HEALTHCARE WASTE INDICATORS FOR ASSESSING THE INFECTIOUS WASTE MANAGEMENT IN THE PUBLIC HOSPITALS OF LA PAZ (BOLIVIA)

Navarro Ferronato¹*, Marco Ragazzi², Marcelo Antonio Gorritty Portillo³, Edith Gabriela Guisbert Lizarazu⁴, Vincenzo Torretta¹

¹ University of Insubria, Department of Theoretical and Applied Sciences, Via G.B. Vico 46, I-21100, Varese Italy
² University of Trento, Department of Civil, Environmental and Mechanical Engineering, via Mesiano, 77, I-38123, Trento, Italy
³ Universidad Mayor de San Andrés (UMSA), IIDEPROQ, Calle 30, Cota Cota, La Paz, Bolivia
⁴ Universidad Mayor de San Andrés (UMSA), Department of Environmental Engineering, Av. Mariscal Santa Cruz 1175, La Paz, Bolivia

*Presenting author email: nferronato@uninsubria.it (N. Ferronato)
1. Introduction of the study area and objectives of the research

2. Methods
   a) Cooperation with local stakeholders
   b) Field analysis
   c) The Indicators set

3. Results

4. Conclusions and future goals
1. INTRODUCTION

Bolivia
Low-middle income country
GNI: about 3 000 USD
About 10 800 000 inhabitants
9 inhabitants per km²

La Paz
About 900 000 inhabitants
420 inhabitants per km²
1. OBJECTIVE OF THE RESEARCH

The research would:

• Assess the **main challenges** for **improving** the HWM of the city.
• Study the **feasibility** for introducing a **HW treatment plant** appropriate for the case study.
• To introduce a plan of **best practices** for introducing a better HW collection, transportation, treatment and final disposal.
• To introduce an **indicator** as reference for understanding local challenges and opportunities about HWM and for evaluating the current scenario.
2.A. METHOD: COOPERATION WITH LOCAL STAKEHOLDERS

- Local Government
- Private companies for collection and treatment
- Universities
- NGOs or other donors (Rotary Foundation)

The interdisciplinary and multi-stakeholder approach allows applying the research and future projects.
2.B. METHOD: FIELD ANALYSIS

Municipal level:
• Field inspections (transport and final disposal)
• Interviews with local stakeholders
→ Assessment of local needs for improving HWM

Hospital level: Work in progress…
• Interviews with directors and managers of the hospitals
• Field inspections
• Literature review of the Documents available locally (Swisscontact, 2006)
• Support of the university for the survey
→ Assessment of HWM quality
2.C. METHOD: THE INDICATORS

Guidelines provided by the WHO + Wasteaware Benchmark indicator approach

6 indicators, 5 for hospitals and 1 for the municipality, each with 5 to 7 sub-indicators, each with 5 criteria of assessment, for a total of 35 sub-indicators and 175 sub-criteria.

Finally they are presented in a Radar Scheme and by a traffic-light code.
2.C. METHOD: THE INDICATORS, SUB-INDICATORS AND CRITERIA

A. Collection and selective collection (6 sub-criteria)
B. Storage (5 sub-criteria)
C. Local treatment (5 sub-criteria)
D. Maintenance and monitoring (7 sub-criteria)
E. Awareness, security and prevention (5 sub-criteria)
F. HWM at city level (7 sub-criteria)

- Assessment per hospital (not reported)
- Average results of the HWM service provided in the hospitals of the city
- Assessment at city level
2.C. METHOD: COLLECTION AND SC

- A.1. Percentage of selective collection (HW)
- A.2. Intermediary storage
- A.3. Internal transport
- A.4. Times of transports to external areas
- A.5. Use of personal protection equipment
- A.6. Typologies of waste collected in separate containers

Ex. A.1. - criteria
0 – Without selective collection
5 – 1-25% of SC rate
10 – 26-50% of SC rate
15 – 51-75% of SC rate
20 – 76-100% of SC. There are not HW within the MSW
3. RESULTS: THE HOSPITALS

Results of the state of the hospitals in 2003 (average result): The main issues detected regard awareness, monitoring and treatment.

The objective is to implement this graph for each hospital, and provide an average one as depicted.

Source: Swisscontact, 2003
3. RESULTS: THE CITY

The main issue is about the financial sustainability for improving current HWM, especially for introducing a sustainable treatment system (on-site or off-site).

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Score obtained</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Methodologies of centralized treatment and final disposal</td>
<td>10</td>
</tr>
<tr>
<td>II. Quality of the transport from hospitals to the treatment plant or final disposal</td>
<td>15</td>
</tr>
<tr>
<td>III. Local and national Laws</td>
<td>15</td>
</tr>
<tr>
<td>IV. System monitoring</td>
<td>15</td>
</tr>
<tr>
<td>V. Financial sustainability and investing</td>
<td>5</td>
</tr>
<tr>
<td>VI. Collection time</td>
<td>15</td>
</tr>
<tr>
<td>VII. Personal protection equipment</td>
<td>10</td>
</tr>
</tbody>
</table>

Satisfying 61%
4. CONCLUSIONS AND FUTURE GOALS

- The **main issues** detected about HWM are the treatment, maintenance and monitoring, awareness and security. These issues should be addressed in future management plans.
- The indicators could be a **reliable tool** for providing an integrated view of the main challenges and needs for improving local HWM.
- The **future objective** is to apply such indicators (which could be improved) for all the hospitals of La Paz, and for other countries worldwide in order to have more benchmark analysis about HWM, with the same method.
ANY QUESTION?

For more information:

Presenting author:
Eng. Navarro Ferronato, Ph.D. Student

nferronato@uninsubria.it

Department of Theoretical and Applied Sciences, University of Insubria, Italy
2.C. STORAGE

- **B.1.** Awareness and consciousness of the staff for the transporting process
- **B.2.** Temporary storage area on-site
- **B.3.** Storage time before treatment or external transport
- **B.4.** Personal protection equipment of the staff
- **B.5.** Container used for the temporal storage of HW

Ex. B.5. - criteria
0 – There are not appropriate containers
5 – There are only specific begs for HW
10 – There are containers and begs. However, there are not information about the danger and are not sterilized
15 – There are appropriate containers and begs for each HW, are well reported, although are not sterilized
20 – There are appropriate containers and begs for each HW, are well reported, and the containers are sterilized
2.C. LOCAL TREATMENT

- **C.1.** Treatment of the infectious and sharp HW
- **C.2.** Precautions applied during the treatment
- **C.3.** Wastewater treatment applied within the hospital
- **C.4.** Percentage of HW treated on site
- **C.5.** Treatment area

Ex. C.5. - criteria
0 – There is not a specific area for HW treatment, or there is no treatment on-site
5 – There is an area for the treatment, although it is not closed, monitored and maintained
10 – There is an area for HW treatment, closed and bounded, with external reporting. However, there is not control, monitoring and sterilization.
15 – There is an appropriate area for treating HW, however it is not sterilized
20 – There treatment area is closed, bounded, reported, monitored, maintained, clean and sterilized.
2.C. MAINTENANCE AND MONITORING

- **D.1.** Responsible staff for system monitoring
- **D.2.** Periodic assessment of the solid waste produced
- **D.3.** Monitoring of the storage areas and cleaning
- **D.4.** Assessment of service quality
- **D.5.** Assessment of expenses and economic sustainability
- **D.6.** Control and monitoring of the injuries of the staff
- **D.7.** Cooperation with external units for assessing the system

Ex. D.5. - criteria
0 – There is not a financial monitoring system, as well as the quantities of HW produced are not known.
5 – Some expenses are known, however, are not assessed and there are no sustainable practices for economic saving.
10 – The expenses of the HWM are known, are assessed periodically, although saving practices are not applied.
15 – The expenses of the HWM are known, are assessed periodically, saving practices are applied as well as for improving the system.
20 – There are also studies for reducing for reducing the costs and consultant are hired for writing internal report.
2.C. AWARENESS, SECURITY AND PREVENTION

- **E.1.** Internal rules and regulations
- **E.2.** Information campaigns and activities for the staff
- **E.3.** Diffusion of informative material about hygiene and good practices for HWM
- **E.4.** Vaccines to local staff
- **E.5.** Regulations and methods for preventing injuries

**Ex. E.5. - criteria**

0 – There are not internal rules for reducing the risk of injuries
5 – There are internal regulations for managing the HW, although are not supported by infrastructural precautions
10 – There are specific regulations with activities of sensitization and information. However, there are not appropriate infrastructural precautions.
15 – There are appropriate containers and precautions for managing HW, as well as regulations and sensitivity campaigns. However the precautions are not always applied.
20 – There are appropriate infrastructures, sensitivity campaigns in support of the regulations and internal rules. Moreover, there is monitoring of the application.