Healthcare Waste Management in South Asia

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✓ Overview of Healthcare Management
✓ Treatment Technologies
✓ Bangkok Metropolitan Administration: A Case Study
✓ Healthcare Waste: South Asian Perspective
✓ Conclusions
**Overview of Healthcare Waste Management**

**What is Healthcare Waste?**
Total waste generated by hospitals, healthcare establishments and research facilities in the diagnosis, treatment, immunization and associated research.

**Healthcare Waste Characterization:**
- Non Risk Waste (75-90)%
- Risk Waste (10-25)%

High Potential for 3R
Overview of Healthcare Waste Management

- **Sharps**
  - Needles, infusions sets,
  - Scalpels, knives, blades

- **Chemical waste**
  - Lab reagents,
  - Disinfectants, solvents

- **Pathological waste**
  - Body parts,
  - Blood & other fluids

- **Genotoxic waste**
  - Cytotoxic drugs,
  - Genotoxic chemical

- **Waste with high heavy metal content**
  - Batteries, broken thermometers,
  - Blood pressure gauges

- **Pressurized containers**
  - Gas cylinders, Cartridges & aerosol cans

- **Infectious waste**
  - Lab Cultures, waste from isolation wards, tissues, etc

- **Pharmaceutical Waste:**
  - Expired or no longer needed pharmaceuticals,
Treatment Technologies

✓ Incineration

- Double-chamber pyrolytic incinerators specially designed to burn infectious health-care waste
- Single-chamber furnaces with static grate, used only if pyrolytic incinerators are not affordable
- Rotary kilns operating at high temperature, capable of causing decomposition of genotoxic substances and heat-resistant chemicals.
Treatment Technologies

- **Disinfection**
  - Chemical disinfection: used for treating liquid waste
  - Thermal disinfection: generally used for treating solid waste

- **Sterilization**
  - Steam sterilization: autoclave used to disinfect waste.
  - Microwave irradiation: uses radiant energy to heat moisture within the waste
Treatment Technologies

✓ **Plasma arc technology**
  - Operates on principles of an electrical arc struck between two electrodes.
  - There is no burning and no formation of ash.

✓ **Landfill**
  - **Open dumps**: not recommended
  - **Sanitary landfills**: Disposing of certain types of health-care waste (infectious waste and small quantities of pharmaceutical waste) in sanitary landfills is acceptable
Treatment Technologies

Increased market share of non incineration technology (USA)

Decrease in number of medical incinerators (USA)
## Treatment Technologies: Comparison

<table>
<thead>
<tr>
<th></th>
<th>Incineration</th>
<th>Autoclave</th>
<th>Microwave</th>
<th>Chemical Disinfection</th>
<th>Plasma Pyrolysis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Investment/Operating cost</strong></td>
<td>High</td>
<td>Moderate</td>
<td>High</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td><strong>Suitability Of the waste</strong></td>
<td>Not for radioactive</td>
<td>All except Pathological</td>
<td>All except cytotoxic, radioactive</td>
<td>Liquid waste</td>
<td>All</td>
</tr>
<tr>
<td><strong>Ease of Operation</strong></td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td><strong>Waste Volume reduction</strong></td>
<td>Significant</td>
<td>Less</td>
<td>Significant</td>
<td></td>
<td>Significant</td>
</tr>
<tr>
<td><strong>Odour Problems</strong></td>
<td>Yes</td>
<td>Slight</td>
<td>Slight</td>
<td>Slight</td>
<td>-</td>
</tr>
<tr>
<td><strong>Environmental friendly</strong></td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Bangkok Metropolitan: Case Study

Incineration by Private Contractor

- Operated by Bangkok Thanakom Co., Ltd (cost of B 5,800/ton)
- Disposal of infectious waste from Bangkok hospitals: 16 ton/day
Bangkok Metropolitan: Case Study

(Nonthaburi, Thailand)

Spoiled medicine capsule together with MSW

Infectious waste in red plastic bag co-disposed with MSW
Hospital Waste Management:
Bangkok Metropolitan Administration
Healthcare Waste: South Asian Perspective

Bangladesh

Prevalent practices

✓ Wastes not segregated in many hospitals

✓ Disposed off together with municipal solid waste

✓ Openly burnt in some hospital

✓ Few local initiatives taken by NGOs (e.g., Prodipan)

✓ Medical waste segregation, recycling and reused by rag pickers
Healthcare Waste: South Asian Perspective

Bangladesh

**Legislation:**
- ✔ No specific legislation directly to medical waste

**Generation:**
- ✔ 255 ton/day in Dhaka alone
- ✔ 10-25% is hazardous
- ✔ Waste generation ➔ 0.8-1.67 kg/bed/day

**Composition of risk waste**

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infectious</td>
<td>3.5%</td>
</tr>
<tr>
<td>Sharps</td>
<td>1.5%</td>
</tr>
<tr>
<td>Pathological waste</td>
<td>0.8-1.67 kg/bed/day</td>
</tr>
</tbody>
</table>

Rag Picker
Healthcare Waste: South Asian Perspective

Bhutan

Legislation & Policy

- Guidelines for Infection Control (Ministry of Health);

Generation: 73 ton/year..

Prevalent Practices

- Poorly managed incinerators;........or back yard burners?
- Open burial pits posing a threat to public;
- No regulated disposal sites except JDW National Hospital;
- Sharps collected/reused without cleaning or sterilization.
Healthcare Waste: South Asian Perspective

India

- **Legislation**: Bio-Medical Waste Regulations 1998
  - Classified in ten categories;
  - Color coding and types of containers for different categories and their corresponding treatment & disposal option with standards

- **Generation**: 0.33 million tons/year

Proportion of different waste in hospital waste (Calcutta)
Healthcare Waste: South Asian Perspective

India

Prevalent Practice & Implementation

Audited by Controller & Auditor General, Delhi (July 1998- August 2001)

✓ Implementation is unsatisfactory
✓ No segregation in 27 out of 40 government hospital
✓ Intravenous sets, catheters, plastic bags etc. incinerated not autoclaved
✓ Labeling instructions of bags not complied,
✓ Usage of same wheelbarrow for transportation of all categories of waste

After a Sristi’s (NGO) intervention in 1997, Court directed Central Pollution Control Board to emphasize on non-burn technology
Dioxins in Delhi

- Dioxins were detected in most of the samples analyzed (tissues of humans, fishes, chickens, goat, lamb, predatory birds and Ganges River dolphin);
- The liver of the spotted owlet showed the highest concentration of 3,300-picogram/gram fat;
- Dioxins conc. in the human fat tissues ranged from 170 to 1300 picogram/gram fat weight (WHO limits of 1-4 picogram/kg of body weight ➔ levels seriously alarming);
- Incineration technology being unpopular as dioxin releaser, being subsidized in India through the program of Ministry of Non-conventional Energy Sources;
- Hospital incinerators the biggest polluters in Delhi, government hospitals seems ignoring the rules & regulations.

Source: Singh, 2003; The Hindu (April 21, 2004)
## State of Healthcare Waste Legislations, Policies, Guidelines in South Asia

<table>
<thead>
<tr>
<th>Country</th>
<th>Legislation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>No specific legislation covered in Bangladesh’s Environmental protection Act 1995</td>
</tr>
<tr>
<td>Maldives</td>
<td>No separated rules in Environmental Protection and Preservation Act 1993</td>
</tr>
<tr>
<td>Nepal</td>
<td>No polices and legislation dealing with hazardous waste</td>
</tr>
<tr>
<td>Pakistan</td>
<td>Hospital waste management rules, August 2005</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>No proper legal framework in National Environmental Act (Draft of national policy, 2001 exist)</td>
</tr>
</tbody>
</table>
Healthcare Waste Legislation in South Asia (at glance)

<table>
<thead>
<tr>
<th>Country</th>
<th>No Legislation/ Guidelines</th>
<th>Policy/Guidelines Exists</th>
<th>Basic Legislation</th>
<th>Legislation/Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maldives</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bhutan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bangladesh</td>
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<tr>
<td>Sri Lanka</td>
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<tr>
<td>Pakistan</td>
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<td></td>
</tr>
<tr>
<td>India</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Nepal</td>
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<td></td>
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</tbody>
</table>
## State of Healthcare Waste Generation in South Asia

### Estimates of medical waste generation in South Asia

<table>
<thead>
<tr>
<th>Country</th>
<th>Waste generation (kg/bed/day)</th>
<th>Total waste generation (tons/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>0.8 - 1.67</td>
<td>93,075 (255 ton/day)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(only in Dhaka)</td>
</tr>
<tr>
<td>Bhutan</td>
<td>0.27</td>
<td>73</td>
</tr>
<tr>
<td>India</td>
<td>1 - 2</td>
<td>330,000</td>
</tr>
<tr>
<td>Maldives</td>
<td>NA</td>
<td>146</td>
</tr>
<tr>
<td>Nepal</td>
<td>NA</td>
<td>365</td>
</tr>
<tr>
<td>Pakistan</td>
<td>1.06</td>
<td>250,000</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>0.36</td>
<td>6600 (only in Colombo)</td>
</tr>
</tbody>
</table>
State of Healthcare Waste Generation in South Asia

Estimates of average medical waste generation per year in South Asia
State of Healthcare Waste Generation in South Asia

Estimated average waste generation per bed in different South Asian countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Waste Generation (Kg/bed/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sri Lanka</td>
<td>0.36</td>
</tr>
<tr>
<td>Pakistan</td>
<td>1.06</td>
</tr>
<tr>
<td>India</td>
<td>1.5</td>
</tr>
<tr>
<td>Dhaka</td>
<td>1.16</td>
</tr>
<tr>
<td>Bhutan</td>
<td>0.25</td>
</tr>
</tbody>
</table>
Scope of 3Rs in Healthcare Waste Management

*Reduce (source reduction) has higher potential to be implemented in health care waste management.*

**Benefits of source reduction:**
- Resources conservation;
- Reduction of collection, transportation, and disposal costs;
- Decreased pollution control liability, regulatory & compliance costs.

**Segregation and handling of generated waste**
- Segregation reduces the volume & toxicity of waste stream;
- Proper procurement practices such changing the products and materials can help to reduce the harm *(Hg based thermometer can be substituted by electronic sensing devices)*;
- Increasing awareness of hospital staffs, employee training in hazardous materials management and waste minimization
Conclusions

✓ Lack of segregation practices, mixing of hospital wastes with general waste makes whole waste stream hazardous;

✓ Mushrooming of clinics often unregistered aggravating the problem; (typical SA problem). How to cover them in the existing legislation.

✓ Open burning by clinics, dispensaries & some hospitals;

✓ Incinerators are old and poorly maintained;

✓ Poor legislative measures/standards, poor implementation;

✓ Public ignorance of the law (if any);

✓ Informal sectors largely involved in recycling and reusing medical waste items.
All is not bad in South Asian Healthcare Management

- Countries are moving towards better technology
  - Many private hospitals in India → non-burn technology
- Greater attention given to improve legislation and guidelines
  - Legislations already exists in India & Pakistan
  - Bangladesh, Bhutan: Guidelines in some form,
- NGOs, communities playing vital role
Thank you very much for your kind attention

Now it is Time for discussion!