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Minimisation; the Watchword and Catchword for Hospital Waste Management in India

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Introduction

1. Hospital Waste Management, in fact to be precise, Bio Medical Waste (BMW) Management, in India is at its present status due to various reasons. Much research has been done, and many articles on many facets of this issue have been written in India, and abroad. Not much headway has been made in India; primarily because the famous 'Sarkari Mahakma' deals with the issue.

2. There are many steps or stages of managing this hospital waste. They may vary in different nations. Actually, they all emerge from guidelines of World Health Organisation (WHO) issued in 1996 initially. Out of all these stages, MINIMISATION is perhaps the most important, and therefore needs more deliberation by all stake holders.

3. Another issue which this researcher wishes to clear at this stage is that the issue is being perceived as management issue and not gauged from technological/medical perspective. The scholar is very confident even before taking up research in this subject, that if properly streamlined and actuated, this can be more refined than the famous delivery mechanism of **Dabbewalas** in Mumbai. We all should look at this issue of MINIMISATION as an important rung in the ladder of waste management.

Importance

4. Another thing which is unanimously agreed to by all stake holders is that nomenclature of this stage- "minimisation" itself suggests financial implications for all stake holders. It is therefore deduced that this stage can get full hearted support of all stake holders.

5. Another thing is that the administrators of the Health Care Establishments (HCEs) play largest stake in the issue; and minimisation has to happen primarily within precincts of Hospital. At other places and other stages it accounts maximum of 10%, say.

6. Minimisation has various aspects. Over a given time matrix, its cumulative advantages accrue to administrators and others also.

Guiding Principles

7. 3, or say 4 R's have been universally accepted to be guiding the minimisation syndrome. Reduce, Recover, Re-use, and Re-cycle. Reduction at source is undeniably the first step in minimisation. It means reduce generation of medical waste. There are many issues related to reduction. Most of these relate to manufacturers of medical equipment/ancillaries/stores. These are affected through government statutes to suppliers and purchasers/HCEs. To reduce the amount of waste generated at the source, the most practical and promising methods appear to be

(i) The adoption of industry standards for product manufacturing and packaging that uses less material. Modifications in product packaging standards can result in reduction of waste packaging material or use of recyclable materials

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(ii) The passing of laws that minimise the use of special materials in consumer products. virgin raw materials by the manufacturing industry promotes substitution by recycled materials.

(iii) The levying (by communities) of cess/fees for waste management services that penalise generators in case of increase in waste quantities. This is a foreign phenomenon.

8. In para 7 above, this researcher has jotted both terms "re-use" and "recycle". It is because if the recovered item is used in same HCE/ industry then it is recycle and if elsewhere than re-use. An example is quoted in case of plastic bottles recovered. If after recovery, similar bottles for use by same health industry then it is recycling; lest reuse if put in use as water bottles for use at railway stations. So, recovery is most important of these four principles**. Every effort must be directed towards achieving 100% recovery of disposed items. As per this researcher this "recovery" is the SOUL of process of Minimisation.** After recovery, the reduction must be affected in **volume and toxicity** both in respect of balance waste. I think toxicity must be reduced first/earliest. Later, efforts made to reduce volume/weight/size for transporting elsewhere and vacating central place; making it ready for collection of waste next day. Both volume and toxicity can be done technologically alone (including use of chemicals)

9. Many articles, and many superb videos are available in libraries, HCEs, and on websites etc showing these 4R's. These things are not being repeated. However, to bring all readers on same track, few things are explained in layman language.

10. An effective waste minimisation management system, **inside precincts of HCEs,** must include maximum of the following options; best is to include all:

(a) Waste **collection** and **carriage/transportation** to central place inside HCE.

(b) Efficient **segregation** mechanism. Utility items must be recovered, and stored separately. (Example-paper, glass, plastic, metals etc). Deliberation is required to ensure daily sorting, sufficient manpower, stores, supervision under qualified staff and inaccessibility to unwanted persons/animals, and detail documentation.

(c) Waste transformation i.e. reduction of volume, and toxicity (including other physical/chemical properties) of waste to make it suitable for final disposal.

(d) Resource recovery through waste processing i.e. recovery of materials (such as compost) or recovery of energy through biological, thermal or other processes.

(e) Safe, regular, and centralised disposal on land i.e. environmentally safe and sustainable disposal directly in landfills, or for treatment by Central Treatment Facility.

10. Central Waste Storage Facility in HCEs. This researcher feels that this is very important issue. Every HCE must be forced to have separate, exclusive facility for storage, sorting, and processing. This facility must be conveniently located, secure, and tailor made for such use. Sufficient warning posters related to BMW must be displayed inside and outside this store. As in case of rain harvesting made compulsory by many municipalities; similarly this centralised storage facility must be

insisted upon right from passing the map of HCE before construction and again at the time of seeking authentication by HCEs. If this is strictly ensured, half the problem is over. It is difficult to implement though. Most private HCE administrators will not be willing to compromise so much space in their building plans.
Rain covered trolley way passages from OT, wards, and OPDs etc must lead to this storage facility. Somewhere around it must be space for installation of machines for reduction of volume and toxicity. Local composting land fill facility must also co-exist. Contractor's/corporation's vehicles for collection of waste must have access to this area from suitable entry/approach and exit points.

Disposal: The final functional element in the minimisation of waste management system is disposal. Today the disposal of wastes by land filling or uncontrolled dumping is the ultimate fate of all wastes, whether they are residential wastes collected and transported directly to a landfill site, residual materials from Materials Recovery Facilities (MRFs), residue from the combustion of solid waste, rejects of composting, or other substances from various solid waste-processing facilities. A municipal solid waste landfill plant is an engineered facility used for disposing of solid wastes on land or within the earth's mantle without creating nuisance or hazard to public health or safety.
Waste Processing: Waste processing is undertaken to recover conversion products and energy. The organic fraction of Hospital Waste can be transformed by a variety of biological and thermal processes. The most commonly used biological transformation process is aerobic composting. The most commonly used thermal transformation process is incineration. During research on the subject, this researcher came across latest technology, comparatively cheap and easy to operate by individual HCEs. The same can be clubbed by suitably closer located HCEs. It is proposed by Messers P&O Pvt Ltd UK. The **Converta** machine which they recommend uses steaming for first processing. Steaming reduces furans, and dioxins. Relevant portion from their prospectus is produced here.
The CONVERTA machine is basically a sterliser. It carries out transformation of waste in 5 cycles within 30 minutes. It reduces toxicity and volume by thermal decomposition; break up of cell membrane, and chemical modification of cells.
First Cycle: Loading the waste, disintegrating it and start heating. The temperature rises from room temp to 100C. Reduction is done by impact, friction, and steam.
Second Cycle: Here temperature range is unaffected at 100C. Evaporation of liquids takes place in this stage. The waste undergoes chemical changes here.
Third Cycle; Superheating stage**.** Temperature increases from 100 to 150C here.
Fourth Cycle: Water is sprayed to cool from 150C to 95C.
Fifth Cycle; Cooling before unloading from 95C to 90C. After unloading the waste is then kept in open to come to room temp.
11. Resource Recovery through Processing. Biological or thermal treatment of waste can result in recovery of useful products such as compost or energy.

(a) **Biological Processes.** Biological treatment involves using micro-organisms to decompose the biodegradable components of waste. Two types of processes are used, namely:

(i) Aerobic processes: Windrow composting, aerated static pile composting and in-vessel composting; vermi-culture etc. In the aerobic process the utilisable product is compost

(ii) Anaerobic processes: Low-solids anaerobic digestion (wet process), high solids anaerobic digestion (dry process) and combined processes. In the anaerobic process the utilisable product is methane gas (for energy recovery)

Both processes have been used for waste processing in different countries – a majority of the biological treatment process adopted world-wide are aerobic composting; the use of anaerobic treatment has been more limited. In India, aerobic composting plants have been used to process up to 500 tons per day of waste.

(b) **Thermal Processes.** Thermal treatment involves conversion of waste into gaseous, liquid and solid conversion products with concurrent or subsequent release of heat energy. Three types of systems can be adopted, namely:

(a) Combustion systems (Incinerators): Thermal processing with excess amounts of air.

(b) Pyrolysis systems: Thermal processing in complete absence of oxygen (low temperature).

(c) Gasification systems: Thermal processing with less amount of air (high temperature).

Combustion system is the most widely adopted thermal treatment process World-wide for MSW. Though pyrolysis is a widely used industrial process, the pyrolysis of municipal solid waste has not been very successful. Similarly, Successful results with mass fired gasifiers have not been achieved. However both pyrolysis and gasification can emerge as viable alternatives in the future.

12. Suggestions. Minimisation is the most important issue as per this researcher. Therefore, there are many suggestions in this regards. First, the suggestions which Comptroller and Auditor General (CAG) of India have been giving at higher levels to Ministry of Environment and Forests (MoEF). Some of these are;-

(a) Coordination with other ministries for introducing '3 R's' strategies.

(b) Ministry of Finance (MoF) could be approached for promoting the procurement of recycled products by the government.

© Ministry of Commerce (MoC) could be approached for providing incentives for the reuse of products in manufacturing.

(d) Department of Industries could be approached for promoting the use of recycled products and encourage industries to use cleaner technology, to undertake product stewardship and other such waste reduction reuse and recycling strategies.

13. Environment Recovery Procedures (ERP) is the most important aspect. As prevalent in some foreign nations, the government must insist on suppliers to recover the product after use and recycle it. This will ensure better packaging norms.

14. Less packaged products must be purchased. Reward points must be instituted for reduction at initial stages to encourage nurses and ward boys/sweepers.

15. Community/press/NGOs must be more aggressive towards better prioritisation of BMW issues. They must force administrators to abide by govt statutes.

16. To increase awareness 'Nukkad Nataks" or street plays at Prabhag levels must be organised by wings of Pollution Control Boards (PCB).

17. Right from primary school level these issue must form part of essential education. Presently it has remained up to yearly poster competitions. Forests related

entries are invariably received in such poster competitions. No one talks about hospital and all other types of Waste Management.

18. Another important suggestion is to have compulsory ECOMARK on all packaging. Like ISI marking, this will ensure correct packaging and reduction will take place at initial stages.

19. It is also recommended to encourage ISO; 9001; 2008 certifications by HCEs. This certification is under revision at International level as 5 years have completed since inception. So, we must propagate this.

20. In case government hospitals do not have sufficient staff for minimisation, the Municipality/PCB can consider outsourcing minimisation efforts to technically competent groups.

21. Qualified technocrats must head the minimisation management teams in HCEs. These must have clear goals to conserve water, energy, material and reduce/recycle/recover maximum possible stores. This team must be allocated dedicated funds.

22. Brainstorming sessions must be organised by administrators in attendance of this team.

23. Sufficient posters must be displayed for every one to be aware of such issues. Feed back registers at receptions of HCEs must be filled by relatives of patients/guests to assess own efforts in this direction.

Conclusion

24. Though, minimisation merits first priority in gamut of Hospital waste management; but BMW itself is low priority area of concern for municipalities. The HCEs must therefore make their own efforts rather than expecting government assistance. A cleanly kept hospital attracts more patient/business; enjoys more reputation. The increased business permits administrators to spend more on issues like minimisation and BMW as such. Hence a cycle is made. This must be understood by all stake holders.

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