Hospital Waste Management — A better way to manage

Many hospitals are under the impression that incineration is the only way to deal with the problem of infectious wastes. More dangerously, hospitals are made to believe that incinerators are actually a sound technology to dispose medical wastes. Incineration and open burning are used around the world as default substitutes for better medical waste management technologies. When health care facilities use open burning or make-shift incinerators to process their waste, they expose communities living nearby to toxic byproducts (such as dioxins, furans, mercury, lead, and other pollutants). Persistent Organic Pollutants (POPs) such as dioxins and persistent toxic substances such as mercury can travel long distances. The incineration process does not destroy matter – it merely changes the chemical composition and toxicity of the substances burned.

Sterilisation technologies, on the other hand, leave a residue that is much less dangerous. Recognising the health and environmental threats posed by incineration and burning of medical waste, cost-effective and proven technologies like autoclaves, microwaves and chemical disinfection are now being adopted by many hospitals across the country for medical waste management.

Hospital waste is around 15%-20% bio-medical waste (depending on the type of facility). Thus **segregation of hospital waste** to separate it from general municipal waste (nearly 80% of hospital waste) **is the most important task**. This 15%-20% biomedical waste can then be subcategorised as **infectious** and **hazardous** waste.

Many non-incineration alternatives exist for the treatment of medical waste. However, in order to maximise the benefits of non-incineration technologies, a strategic framework of waste segregation and minimisation is needed. The strategic framework entails:

- An analysis of the waste stream
- Implementation of an effective waste collection, transport, and storage system
- Development of waste management and contingency plans
- Occupational safety and health considerations
- Worker training
- Proper citing of the technology.

Non-burn technologies

More health protective waste management practices must be based on an integrated programme **of reduction, reuse, and recycling**. Waste segregation is the key to recycling and cost-savings in waste disposal. Those institutions that control unnecessarily generating, excessive infectious waste, enjoy substantial cost-savings.

Alternative waste treatment technologies avoid many of the public health and environmental impacts of waste incineration. Options include autoclave, microwave, chemical, or radiation waste treatment, sometimes combined with mechanical destruction, in order to render waste non-infectious and non-injurious. Of course, each of these technologies must be subject to the same rigorous analysis as incineration in order to avoid substituting one problem for another.

Four major processes are used to disinfect infectious waste: **thermal, chemical, irradiative, or biological.**

Thermal processes rely on heat to destroy pathogens. The low-heat thermal processes (operating below 180°C) utilise moist or dry heat and do not involve combustion. They are the most widely used alternatives and include autoclaves or retorts, advanced autoclaves, and microwave units.

Autoclaves can be found in a wide range of capacities, from small units in clinics to large systems in centralised facilities capable of handling thousands of kilograms per hour.

Advanced autoclaves are autoclaves with added features such as automatic or continuous waste feeding; internal shredding and mixing to improve the penetration of heat; drying; and post-treatment grinding or compaction.

Other low-heat processes include microwave technologies that use microwave energy to provide moist heat and to generate steam from water in the waste. Dry heat systems circulate heated air in the treatment chamber to disinfect the waste.

Chemical processes employ disinfectants to destroy pathogens, or chemicals to decompose the waste, or agents to encapsulate the waste. The use of chlorine disinfectants (in the form of bleach or chlorine dioxide) has raised concerns about the possible formation of chlorinated by-products in the wastewater. Non-chlorine chemical systems include those that use lime powder, lime slurries, or peracetic acid (which eventually breaks down into vinegar).

Systems that use heated alkali to digest tissues, pathological waste, and animal carcasses have been found to be effective in also destroying chemotherapy agents as well as prion (microscopic protein particles which is a causative agent for certain brain diseases).

Irradiation involves the use of ionizing radiation to destroy microorganisms. In the past, this technology has been used for sterilising food and medical products. Biological processes use enzymes or micro organisms to decompose organic matter. Both irradiative and biological systems are in the development or demonstration stage. Small treatment technologies are available to treat only sharps by destroying needle portions or by melting and encapsulating syringes.

Although many alternatives exist, no one technology offers a panacea to the problem of medical waste disposal. Each technology has its advantages and disadvantages. Facilities have to determine which non-incineration technology best meets their particular needs while protecting health and the environment.

When selecting an alternative technology, the following factors should be considered:

- The nature and quantum of wastes generated
- The technology's ease-of-use, throughput capacity and microbial inactivation efficacy
- The types of wastes treated by the technology
- The environmental emissions, noise, odour and waste residues
- Regulatory acceptance
- Space, utility (water/electricity etc) and other installation requirements
- Waste reduction potential
- The technology's reliability, level of commercialisation, track record and cost
- Community and staff acceptance

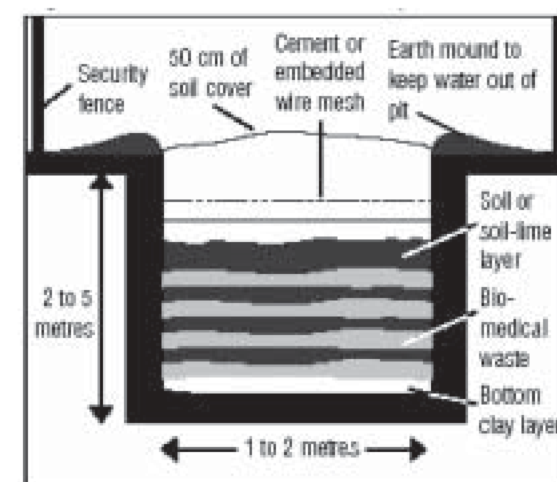

Fig 1 Pit for burial infectious waste

Technologies for Rural settings

The treatment options for disposal of the waste generated in rural areas needs to be very carefully weighed to address the risks that operational deficiencies can pose. The unavailability or shortage of skilled manpower and necessary resources in such areas should also be considered while selecting a technology. Rural areas should learn from urban experiences and not depend on combustion technologies for overcoming the waste problem. Many cleaner alternatives are now available for safely treating and disposing of the medical waste. These technologies are not only cheaper to operate but are also environmentally safer.

The Bio-Medical Waste (Management & Handling) Rules, 1998, make it mandatory for all health care establishments to:

- Segregate waste at source
- Ensure secure collection and transportation
- Carry out deep burial of pathological tissues and animal waste (in regions with population greater than 500,000 persons).
- Provide for alternative treatment methods (non-incineration) for other bio-medical waste streams.

Among the growing number of cleaner and safer solutions are a combination of deep burial, small-scale steam sterilisation, simple devices such as needle cutters, and innovations like the needle puller. The following section deals with some simple ways of handling the waste at rural hospitals:

Infectious waste

Generally, infectious waste in rural areas is disposed off through open burning or dumping. However, these practices should be totally discouraged as they pose a threat to the environment and the community. Small clinics or rural areas that generate small volumes of waste may use on-site waste burial pits as per standards laid down in the Bio-Medical Waste (Management & Handling) Rules, 1998, in areas with population less than 500,000 persons. A pit or trench should be dug about two metres deep. It should be half-filled with waste, then covered with lime within 50 cm of the surface before filling the rest of the pit with soil. On each occasion, when waste is added to the pit, a layer of 10 cm soil should be added to cover the waste. The deep burial site should be relatively impermeable and no shallow well should exist close to the site.

Infectious plastic waste

Autoclaves are available in a wide range of capacities. The required size of the autoclave unit can be calculated based on the size of the safety boxes. For example, a cylindrical chamber autoclave with a minimum diameter of 22 cm (8.5 inches) and a minimum depth of 28 cm (11 inches) can fit a single five-litre safety box. Assuming a typical minimum treatment process of 121° C for 30 minutes, it would be possible to treat 300 syringes a day during a two-hour period, with the above-mentioned autoclave capacity. It may be necessary to use autoclavable liners to prevent waste from sticking to the inner walls or metal trays, and to facilitate removal of the treated waste. Alternatively, for small waste loads, the sharps waste could be collected in a metal container with an opening to allow the penetration of steam, thus eliminating the cost of safety boxes. One advantage of the autoclave is that the equipment is simple enough to be manufactured locally in regions with a light industrial manufacturing sector. It may also be possible to

contd. from page 3

build gas-fire or kerosene, electricity, locally available steam, or other energy sources. Autoclaves should be tested under representative conditions to ensure microbial inactivation.

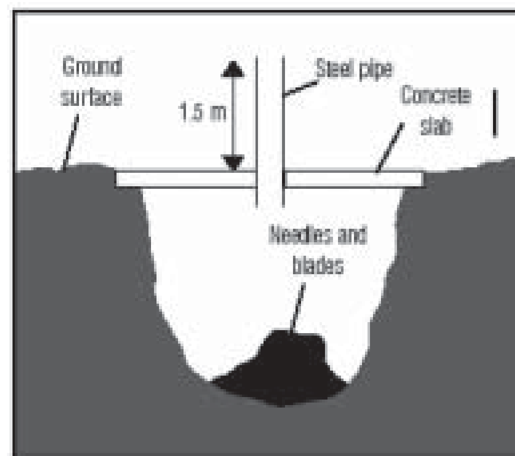

Fig. 2 Pit for sharps waste disposal

Sharps pit

Blades and needles waste, after disinfection, should be disposed in a circular or rectangular pit as shown in Figure 2. Such a pit can be lined with brick, masonry or concrete rings. The pit should be covered with a heavy concrete slab, which is penetrated by a galvanised steel pipe projecting about 1.5 m above the slab, with an internal diameter of up to 20 mm. When the pit is full, it can be sealed completely, after another has been prepared.

Encapsulation

Encapsulation is also an easy technology for disposing sharps safely. Sharps can be collected in puncture and leak-proof containers such as high-density polythene boxes, metallic drums or barrels. When the container is three-quarters full, filler material such as cement mortar or clay can be poured in until the container is completely filled. After the medium has dried, the containers are sealed and disposed in landfills.

Needle destroyers/cutters

The needle destroyer is an electrical gadget that mutilates the needle. The destroyer has an exposed filament. When the needle is inserted, the circuit inside gets completed and a high temperature electric arc is generated which burns the needle. The destroyer also has a cutter that cuts the nozzle of the syringe so that it can no longer be used. Needle destroyers range from battery-run portable devices to plug-in desktop units. Most are automated for one-hand quick operation to prevent needle stick injury.

Centralised treatment facility

Rural communities can be served with a regional or district-level central facility utilising cleaner alternatives. A system of sharps collection, transport and centralised treatment can serve both urban and rural needs. In case of an immunisation campaign, the transport system could be arranged in conjunction with the delivery of vaccine supplies and safety boxes. The safety boxes or sharps containers can be brought back to a centralised facility or a PHC that uses an autoclave. In areas where technologies are not available, the centralised facility could use a combination of treatments with a disinfectant and cement encasing or encapsulation.

Ms Yamini Sharma
Toxics Link, Delhi

References:

1. *The last mile: Reaching Rural India—Srishti /Toxics Link Factsheet December 2002*
2. *World Health Organization (WHO), 2001 Decision—Making guide for managing health-care waste from primary health centers"*
3. *"Understanding and Simplifying Bio-Medical Waste Management: A training manual for trainers" — Toxics Link, January 2005*
4. *"Non Incineration Medical Waste Treatment Technologies" report. Health Care Without Harm, August 2001.*

For more information, write to:
info@toxicslink.org
or visit us at
www.toxicslink.org

Clipboard

A CMAI publication focussing on issues related to hospital administration

Christian Medical Association of India

Published by
The General Secretary
CMAI, Plot no. 2, A-3 Local Shopping Centre, Janakpuri
New Delhi 110 058
Tel: (011) 2559 9991/2/3
E-mail: cmai@cmai.org; cmaidel@vsnl.com
Website: www.cmai.org

CMAI Bangalore Office
HVS Court, 3rd Floor
21 Cunningham Road
Bangalore 560 052
Tel: (080) 2220 5464, 2220 5837
E-mail: cmaiblr@vsnl.com

Editorial Committee
Dr Vijay Aruldas
Mr Jeyakumar Daniel
Mr Innocent Xess
Sr Vijaya
Mr Samuel NJ David
Mr Edward David
Dr CAK Yesudian
Ms Reena Mathai Luke

Editor
Mr Justin Jebakumar

Editorial coordinator
Ms Mary Ngaihte

Design & production
Ms Mary Ngaihte

Printer: Impulsive Creations

Issue 37 January - March 2006

Clipboard

A Quarterly Update on Management Issues from the Administrators Section of the Christian Medical Association of India

Dear Members,

Bio-medical waste is an area of increasing concern for healthcare organisations. Poor handling of medical waste pose a bigger threat to staff, patients and the community. To cite an example, in 1994, 39 cases of HIV infection were detected by Centre for Disease Control (CDC), USA, as occupational infections, of which 32 from hypodermic needle injuries. By 1996, such cases had risen to 51. All infected persons were doctors, nurses or lab assistants!

In India, apart from careless handling of wastes, the practice of unscrupulous recycling of disposables and drugs add to this problem.

Waste management is today recognised as integral part of hospital administration and it is important to understand that different kinds of waste need different type of technology or treatment. Any option, be it incinerators or non-burn technology, should protect health workers and the community in addition to minimising environmental hazards. In short, any technology used for treatment of bio-medical waste should effectively disinfect and mutilate, so that discarded materials (needles in particular) are made non-reusable.

For long, using of incinerators was the most favoured technology. But now with many non-incineration alternatives available, coupled with the realisation that incinerators actually increase the volume of waste — by changing the chemical composition and transforming the solid and liquid toxic wastes into gaseous emission – we know that handling toxic waste needs planning and strategy.

This issue attempts to present alternatives and ideas especially to rural hospitals. CMAI has been working along with Toxics link, an organisation spearheading to address biomedical waste in India. CMAI will be glad to assist any of our member hospitals to devise plan and set up systems in institutions to handle bio-medical waste effectively.

With kind regards,

Justin Jebakumar
Associate Secretary
Administrators Section

Biblespeak

Slander, a blunder

Speaking ill of another person in his or her absence is called slander. We may justify ourselves saying "after all, I am telling the truth only. Imagine God revealing our sins to others. An Old Testament example stands out as a stern warning from God against backbiting. In the story in Numbers 12, Miriam and Aaron led a campaign against Moses. Here are some striking observations: Not Moses but the Lord heard it (v 2). The anger of the Lord was kindled (v 10). This indicates loss of spiritual sensitivity. Miriam was shut out of the fellowship of God's people and faced many more problems.

When you are tempted to backbite, ask yourself these questions: (a) Is it true? (b) Is it necessary? (c) Is it kind? When a back-biter comes to you, ask theses questions: Will it do me any good? Will it do that person any good? If you are backbitten or slandered against, (a) Don't defend (b) Don't offend (c) But bless. Lovelessness is the root cause of backbiting. Love covers multitude of sins (I Pet 4:8). Backbiting grieves the Holy spirit because it is against His nature (Eph 4:30-31). Many examples in the Bible stand out as a stern warning from God against backbiting.

Ref: www. Stanleybible.com - devotion

The key to successful leadership today is influence, not authority
- Kenneth Blanchard