CLINICAL WASTE MANAGEMENT UNDER COVID-19 SCENARIO IN MALAYSIA

Prof Dr Agamuthu, P.
Professor, Jeffrey Sachs Center on Sustainable Development, Sunway University and High-Level Foreign Expert, Ministry of Science and Technology, China
profagamuthu@gmail.com
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Introduction

• Clinical waste is the waste originating from healthcare facilities and other related facilities such as laboratories, autopsy or mortuaries etc.

• Clinical waste can be categorized into several categories such as infectious waste, pathological waste, sharp waste, chemical waste

• The generation of clinical waste in Malaysia is 90 tonnes/day or 33,000 tonnes/annually

• Schedule waste regulation (2005), Environmental Quality Act, 1974, and standard operating procedure provided by Ministry of Health, Malaysia regulates the management of clinical waste
Introduction (cont’d)

• COVID-19 outbreak was first identified in December 2019 and in March, it was declared as Pandemic.

• Malaysia recorded 8616 Covid-19 cases and 121 deaths as of June 28th 2020.

• Increase in the number of COVID-19 cases can be correlated to the increase in clinical waste generation.

• Mainly disposable gloves, face masks and personal protective equipment (PPE) contribute to clinical waste generation during COVID-19 pandemic.
Littering of COVID-19 related waste

(Source: Nasseri, 2020)
## Clinical Waste Generation in Malaysia

<table>
<thead>
<tr>
<th>Types of Waste</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pathogenic Clinical Waste - SW 404 (tonnes)</td>
<td>28,375.24</td>
</tr>
<tr>
<td>Expired Drug - SW 403 (tonnes)</td>
<td>458.97</td>
</tr>
<tr>
<td>Discarded Drug - SW 405 (tonnes)</td>
<td>298.53</td>
</tr>
<tr>
<td>TOTAL (tonnes)</td>
<td>29,132.74</td>
</tr>
</tbody>
</table>

Source: Environmental Quality Reports (2013 – 2017)
Composition of Clinical Waste

- Non-Infectious waste: 80%
- Pathological waste: 15%
- Sharp waste: 1%
- Chemical & Pharmaceuticals waste: 3%
- Other waste: 1%

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Clinical waste is listed as scheduled waste in Malaysian environmental regulations.

The Department of Environment (DOE) is responsible for all aspects of clinical waste management from collection, transportation, treatment and disposal and uses an online system named electronic scheduled waste management system (eSWIS) to monitor compliance.
Classification of Clinical Waste

Clinical waste classification under the Environmental Quality (Scheduled Wastes) Regulations, 2005

<table>
<thead>
<tr>
<th>Scheduled waste codes</th>
<th>Types of clinical waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW403</td>
<td>Expired drugs containing psychotropic substances or containing substances that are toxic, harmful, carcinogenic, mutagenic or teratogenic;</td>
</tr>
<tr>
<td>SW404</td>
<td>Pathogenic and clinical wastes and quarantined materials;</td>
</tr>
<tr>
<td>SW 405</td>
<td>Discarded drugs</td>
</tr>
<tr>
<td>SW421</td>
<td>A mixture of scheduled wastes;</td>
</tr>
<tr>
<td>SW422</td>
<td>A mixture of scheduled and non-scheduled wastes.</td>
</tr>
</tbody>
</table>
Clinical Waste Management – Regulations (Cont’d)

• Clinical waste management guidelines require scheduled wastes to be managed properly before disposal as it could be harmful.

• Generators of scheduled waste need to notify the DOE of any scheduled wastes generated and keep up-to-date inventory of scheduled waste generated, treated, and disposed as per regulations.

• Scheduled wastes may be stored, recovered, and treated within the premises of a waste generator.

• Waste generators shall conform to the requirements of the consignment note system when transporting wastes to ensure it reaches the approved destination and are carried out by licensed transporters, and the treatment shall only be carried out at prescribed premises licensed by the DOE.
Clinical Waste Management – Disposal

- Disposal of clinical waste is performed as followed;
  - Separation of clinical waste from generated waste
  - Labelling of clinical waste
  - Disposal into proper containers and bags
  - Collection by licensed contractors for disposal and treatment at 12 incineration facilities nationwide

- The waste is disposed of according to color coded containers or plastic bags (Zaimastura, 2005)
Clinical Waste Bag

Blue plastic bag / container is used for wastes to be autoclaved, yellow is for wastes that are to be incinerated and black is for general household wastes (DOE, 2009)
Clinical Waste Bins

Two wheel clinical waste bin

Pedal operated clinical waste bins

Mobile pedal operated clinical waste bin

Sharp waste bins
### Management of Expired or Discarded Drugs

#### Description of Clinical Waste

Pharmaceuticals which have become unusable for the following reasons:-

- expiry date exceeded
- expiry date exceeded after the packaging has been opened or the ready-to-use preparation prepared by the user; or
- use is not possible for other reasons (e.g. call-back campaign)

Wastes arising in the use, manufacture and preparation of, and in the oncological treatment of patients with, pharmaceuticals with a cytotoxic effect (mutagenic, carcinogenic and teratogenic properties)

#### Waste Management Guidance

**Class I** - pharmaceuticals such as camomile tea, cough syrup, and the like which pose **no hazard** during collection, intermediate storage and waste management: **managed jointly with municipal wastes**

**Class II** - pharmaceuticals which pose a potential hazard when used improperly by unauthorized persons: **managed in an appropriate waste disposal facility**

**Class III** - Heavy metal – containing **unidentifiable pharmaceuticals**: managed in an **appropriate waste disposal facility**

Intermediate storage of these wastes takes place under controlled and locked conditions. For reasons of occupational safety, **cytotoxic pharmaceutical wastes** must be collected separately from pharmaceutical waste and **disposed of in a hazardous waste incineration plant**

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**Guidelines for Clinical Waste Management by DOE Malaysia**
Clinical Waste Management – Concession Companies

List of concession companies that manage clinical waste in Malaysia

<table>
<thead>
<tr>
<th>Company</th>
<th>Service for Government /Private</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radicare Sdn Bhd</td>
<td>Government hospital, clinic, medical institute</td>
</tr>
<tr>
<td>Edgenta Medisure Sdn Bhd</td>
<td>Government hospital, clinic, medical institute</td>
</tr>
<tr>
<td>Medivest Sdn Bhd</td>
<td>Government hospital, clinic, medical institute</td>
</tr>
<tr>
<td>Sedafiat Sdn Bhd</td>
<td>Government hospital, clinic, medical institute</td>
</tr>
<tr>
<td>One Medicare Sdn Bhd</td>
<td>Government hospital, clinic, medical institute</td>
</tr>
<tr>
<td>Future Nrg Sdn Bhd</td>
<td>Private hospital and clinics</td>
</tr>
<tr>
<td>Kualiti Alam Sdn Bhd</td>
<td>Private hospital and clinics</td>
</tr>
</tbody>
</table>
Biohazard symbol and labelling of clinical waste
Clinical Waste Management - Temporary Storage

• Some hospitals store the clinical waste generated at cold rooms as a temporary storage until dedicated lorry arrives

• Collection can be daily or 3 times a week depending on the quantity

• Transportation is done only by the special lorry licensed to transport hazardous waste which belongs to the concession companies
Clinical Waste Management - Treatment

- Almost all pathological or infectious clinical waste is incinerated in Malaysia.
- Only Class III or cytotoxic pharmaceutical waste is required to be incinerated.
- Class I pharmaceuticals may be disposed in municipal disposal site.

Source: Environmental Quality Reports (2013 – 2017)
Clinical Waste Management – Treatment (Cont’d)

Healthcare Waste Treatment by Kualiti Alam

(Source: Cenviro, n.d.)
Kualiti Alam Incineration Plant

Incinerator ash of clinic waste is transported to Integrated Hazardous Waste Treatment Center, is Solidified with cement, and disposed of in secure landfill.
Clinical Waste Management (Cont’d)

• According to environmental regulations related to clinical or schedule waste;

  • Public is not allowed to handle and dispose any type of scheduled waste including clinical waste without proper license

  • Those found guilty can be sentenced to a mandatory prison and maximum fine of RM500,000 (115,000 USD)
Clinical Waste and COVID-19

- **27% increase** in clinical waste following Covid-19 outbreak in Malaysia (25 tonnes of COVID-19 clinical waste per day)

- Increased generation of swab, syringes, needles, sharps, blood or body fluid, excretions, mixed waste, laboratory waste, material or equipment contaminated with the virus, mask or disposable gloves, personal protective equipment (PPE)

- Asian development bank estimated additional generation of clinical waste due to COVID-19 in just 60 days to be:
  
  - 16,800 tonnes in Manila
  - 12,750 tonnes in Jakarta
  - 9,600 tonnes in Hanoi
  - 12,600 tonnes in Bangkok
  - **9,240 tonnes in Kuala Lumpur**
China struggled to cope with plethora of medical waste generated by COVID-19 outbreak in the country

(Source: Routers, 2020)
## Generation of Covid-19 clinical waste by country

<table>
<thead>
<tr>
<th>Country</th>
<th>Amount of waste generated during covid-19 (kg/bed/day)</th>
<th>Percentage of increase in clinical waste generation during covid-19 pandemic</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taiwan</td>
<td>0.9 – 2.7</td>
<td>No data</td>
<td>Chiang et al. (2006)</td>
</tr>
<tr>
<td>Jordan</td>
<td>3.95</td>
<td>1000%</td>
<td>Abu-Qdais et al. (2020)</td>
</tr>
<tr>
<td>Wuhan, China</td>
<td>0.6 – 2.5</td>
<td>213%</td>
<td>Yu et al., 2020</td>
</tr>
<tr>
<td>Bandung, Indonesia</td>
<td>2.2</td>
<td>17.1%</td>
<td>Damanhuri (2020)</td>
</tr>
<tr>
<td>Penang, Malaysia</td>
<td>0.4 – 1.0</td>
<td>27%</td>
<td>Astro Awani (2020)</td>
</tr>
<tr>
<td>Thailand</td>
<td>2.9</td>
<td>No data</td>
<td>IGES (2020)</td>
</tr>
<tr>
<td>Mexico</td>
<td>2.0 -2.2</td>
<td>No data</td>
<td>IGES (2020)</td>
</tr>
</tbody>
</table>
Clinical Waste Management and COVID-19

- COVID-19 related clinical waste is being managed through the same regulations as for clinical waste or schedule waste

- COVID-19 related clinical waste is collected by assigned workers, stored in designated areas, transported, incinerated and disposed of by licensed companies
Household clinical waste management and COVID-19

• Abundance of masks are not properly disposed by the public

• Penang city council observed an sharp increase in the amount of clinical waste generated daily and warned that it could be an environmental disaster if no action is taken to manage the waste

• Some of the clinical waste has ended up in the solid waste landfills which is mostly PPE and face masks

• It also reported that about 9,000 face masks is disposed daily in Penang. This also poses risk to the municipal workers who collected the waste from households, shop lot and industrial area (The Sunday daily, 23rd June 2020).
Littering of Facemasks used as personal protective gear by public
Improper Disposal of face masks
CONCLUSION

• In Malaysia, clinical waste management is under the Federal Government and Department of Environment

• Environmental Quality Act 1974 with recent amendments is currently being implemented in Malaysia

• The generation of clinical waste is 90 tonnes/day or 33,000 tonnes/annually whereby about 75 to 80% is non-pathogenic waste whereas 15% of composition is pathogenic waste and chemical and pharmaceuticals waste, sharp waste and other waste accounts for 3%, 1% and 1%, respectively

• The guideline on the management of clinical waste provides comprehensive information on appropriate handling and disposal of clinical wastes generated from hospitals and other health care facilities
THANK YOU