

Health Care Waste Management

Biratnagar Eye Hospital (BEH), Nepal

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Introduction

Biratnagar Eye Hospital (BEH) is a high-volume, non-governmental charitable eye hospital under the umbrella of the Eastern Regional Eye Care Programme of Nepal Netra Jyoti Sangh (National Society for Comprehensive Eye Care). BEH provides state-of-the-art comprehensive eye and ear health services that are accessible and affordable for the population of Eastern Nepal and Northern India. Daily, around 1,300 patients are managed at the out-patient department, and 250 different types of eye surgeries are performed by a staff of over 500 people and trainees.¹

The modern concrete building structure was designed with a focus on accessibility, disaster-resilience and environmental sustainability:

Accessibility was improved, for example through railings, high-contrast sign boards, slip-resistant surfaces to prevent falls for patients with visual and physical impairments, etc.

Disaster-resilience by several disaster-risk reduction adjustments to increase BEH's resilience for the high number of earthquakes in the region (for example, alarm system for fire and earthquakes), and providing disability inclusive disaster risk reduction for the hospital and served communities

Environmental sustainability: The buildings were designed for natural lighting and ventilation, thus reducing the consumption of electricity for lights and air-conditioning. Solar panels were installed and are connected to the water heating system. A dedicated "**Health Care Waste Management Program**" was introduced (picture 1), and will be discussed now in more detail.

¹ [BEH Annual Report 2018](#)



Picture 1: Segregated waste collection

Hospital Mission on Waste

To implement the Health Care Waste Management Program successfully throughout the hospital, by applying local guidelines² and contextualized international policies³ on Health Care Waste Management

Past situation of Health Care Waste Management

Before the implementation of the Health Care Waste Management Program, the hospital did not have a systematic waste management system. Waste was collected randomly without segregation at the premises of the hospital by unprotected staff (picture 2 and 3), and transported once a week by a municipal waste collector (picture 4) or burned by an incinerator (picture 5). Infectious hazardous waste was not separated from and contaminated general non-hazardous waste. Thus, the overall volume of hazardous waste increased. Consequently, the waste handlers of the hospital, rag pickers and everybody else exposed to waste were at risk of contamination, injury, chemical exposure, and other health-related concerns (picture 3).

² Nepal National Health Care Waste Management Guidelines, available from [Nepal guidelines](#)
³ World Health Organization. Safe management of wastes from health-care activities. 2nd edition, WHO 2014, ISBN 978 92 4 154856 4 (available from [WHO Safe management of waste from healthcare activities](#))



Picture 2: Waste collection in the past



Picture 3: Waste storage area in the past



Picture 4: Waste transportation in the past



Picture 5: Waste treated by incinerator

Hospital Waste Management Committee

The inherent environmental and health risks of the old waste management system encouraged the management of BEH to develop a safer and more sustainable system in a stepwise approach:

Governance	<ul style="list-style-type: none">• January 2018: Formation of the BEH Waste Management committee (10 members), chaired by the Hospital Director
Analysis	<ul style="list-style-type: none">• Situation analysis of the existing waste management
Policy	<ul style="list-style-type: none">• Develop a hospital policy and Standard Operating Procedures (SOP), aligned with national and international guidelines
Training	<ul style="list-style-type: none">• Training of hospital staff about waste management
Pilot and roll-out	<ul style="list-style-type: none">• May 2018: Pilot SOP at the theatre, pathology department and phaco ward. Gradually introduced to all areas of the hospital
Monitoring	<ul style="list-style-type: none">• Monitoring of the system by the committee, provision of refresher training, financial analysis
Accreditation	<ul style="list-style-type: none">• International certification (ISO 14001:2015) granted after introduction of Zero Waste concept

Health Care Waste Treatment

a) Solid waste management

Waste is now segregated at source, using a color coding system according to recommendations from the World Health Organization⁴: Blue, green and black color bins are placed at hospital areas which are easily accessible for patient and visitors. The bins are combined with posters explaining proper waste segregation (picture 6). Red and yellow color bins are kept in areas that are inaccessible for patients and visitors (picture 7). Additionally, needle cutters are placed at each station for handling sharp waste (picture 8). Trained housekeeping staff is involved in the Health Care Waste Management System, and equipped with personal protective equipment such as caps, masks, gloves and aprons. Transportation trolleys are used to carry the waste to the storage and treatment area (picture 9). Infectious waste is transported separately from general waste in order to avoid contamination. Waste is transported thrice a day from the collection to the segregation site.



⁴ World Health Organization. Safe management of wastes from health-care activities. 2nd edition, WHO 2014, ISBN 978 92 4 154856 4 (available from [WHO Safe management of waste from healthcare activities](#))

Picture 6: Segregation of plastic (blue bins), paper (green) and bio-degradable (black) waste in the open patient area



Picture 7: Yellow waste bins for infectious hazardous waste



Picture 8: Staff using the needle cutter



Picture 9: Red bin for hazardous human anatomical waste, transported among others by trained staff using personal protective equipment to waste treatment and storage center

Infectious and sharp waste is sterilized with autoclaves (picture 10) and sodium hypochlorite solution, stored at the treatment center of BEH and sent for recycling twice a month at a treatment center. The sale of sterilized waste contributes also to the hospital income. In the year 2018 and 2019, a total of 1,889 USD has been generated from the sale of sterilized waste.



Picture 10: Treatment of infectious waste in an autoclave

Bio-degradable three-chamber pits are used to store bio-degradable waste. After three months the waste is converted to compost manure which is used in the adjacent gardens and farmland of BEH (picture 11, 12).



Picture 11: Pits for management of biodegradable waste



Picture 12: Self-produced compost as fertilizer for mango trees at the hospital compound

b) Waste water management

Waste water collected from different sources within the hospital is contaminated with hazardous chemicals and biological pollutants. Therefore, the water is closely monitored and pretreated by Decentralized Waste Water Treatment System (DEWATS) modules. The modules range from settler to superior anaerobic systems like baffle reactor, fixed bed filters and aerobic systems like planted gravel filter, ponds etc. prior to discharge into the farmland of the hospital and the public sewer system (picture 13). It consists of a simple design using natural bacteria, plants and gravity instead of relying on electricity and chemicals. Everyday around 90-100,000 liter of water are treated through DEWATS, and the treated water is also used for gardening (more than 300 litchi and mango trees inside the compound).



Picture 13: Decentralized Waste Water Treatment System

c) Equipment

BEH purchases environmental friendly equipment and instruments, such as replacing mercury containing equipment with latest technology equipment and replacing tube light and Compact Fluorescent (CFL) light with long-lasting LED light. It has a dedicated maintenance department with trained technicians and biomedical engineers. Frequently scheduled instrument

maintenance and repair contribute to long lasting equipment and reduction of technical waste.

Recommendations

Successful waste management is successful only when a strict monitoring system is in place, including all aspects of waste reduction, segregation, collection, transportation and treatment. This requires a change in the attitude of all stakeholders which can be challenging.

Lessons learned and recommendations from the implementation process

- Develop **staff ownership** of the whole process
- **Senior management support** is essential: Everybody, including the Hospital Director, Manager, Head of Nursing, Head of Maintenance Department and Housekeeping should be on board
- Do not implement anything without **early orientation and staff training**
- Start with smaller **pilot activities** in selected departments
- **Replicate** successfully implemented changes **gradually** throughout the whole hospital
- Be **participatory** as much as possible: At BEH the view of nurses, medical staff, hospital management staff and housekeeping staff informed the design of the health care waste management system
- Do not forget **refresher training**: Organizing regular awareness and orientation training sessions on health care waste management for new and existing hospital staff - and for the community - will go a long way

Promotion of Health Care Waste Management

In 2018, BEH decided to prioritize environmental health and safety, and to reduce its climate footprint. Today, the hospital is recognized as a model for a green and healthy hospital in Nepal. The system was designed and implemented with technical support from experts on health care waste

management. As a leader in environmental health and health care waste management, the hospital actively promotes initiatives on safe health care waste management and encourages health care professionals to visit and observe the system implemented by BEH. By the end of 2019, the hospital has received already more than 500 visitors, including governmental officials, staff from other eye hospitals as well as general hospitals and delegates from various agencies.

Conclusion

A sustainable, user friendly and safe health care waste management system can be implemented successfully in a high-volume eye hospital in a setting with overall limited resources. This requires dedicated leadership, staff involvement and continuous monitoring and feedback mechanism to secure ownership and needed attitude change towards waste management. BEH is now recognized as one of the leading hospitals in Nepal for safe and sustainable Health Care Waste Management.

Resources

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