and in patient education; disseminate HCWM policies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Network with various stakeholders in the dissemination of HCWM policies</td>
</tr>
<tr>
<td>3. Existing policies on waste minimization (local ordinances on ban of plastic in hospital premises, restriction in bringing in food, placing of food in reusable containers);</td>
<td></td>
<td>Some hospitals to follow-suit</td>
</tr>
</tbody>
</table>
4. Income-generating programs on recycling of plastics are in place in QMC (Material recovery facility)

Some hospitals to follow-suit

3. Laguna Group

<table>
<thead>
<tr>
<th>Current HCWM Organizational Structure &amp; Experiences</th>
<th>Issues/Concerns</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No organized HCWM C</td>
<td>Inadequate manpower compliment.</td>
<td>Organize HCWM organizational structure</td>
</tr>
<tr>
<td>or Inactive HCWM C in some hospitals</td>
<td>Budgetary constraint.</td>
<td>Budget allocation</td>
</tr>
<tr>
<td>2. HCWM plan/policy guidelines</td>
<td>Multitasking of personnel</td>
<td>Re-activate hiring of personnel per designation</td>
</tr>
<tr>
<td>3. Budgetary requirements</td>
<td>Not strictly implemented</td>
<td>Strengthen the policy/plan implementation</td>
</tr>
<tr>
<td></td>
<td>Not included/limited budget</td>
<td>Additional funds specifically for HCWM program/plan</td>
</tr>
<tr>
<td></td>
<td>Rapid turnover of health personnel</td>
<td>Re-echo or feedback</td>
</tr>
<tr>
<td></td>
<td>Inadequate training on HCWM</td>
<td>More/regular training</td>
</tr>
<tr>
<td>4. Implementation</td>
<td>Lack of IEC Non prioritization</td>
<td>Prioritization of HCWMP</td>
</tr>
<tr>
<td>5. M &amp; E</td>
<td>Irregular monitoring</td>
<td>Regular internal and external monitoring utilizing the established checklist</td>
</tr>
<tr>
<td></td>
<td>Inavailability of checklist</td>
<td></td>
</tr>
</tbody>
</table>
4. Batangas Group

<table>
<thead>
<tr>
<th>Current HCWM Organizational Structure &amp; Experiences</th>
<th>Issues/Concerns</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lack of personnel</td>
<td>Waste not collected</td>
<td>Assign personnel responsible for garbage collection</td>
</tr>
<tr>
<td>2. Chevalier failed to collect for two weeks</td>
<td>Chevalier got problems with DENR; temporarily suspended</td>
<td>Training</td>
</tr>
<tr>
<td>3. No existing organization</td>
<td>No budget or lacks manpower</td>
<td>Organize committee</td>
</tr>
</tbody>
</table>
| 4. With organize committee plans/manual           | No funds, no training  
No appropriate PPE  
No support from top management | DOH-CO to allocate fund  
DBM creates position for WM  
Provisions of training for WMC |
| 5. No Pollution Control Officer                   | No designated Pollution Control Officer  
Doctors became hindrance regarding program implementation  
No regular meeting | Designate PCO and train him/her  
Orientation/training provision  
Administer sanctions/penalties for erring members  
To set a regular meeting (in memo) |
Module Description

A hospital visit or a walk-through survey will be held on March 8, 2012 at Sta. Ana Hospital located in New Panaderos Street, Sta. Ana, and Manila. The walk-through survey will provide the information on the status of the healthcare waste management in a healthcare facility. The survey results of this walk-through shall be used as an initial step towards a more comprehensive process that shall be conducted by the participants upon returning to their respective facilities.

Objectives

At the end of the hospital visit/survey, the participant will be able to:

1. Establish an initial reference point for assessing waste management practices and techniques in a healthcare facility;
2. Compare the various performance indicators with the existing national and/or global standards, as applicable;
3. Describe current good practices and techniques and identify potential gaps;
4. Help define goals and milestones in order to gauge progress of the activities in relation with the healthcare waste project;
5. Determine initial resource needs to support the healthcare waste initiative.

Guidelines for the Visit

1. The participants will be divided into four (4) groups of 8-9 members each group with assign facilitator.

2. The specific schedule of activities during the visit is as follows:
   - 8:30 am - Departure of Participants from the training venue (Citystate Tower Hotel)
   - 9:30 am - Courtesy call to the Hospital Director and Staff
   - 10:00 am - Orientation session on the hospital facility by Sta. Ana Hospital Representative
   - 1:00 pm - Guided walk-through survey
   - 3:00 pm - Discussion/Wrap-up
   - 3:30 pm - Adjournment

2. General orientation of the facility will be conducted prior to ocular using the walk-through checklist. An assigned staff of the Sta. Ana Hospital will act as a resource person to attend to the general data/information needs of the participants.
3. Four main areas of the hospital shall be visited (one area per group).
   a. Laboratory/diagnostic areas and Administrative Office
   b. Medical, Surgical, OB-gyne wards
   c. Out-patient department, Dietary Department
   d. Operating/Delivery rooms and Emergency Room

4. After the group visit to their respective assigned areas all groups will proceed to the Central Waste Storage Area and Wastewater Treatment Facility

5. A walk-through survey (self-monitoring) form shall be used to guide the participants. (See Annex A.) For groups assigned in more than one area, another copy of the walk-through survey form shall be used.
TRAINING ON HEALTH CARE WASTE MANAGEMENT (CHD-CALABARZON)
Citystate Tower Hotel
Mabini corner P.Faura Street, Ermita, Manila
March 5-9, 2012

TRAINING EVALUATION FORM

In an effort to evaluate the effectiveness of this Training and improve future trainings, we request your assistance in providing us with the necessary feedback. Your comments will be greatly appreciated.

DIRECTIONS: Please encircle the appropriate response to the following items using the code:

SA = strongly agree  
A = agree  
D = disagree  
SD = strongly disagree

1. The training objectives were clear and relevant to my work situation

2. The training stimulated my interest in the subject matter

3. My previous knowledge/experiences prepared me adequately for the training

4. The handouts/audio-visual aids facilitated my understanding of the subject matter

5. The lectures were effective in facilitating my understanding of the subject matter

6. I had ample opportunity to ask questions and participate in the discussions

7. The facilitators provided valuable information and directions.

8. The activities were effective for the training objectives

9. The content of the workshops was appropriate for my needs

10. The venue is conducive to training
11. The meals were adequate

12. I am fully satisfied with the output of this training

**COMMENTS:**

13. What is your general reaction to the training program?

14. What did you like best about the training?

15. What did you like least about the training?

16. What changes would you recommend to improve future trainings?

17. Other Comments
An example of a person's TRI
<table>
<thead>
<tr>
<th>Gathering data</th>
<th>Analyzing data</th>
<th>Developing solutions</th>
<th>Taking actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>interview</td>
<td>analyze</td>
<td>storyboard</td>
<td>teach</td>
</tr>
<tr>
<td>read</td>
<td>define</td>
<td>produce</td>
<td>administer</td>
</tr>
<tr>
<td>survey</td>
<td>prioritize</td>
<td>media</td>
<td>lecture</td>
</tr>
<tr>
<td>learn</td>
<td>identify goals</td>
<td>write</td>
<td>conduct</td>
</tr>
<tr>
<td>observe</td>
<td>proceduralize</td>
<td>prepare tests</td>
<td>workshops</td>
</tr>
<tr>
<td></td>
<td></td>
<td>visualize</td>
<td>facilitate learning</td>
</tr>
</tbody>
</table>
Date: 9 March 2012

For: EDGARDO M. GONZAGA, MD, MSc, CESO III
Director IV

Through: HERMINIA L. PALAMING, MD, MPH
Chief, RLED

NOEL G. PASION, MD, MPH
Chief, HOS/LHAD

Subject: Output During the Health Care Waste Management Training last March 5 to 9, 2012

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The following are the recommendations by the undersigned after attending the pilot “Health Care Waste Management Training” last March 5 to 9, 2012, at the CityState Tower Hotel, Ermita, Manila:

1. The DOH CHD 4A should take the lead in practicing and advocating proper waste minimization and health care waste management, being the lead agency in health, and in accordance to existing legal mandates and policies (R.A. 9003, PD 856, DOH Healthcare Waste Management Manual of 2011, etc.).

2. The DOH CHD 4A should convene the Region 4A Waste Management Committee to:
   a) review existing waste management policies and procedures;
   b) assess the existing waste management system;
   c) lobby with the subcontracted Utility Service to implement the proper waste management system;
   d) formulate a Waste Management and Minimization Plan, for incorporation in the 2013 annual Work and Financial Plan;
   e) conduct orientations and capability building activities for personnel on healthcare waste management; and
   f) procure necessary waste management logistics (colored trash bins, assorted colored plastic containers, collateral materials, etc.).

3. The DOH CHD 4A should mainstream and advocate healthcare waste management among local government units and other healthcare facilities, both public and private.

4. The DOH CHD 4A should coordinate with the DENR, LLDA, and other stakeholders, in order to streamline procedures and policies related to healthcare waste management.

Prepared by:

Engr. Corazon Z. Vidad
Dr. Susana C. Castillo

Engr. Jojo G. Franco
Dr. Gilbert G. Par

Engr. Peter T. Herrera
X. PHOTO DOCUMENTATION
THE TRAINING VENUE

5th Floor Platinum Hall, Citystate Tower Hotel, Ermita, Manila

Lobby Posting and streamer/banner for the said training.

Free materials courtesy of RRC.AP on display at the Display Corner/Marketplace.
TRAINING MATERIALS/ PARAPHERNALIA

Training manual containing printed training presentation materials for each module.

Training bag in which the participants put their things needed for the training.

CDs containing presentations materials for each training module, pictures and video presentation given to each participant.
REGISTRATION MATERIALS

Participant’s Profile Sheet used to gather detailed information of participant.

Participants’ Nameplates/IDs

Registration Sheet where the participants signed their name that signifies their presence during the training.
5 MARCH 2012 (Day 1)

OPENING CEREMONY

The program was started with a Prayer led by Rev. Jonathan Mendieta and was followed by the singing of the Philippine National Anthem.

Dr. Edgardo M. Gonzaga, Director IV of Center for Health Development IV-A (CALABARZON) delivered the Opening Remarks. He emphasized the importance of conducting training on Health Care Waste Management. He also acknowledged the presence of the participants.
(Seated from the left) Rev. Jonathan C. Mendieta, Dr. Gilbert Par, Engr. Corazon Z. Vidad, Dr. Edgardo M. Gonzaga, Director IV of Center for Health IV-CALABARZON, Engr. Guilberto Borongan and Arch. Marco Silvestri with the participants who arrived early.
Day 1: LEVELING OF EXPECTATIONS

The participants were group into four and requested to write their expectations from the training, resource persons, themselves, and to their co-participants.

The participants write their expectations on the paper provided per station.

Participants’ expectations were posted as reminder during the training.
Dr. Gilbert Par discussed “Health and Environment Impacts of Health Care Waste”.

Unfreezing Exercise led by Mr. Ricardo Corado.

Engr. Guilberto Borongan discussed “Healthcare Waste Minimization (3Rs Application)”.
(Left) Engr. Aida C. Barcelona discussed “Segregation, Collection, Storage, and Transport of Health Care Waste”.

(Middle) Group Exercise: Participants were divided into four groups to work on classifying different types of wastes.

(Below) Participants post their group output on the board. Then each was processed by Engr. Barcelona who determined which group got the highest correct answers.
(Left) Ms. Faye V. Ferrer, Healthcare Without Harm-Southeast Asia, discussed Mercury in Health Care Facility.

(Right) Ms. Faye V. Ferrer received her Certificate of Appreciation.


Dr. Gilbert Par discussed “Health and Safety Practices in HCW Programs”.
SOCIALIZATION

The “Healthcare Waste Management Dance Group” led by Engr. Virginia L. Fabros in their special dance number.

Engr. Guilberto Borongan and Dr. Gilbert Par paired up for the game “Pinoy Henyo”, a guessing game to identify the name of waste written in piece of paper.

Everyone enjoyed and had a wonderful night.
MARCH 7 (Day 3)

Prof. Romeo Quizon discussed “Healthcare Wastewater Management”. Participants were requested to discuss the components of wastewater and their environmental/health impacts by group and presented their output afterwards.
Engr. Corazon Vidad discussed “Waste Treatment and Disposal”.

Dr. Bayani H. Terciano, Chief of Hospital of Luisiana District Hospital presented the output of Laguna Group.
Engr. Rene P. Chavez, Environment, Health and Safety Officer of Mary Mediatrix Medical Center presented output of Batangas Group.

Dr. Gilbert Par of Center for Health Development IVA-CALABARZON presented output of Quezon Group.
Mr. Ricardo P. Corado, Infection, Prevention and Control Nurse of Unciano Medical Center presented output of Cavite & Rizal Group.

Dr. Mohd Nasir Hassan of WHO/WPRO discussed “Case Studies on Healthcare Waste Management”.

Dr. Mohd Nasir Hassan received his Certificate of Appreciation.

Arch. Marco Silvestri discussed Case studies on HCW Technologies and Energy Efficiency in HCF.
MARCH 8 (Day 4)

FIELD VISIT

The bus.

The participants waiting for the departure.

The Sta. Ana Hospital
Ms. Margaret Cabral discussed the Health Care Waste Management Plan of the Sta. Ana Hospital.

The garbage can with proper signages.
A group picture with Ms. Margaret Cabral of Sta. Ana Hospital.
MARCH 9 (Day 5)


Ms. Gloria Africa hosted the Closing Ceremony.

Engr. Pablo del Mundo rendered a special song number.
From left to right. Mr. Ramil Raoet, Engr. Rene Chavez, Dr. BayaniTerciano, Ms. April del Rosario, and Ms. Salome Paycao shared their impressions on the training which are all positive remarks.
Rev. Jonathan Mendieta and Engr. Corazon Vidad delivered their messages to the participants.
AWARDING OF CERTIFICATES

From left to right. Mr. Marco Silvestri, Engr. Guilberto Borongan, Dr. Gilbert Par, and Engr. Corazon Vidad with their respective Certificate of Appreciation.
Engr. Guilberto Borongan shared an Inspirational Message.

Dr. Gilbert Par on his Closing Remarks.

Picture with some of the participants during the last day.
Thematic Working Group on Solid and Hazardous Waste

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Thailand