PROJECT REPORT

AUDIT
OF
BIO-MEDICAL WASTE MANAGEMENT
IN
GOVERNMENT HCIs
AND
CENTRALISED BIO-MEDICAL WASTE TREATMENT FACILITIES IN CHENNAI

Prepared by

CAG & Toxics Link Chennai

In collaboration with Srishti programme (Toxics Link Delhi)

Submitted to

TamilNadu Pollution Control Board (TNPCB)

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CAG

Toxics Link
for a toxics-free world

Abbreviations used:

BMW	Bio-medical Waste
BMWM	Bio-medical Waste Management
CAG	Citizen consumer and civic Action Group
Cat.	Category of Bio-medical waste
CBWTF(s)	Common Bio-medical Waste Treatment Facility(ies)
DME	Directorate of Medical Education
ETI	Environment Training Institute (a division of the TNPCB)
GJ	GJ Multiclave India Private Limited
HCI(s)	Healthcare Institution(s)
IOG	Institute of Obstetrics & Gynaecology
PoP	Plaster of Paris
Rules	Bio-Medical Waste (Management & Handling) Rules 1998
TNPCB	TamilNadu Pollution Control Board
TNWML	TamilNadu Waste Management Limited
ToT	Training of Trainers

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INTRODUCTION

The deadlines set by the Bio-Medical Waste Rules for healthcare institutions (HCIs) in Chennai city to set up efficient waste management systems expired on December 31, 2002. Despite this, many HCIs are yet to initiate appropriate steps towards complying with the Rules. In particular the Government-run HCIs that cater to a large proportion of healthcare consumers in the city lag behind, even in basic steps such as segregation of waste.

With this situation in mind, the TamilNadu Pollution Control Board (TNPCB) requested CAG (Citizen consumer and civic Action Group) and Toxics Link Chennai to assess the prevailing conditions of bio-medical waste management in the 18 Chennai city-based Government HCIs and suggest a possible plan of action to develop their capacities to safely deal with the waste that they generate. Part of this plan of action required a study of the feasibility of using the waste disposal capacities of existing Common Bio-Medical Waste Treatment Facilities (CBWTFs) set up primarily to deal with waste from Chennai city-based private HCIs, for disposal of the Government HCI waste as well. The plan of action also included a comprehensive training component (including training the trainers) on safe bio-medical waste management and disposal.

As such therefore, the CAG-Toxics Link Chennai study focussed on

a. Waste audit (including waste generation and instrumentation) and assessment of 19 HCIs;
b. Waste disposal audit of the two CBWTFs (located at Thenmelpakkam and Chennakuppam in Kancheepuram district) with a view to evaluate their capacity to take on additional waste loads and;
c. Training of the HCIs and establishment of a model institution.

This report comprises the first **two** of the three parts including recommendations that flow from the audit findings. The schedules for the audits and site visits etc. have been included as Annexures.

PART I

AUDIT AND ASSESSMENT OF GOVERNMENT HCIs

As a first step in the execution of the project, an action plan was developed and discussed with the various stakeholders of the project at the 1st project review meeting (Refer Annexure). The main stakeholders in the project are TNPCB, DME, Chennai Corporation, ETI, CAG and Toxics Link Chennai.

Action Plan for Implementation of BMWM and Training

The action plan developed for streamlining bio-medical waste management in Government institutions in Chennai city is divided into two parts – Part I focuses on short-term crisis management that required immediate operationalising, and Part II is the long-term plan that incorporates regular training for all healthcare workers and looks at the appropriateness of on-site and off-site disposal of wastes.

As mentioned earlier, this Report is confined to the first part of the Action Plan – and looks at the specific interventions that need to be made the HCI level to introduce safe BMWM and practices. These interventions have been developed on the basis of the rapid audits conducted – on waste generation (quantity and quality) as well as on the existing waste management and disposal capacities of the HCIs, with a specific focus on instruments available.

The details of the training and indeed of the long-term waste management plan are **not** included in this Report and will be provided separately.

***Disclaimer**: The Crisis Management Plan was proposed purely as a temporary measure and should not be construed as a final solution, while the Long-term plan was proposed as the way forward to reach the desired status in bio-medical waste management in Chennai. All measures were ensured to be in accordance with the Bio-medical Waste (Management and Handling) Rules 1998.*

PART I – AUDIT AND ASSESSMENT OF HCIs

Collation of Baseline Information

As a first step the necessary information on the number of institutions, total number of all employees and the total number of beds in each HCI was sought from the DME.

Step I - Rapid Waste Audit

All BMW from different areas of the HCI, namely, the Wards, Nursing station, O.T, laboratories, blood bank etc were weighed in order to arrive at the volume of waste generated.

If the waste had been segregated then each of the colour-coded bag was weighed separately to get the volume of segregated waste.

If the waste had not been segregated then the bags were emptied, segregated and then weighed.

This was a step incorporated into the plan, so that the statistics on the volume of waste generated could eventually be used for waste minimisation strategies.

Step II – Rapid Instrumentation Audit

- Assessment of the raw materials supplied for regular healthcare such as cotton, bandages (if they are bleached or not), supply of syringes (both plastic and glass), IV bottles, other tubing etc. This was obtained through hospital records, which were readied prior to the audit.
- Assessment of all equipment used for waste management such as autoclaves, needle-cutters/needle destroyers.
- Assessment of sodium hypochlorite for disinfection.

Step III – Management of Priority Areas

Based on the information collected during the audits, representatives of CAG / Srishti /Toxics Link Chennai listed the following steps for immediate (short term) implementation.

PA1 – Segregation

CAG / Toxics Link along with the representatives of the HCIs identified specific waste generation zones and suggested simple segregation measures to reduce the waste management problem.

Since segregation should be done at the lowest level for it to be successful, segregation was mandated to be set-up at the nursing station level in each HCI. At this stage, it was found that 3 bins/containers and a needle destroyer would be mandatory for the HCI to set up at these nursing levels to cater to:

1 – For infectious solid waste (Cat. 6)
2 – For Sharps (Cat. 4)
3 – For Plastics (Cat. 7)

However, subsequently after discussions with the HCI staff and experts, this recommendation was modified. *(Refer **Recommendations** section for details)*

PA2 – Disinfection

It was suggested that sharps be disinfected with hypochlorite and then sent to the autoclave. As a rule, wastes of bins 1 & 2 (listed above) should be sent to a waste autoclave dedicated for waste management. The contents of bin 3 should be disinfected with Hypo and collected separately for recycling. *(Refer **Recommendations** section for details)*

PA3 – Sharps Management (Category 4)

It was suggested that measures be taken for on-site disposal of sharps to limit and reduce the possibility of infection spread. Towards this, all HCIs were directed to take suitable steps for the provision of an underground concrete sharps pits with a lockable lid within their premises.

It was also suggested that no recapping of syringes be done after the injection has been administered. All sharps were directed to be collected from the wards and taken to the Nursing Station where they should be destroyed with a needle destroyer. All other sharps (including vials, broken glass etc.) should be contained in a sharps container temporarily or disposed in the sharps pit permanently.
*(Refer **Recommendations** section for details)*

PA4 – Solid waste (Category 6)

It was suggested that no waste be burned and that all collected solid waste should be autoclaved and then separately sent to the Corporation identified secured landfill site. In HCIs with large campuses, deep burial pits with adequate fencing will be ideal to dispose solid waste. Nearby crematoria or cemetery can also be options that can be considered. *(Refer **Recommendations** section for details)*

PA5 – Plastics (Category 7)

It was suggested that:
All autoclaved syringes be shredded.
Licensed recyclers for waste plastic recycling will be identified and certified to collect and recycle plastic waste.
All general waste should be collected by Chennai Corporation for municipal dumping.
*(Refer **Recommendations** section for details)*

RECOMMENDATIONS FOR IMPROVING BMWM

General Recommendations for all HCIs

PA1 - Segregation

As the assessment was being carried out, it was noticed that there were several misconceptions regarding the use of colour codes for segregation purposes. Hence it was decided that the appropriate colours for the respective categories of waste be developed and circulated to all 18 healthcare institutions.

Colour coding - The following colour codes and locations of the coloured bins and the treatment for the different categories of waste were developed.

Colour	Waste Category	Location	Treatment
YELLOW	Human anatomical & body parts	Only operation Theatre and Labour Rooms	Incineration/Burial
RED	Infectious Gauze, cotton, plastic tubing, syringes and other infected plastic, etc	All wards/Nursing stations	Autoclave
BLUE	Sharps	All wards/Nursing stations	Autoclave
PUNCTURE PROOF CONTAINER	Remnants from the needle destroyer	All wards/Nursing stations	Sharps pit
GREEN	General waste	Separately kept from bio-medical waste bins	Composting or handed over to Municipal Corporation

Further to the specifications on colour coding three main recommendations were provided:

- Separation of green bin from medical waste bins at the nursing station
- Provision of yellow bin only in areas of surgery and in delivery rooms
- Procurement and supply of coloured bins and bags (From the DME's office)

PA2 – Disinfection

As most of the HCIs did have adequate number of autoclaves, disinfection should ideally be a non-problem area. However, it was found that very few HCIs had a dedicated waste autoclave.

- All institutions having more that one autoclave were directed to dedicate specifically one autoclave for disinfection. The institutions were also asked to adequately upgrade autoclaves to meet the standards.

The usage of hypochlorite for disinfection in several HCIs was poor, either due to lack of knowledge of use or lack of supply.

- All HCIs were directed to procure hypochlorite immediately with available financial resources

PA3 – Sharps

Several HCIs already had needle destroyers. These were either concentrated in the blood bank, a few wards, laboratories, etc. Therefore, this congregation resulted in improper distribution of needle destroyers. Recommendations thus provided include:

- Redistribution of needle destroyers to areas where sharps were used
- Usage of blue bins/puncture proof sharp containers at the nursing stations, injection rooms, etc.
- DME's office was requested by the TNCPB to reactivate the Hospital Maintenance Fund which could be used for procurement of needle destroyers
- Construction of concrete sharps pits in whichever institutions possible

PA4 – Solid waste

- Autoclaving of solid waste
- Collection of autoclaved waste by Chennai Corporation in designated vans

PA5 – Plastics

- As plastics were segregated to a certain extent efficiently by most institutions, it was recommended that the infected plastics be autoclaved and that the Chennai Corporation collect it and dispose it in designated landfill site.

On a general note, all HCIs were instructed to:

- Apply and procure due authorisation, if not already obtained
- Set up a Core Group on BMWM
- Identify and allocate a main collection and storage area within the campus for BMW and isolate it from access to general public

Specific Recommendations for each HCI

These recommendations are based on the audit carried out and come from the need for specific, tailor-made suggestions, but at the same time which were simple and doable. Each aspect of BMWM was studied closely and with the resources available with the institutions, the following recommendations were made for each of the 18 HCIs, in the form of 'DOs' and 'DON'Ts'. This basic attempt was successful in rendering bio-medical waste non-infectious once it leaves the premises and simultaneously demonstrating the effortlessness of proper BMWM.

Kasturba Gandhi Hospital

Salient audit findings: Since this is primarily a maternity HCI, the waste is largely composed of placenta and related waste. Poor levels of segregation were observed. Supplies were found to be inadequate. Instrumentation was also inadequate.

DOs

1. Adequate number of coloured bins and the respective colour bags should be immediately procured. Smaller-sized bins should be used for waste collection at the ward level and larger size bins for final collection
2. Wastes should be segregated into the respective coloured bins lined with the respective colour bags (according to the Rules) at the ward level
3. Put up posters clearly specifying colour codes for wastes in the wards and all waste collection points.
4. Disinfection using bleach and water solution in a concentration of 1% must be done at all the wards
5. All hospital workers should wear gloves (double gloves for sharps) while handling bio-medical wastes
6. Needle destroyers should be used to destroy needles. Ideally all nursing stations at each ward should have one.
7. An autoclave dedicated for waste treatment should be immediately procured.
8. Nodal officer for waste management should be appointed

DON'Ts

1. Never pick up or handle bio-medical wastes with bare hands, especially sharps
2. Never dispose any untreated waste with the municipal garbage
3. Never burn wastes of any kind

Government Royapettah Hospital

Salient audit findings: The HCI is a multi-speciality institution and therefore generates all categories of wastes. The waste generated is about 4-6 kgs per bed per day. Poor levels of segregation were observed and therefore much of the BMW waste was mixed with non-infectious and general waste. A fair amount of disinfection with hypo was observed taking place though there is hardly any waste being autoclaved. The instrumentation audit revealed that sufficient numbers of bags and bins existed. 5 autoclaves (mini) and 6 needle destroyers are available. Most of the equipment was found to be in good working condition.

DOs

1. Bins must be lined with bags, this helps waste collection
2. Disinfection must be done at all the wards, blood banks and Labs
3. Needle destroyers must be used to destroy needles at the ward level itself.
4. Though glass syringes reduce waste, they must be thoroughly sterilised before reuse.
5. An autoclave must be dedicated for waste treatment.
6. The main collection point for waste should be isolated and fenced to prevent access to it by unauthorised personnel.

DON'Ts

1. Never pick or handle bio-medical wastes with bare hands, especially sharps
2. Never mix infectious waste with non-infectious material, especially plastic waste as it is recycled
3. Never dispose any untreated waste with the municipal garbage
4. Never dispose any other waste in the sharps pit.
5. Never burn wastes of any kind

Institute of Child Health and Hospital for Children

Salient audit findings: Partial segregation with different colour bins was observed. However, a majority of the bins contained mixed waste. Random disinfection with beach solution was prevalent. The HCI had sufficient needle destroyers and autoclaves.

DOs

1. Wastes must be clearly segregated according to the respective colour codes
2. The green bin for 'General waste' must be kept separate from the other coloured bins used for bio-medical waste
3. Disinfection must be carried out at the 'Immunisation cell'
4. Needle cutters should be mandatorily used at all places where injections are administered, particularly at nursing stations
5. All medical waste handlers should wear gloves
6. Top Management and Nursing staff should be pro-active in waste management
7. The institution needs to dedicate an autoclave for waste management
8. The main collection area should be fenced off so that public do not have access to it.

DON'Ts

1. Never mix general wastes with bio-medical waste
2. Never mix infected plastics and non-infected plastics
3. Never burn wastes of any kind

Kilpauk Medical College & Hospital

Salient audit findings: Minimal segregation with variously coloured bins containing mixed waste was observed. Random disinfection with beach solution was prevalent. The HCI had 3 autoclaves of which two have been non-functional for a long while.

DOs

1. Coloured bins and bags need to be supplied to all the wards
2. Segregation must be initiated immediately
3. Wastes collected should be left unopened in the final collection area.
4. All wastes that require disinfection should be treated with hypochlorite solution, especially infected plastics and sharps
5. One autoclave must be dedicated for waste management

DON'Ts

1. Never handle biomedical waste with bare hands (especially sharps)
2. Never mix medical waste and general waste

Stanley Medical College Hospital

Salient audit findings: High level of segregation with appropriate colour bins was observed. Most of the nursing stations carried out disinfection. Good number of needle destroyers were available and in use. The HCI is operating a dedicated waste autoclave.

DOs

1. Segregation should be carried out more rigorously
2. Needles should be destroyed at all places where injections are administered, particularly at nursing stations immediately one needle destroyer needs to be allotted for the biochemistry lab
3. Separate needles and syringes and dispose them in the respective bins
4. Larger sized bins need to be provided to the Clinical Pathology lab
5. gloves should be used by all waste handlers
6. Management should monitor waste management on a regular basis

DON'Ts

1. Never handle biomedical waste with bare hands
2. Never mix general wastes with bio-medical waste
3. Never mix infected plastics and non-infected plastics
4. Never burn wastes of any kind

General Comments:

Segregation system in place
Dedicated waste autoclave in place and in working condition
Nodal officer for bio-medical waste management has been appointed

I. O. G and Government Hospital for Women and children

Salient audit findings: Minimal segregation with random coloured bins was observed. Random disinfection with bleach solution was prevalent. The HCI did not possess sufficient needle destroyers and autoclaves.

DOs

1. Adequate number of coloured bins and the respective colour bags should be immediately procured.
2. Posters clearly specifying colour codes for wastes should be put up in the wards and all waste collection points.
3. Disinfection using hypochlorite/ bleach solution in a concentration of 1% must be done at all the wards
4. All hospital workers should wear gloves (double gloves for sharps) while handling bio-medical wastes
5. Needle destroyers should be used to destroy needles. Ideally all nursing stations at each ward should have one.
6. An autoclave dedicated for waste treatment should be immediately procured.

DON'Ts

1. Never pick up or handle bio-medical wastes with bare hands, especially sharps
2. Never dispose any untreated waste with the municipal garbage

Regional Institute of Ophthalmology and Govt. Ophthalmic Hospital

Salient audit findings: Segregation with different colour bins was observed. However, a majority of the bins contained mixed waste. Random disinfection with bleach solution was prevalent. The HCI had no needle destroyers and 4 autoclaves, but none for dedicated waste treatment.

DOs

1. Bins must be lined with bags, this helps waste collection
2. Disinfection of all wastes must be done at all the wards especially in the septic ward, blood banks and Labs
3. Needle destroyers must be used to destroy needles at the ward level itself.
4. An autoclave must be dedicated for waste treatment.

DON'Ts

1. Never pick or handle bio-medical wastes with bare hands, especially sharps
2. Never mix infectious waste with non-infectious material, especially plastic waste as it is recycled
3. Never dispose any untreated waste with the municipal garbage

Government General Hospital

Salient audit findings: Segregation with different colour bins was observed. However, a majority of the bins contained mixed waste. Random disinfection with bleach solution was prevalent. The HCI had 4 needle destroyers and 1 autoclaves for dedicated waste treatment. A pit for disposal had been dug up but contained mixed waste.

DOs

1. Colour bins and colour bags of adequate capacity, especially for the central lab, should be procured
2. Posters / stickers clearly specifying colour codes for wastes should be put up in the wards and all waste collection points.
3. Existing needle cutters must be used and more needle destroyers (an appropriate one for the blood bank) must be procured
4. Disinfection of all infectious wastes using hypochlorite/ bleach and water solution in a concentration of 1:10 must be done at all the wards
5. Appropriate containers should be used to store sharps
6. Waste treatment monitoring must ensure that the disinfection/autoclaving is done

DON'TS

1. Never dispose used IV bottles in bins containing infected waste
2. Never mix medical waste & general waste
3. Never dispose medical waste in the open
4. Never handle biomedical waste with bare hands (especially sharps)

Government R.S.R.M Lying In Hospital

Salient audit findings: Minimal waste generation and segregation with different colour bins was observed. However, a few bins contained mixed waste. Random disinfection with bleach solution was prevalent. The HCI had 5 needle destroyers and a central autoclave, but not for dedicated waste treatment.

DOs

1. Segregation must be carefully monitored
2. All wastes that require disinfection especially wastes from the septic ward should be treated with hypochlorite / bleach solution
3. Needle destroyers should be used in all wards
4. One autoclave must be dedicated for waste management

DON'Ts

1. Never handle biomedical waste with bare hands (especially sharps)
2. Never mix medical waste and general waste
3. Do not leave waste opened in the final collection area
4. Do not store waste in an area accessible to rag pickers
5. Never burn wastes

Government Peripheral Hospital, Tondiarpet

Salient audit findings: Segregation with different colour bins was observed. However, a majority of the bins contained mixed waste. Random disinfection with bleach solution was prevalent. The HCI had no needle destroyers and 4 autoclaves, but none for dedicated waste treatment.

DOs

1. Adequate number of coloured bins and the respective colour bags should be immediately procured.
2. Appropriate containers should be used to store sharps
3. Posters clearly specifying colour codes for wastes should be put up in the wards and all waste collection points.
4. Disinfection using hypochlorite / bleach and water solution in a concentration of 1:10 must be done at all the wards
5. Needle destroyers should be used to destroy needles. Ideally all nursing stations at each ward should have one.
6. An autoclave dedicated for waste treatment should be immediately procured.

DON'Ts

1. Never pick up or handle bio-medical wastes with bare hands, especially sharps
2. Never dispose any untreated waste with the municipal garbage
3. Never mix medical waste and general waste
4. Wastes should not be stored in an area accessible to rag pickers
5. Never burn wastes

Government Peripheral Hospital, Anna Nagar

Salient audit findings: Segregation with different colour bins was observed. However, a majority of the bins contained mixed waste. Random disinfection with bleach solution was prevalent. The HCI had 3 needle destroyers and 5 autoclaves. None was used for dedicated waste treatment, and one was non-functional.

DOs

1. Waste must be segregated into the appropriate bins provided.
2. All waste must be disinfected with 10% hypochlorite / bleach solution at the ward level
3. Posters clearly specifying colour codes for wastes should be put up in the wards and all waste collection points
4. The bin for general waste should be kept away from the other bins
5. Bins for bio-medical waste must be kept out of the reach of patients and attendants
6. Needle destroyers should be used to destroy needles. Ideally all nursing stations at each ward should have one
7. An autoclave should be dedicated for the treatment of bio-medical waste

DON'Ts

1. Never handle bio-medical waste with bare hands especially sharps
2. Never mix bio-medical waste with general waste
3. Never burn wastes

Government Peripheral Hospital, Periyar Nagar

Salient audit findings: Very poor segregation and disinfection was noticed. Disinfection was almost absent, inspite of the fact that this HCI generates a lot of sharps waste. Instrumentation was also inadequate. Needle cutters were in use and 3 autoclaves were installed of which one was non-functional.

DOs

1. Waste must be segregated and colour codes must be strictly followed
2. All waste must be disinfected with 10% hypochlorite / bleach solution at the ward level
3. Posters clearly specifying colour codes for wastes must be displayed in all waste collection points
4. Infected plastic should be separated from non-infected plastic
5. The bin for general waste should be kept away from the other bins
6. Bins meant for bio-medical waste must be kept out of the reach of patients and attendants
7. Preferably, standard needle cutters / destroyers must be used to destroy needles. In case other implements are used, it should be ensured that needles have been properly destroyed.
8. An autoclave should be dedicated for the treatment of bio-medical waste
9. All waste handlers must wear gloves.

DON'Ts

1. Never handle bio-medical waste with bare hands especially sharps
2. Never mix bio-medical waste with general waste
3. Avoid crude methods of needle destruction
4. Never dispose untreated bio-medical waste with the municipal waste

Government Peripheral Hospital, KK Nagar

Salient audit findings: Satisfactory levels of segregation and disinfection was observed. Supplies were found to be inadequate. Needle destroyers were very few in number. The dedicated waste autoclave was non-functional during the audit.

DOs

1. General Waste Bin should be removed from medical waste area of nursing station
2. One yellow bin is must be provided for female surgical ward
3. Adequate Hypochlorite solution must be procured.
4. Atleast two needle destroyers should be immediately procured. One for injection room and one for the wards
5. Infected plastics should be properly separated from non-infected plastics
6. All waste handlers must wear gloves
7. Dedicated waste autoclave should be properly maintained
8. Burial pit should be fenced to prevent access to general public

DON'Ts

1. Never recap or bend the needle manually. Bending is not an option for disposal
2. Never keep the green bin with the other medical waste bins
3. Never put mixed wastes in the deep burial pit

Govt Rehabilitation Hospital and Centre for Artificial Limbs, KK Nagar

Salient audit findings: On a general note, the HCI generates minimal quantity of waste. Satisfactory levels of segregation were observed. Supplies were found to be inadequate. No needle destroyers were available. The HCI did not possess a dedicated waste autoclave. Large quantities of PoP waste was seen lying in the campus.

DOs

1. General waste should be cleared periodically and should not be left scattered in the premises
2. One needle destroyer must be procured for the hospital
3. Needles must be destroyed and kept separately
4. Adequate hypochlorite solution should be provided at nursing stations

DON'Ts

1. Never mix general waste with bio-medical waste
2. Never recap or bend the needle. Bending is not a form of disposal
3. Do not bury the sharps in an open pit

Area of concern: Large volumes of infected and non-infected PoP waste

Government Hospital of Thoracic Medicine, Otteri

Salient audit findings: Poor levels of segregation and disinfection were observed. Supplies were found to be inadequate. No needle destroyers were available and makeshift pullers were in use. No dedicated waste autoclave was in use.

DOs

1. Waste must be segregated and the bin for general waste should be kept away from the other bins
2. Posters/ stickers on waste segregation must be put up all waste collection points
3. All waste must be disinfected with 10% hypochlorite / bleach solution at the ward level, particularly for sputum and pus.
4. Sputum and sputum collection devices should be disinfected with hypochlorite
5. Sputum steriliser should be used for the treatment of sputum
6. Gloves and masks must be worn by people handling bio-medical waste
7. The bins meant for bio-medical waste must be kept out of the reach of patients and attendants
8. Preferably, standard needle cutters / destroyers must be used to destroy needles. In case other implements are used, it should be ensured that needles have been properly destroyed.
9. An autoclave should be dedicated for the treatment of bio-medical waste

DON'Ts

1. Waste incineration should not be permitted since the hospital is very close to residential neighbourhoods.
2. Avoid using too many bins for waste collection, in the lab, it may lead to confusion.
3. Never handle bio-medical waste with bare hands especially sharps
4. Never mix bio-medical waste with general waste such as paper and packaging
5. Never drain sputum and pus into the sewer without any disinfection or treatment.
6. Waste handlers must be aware of the final disposal of each kind of waste
7. General waste should not be disposed in the wells for bio-medical waste
8. Pigs should not be allowed into the campus

Institute of Mental Health, Kilpauk

Salient audit findings: Poor levels of segregation and disinfection were observed. Supplies were found to be inadequate. No needle destroyers were available and makeshift pullers were in use. No dedicated waste autoclave was in use. In general the HCI was not generating much waste.

DOs

1. Waste must be segregated
2. All waste must be disinfected with 10% hypochlorite / bleach solution especially at the laboratory
3. Preferably, standard needle cutters / destroyers must be used to destroy needles. In case other implements are used, it should be ensured that needles have been properly destroyed.

DON'Ts

1. Never handle bio-medical waste with bare hands especially sharps
2. Never mix bio-medical waste with general waste

Note: The institution itself generates very negligible quantities of bio-medical waste, while the Lab attached to this hospital actually generates waste. The practice of taking back used disposable syringes in condemnation increases the chances of spread of infection.

Government Hospital, Saidapet

Salient audit findings: Poor levels of segregation and disinfection were observed. Supplies were found to be inadequate. No needle destroyers were available and makeshift pullers were in use. No dedicated waste autoclave was in use.

DOs

1. All waste must be segregated
2. Posters/ stickers on waste segregation must be put up all waste generation and collection areas
3. All waste must be disinfected with 10% hypochlorite / bleach solution at the ward level
4. Sputum and sputum collection devices should be disinfected with hypochlorite
5. All waste handlers must wear gloves while handling bio-medical waste
6. The bins for bio-medical waste was kept out of reach of patients and attendants
7. Preferably, standard needle cutters / destroyers must be used to destroy needles. In case other implements are used, it should be ensured that needles have been properly destroyed.
8. An autoclave should be dedicated for the treatment of bio-medical waste

DON'Ts

1. Never handle bio-medical waste with bare hands especially sharps
2. Never mix bio-medical waste with general waste
3. Crude methods of needle destruction such as breaking/ bending the needle should be avoided
4. Never burn bio-medical wastes

Govt. Hospital for Thoracic Medicine, Tambaram

Salient audit findings: Poor levels of segregation and disinfection were observed. Supplies were found to be inadequate. Needle destroyers were available but not being put to use efficiently. No dedicated waste autoclave was in use. Sharps was being disposed in a secured pit at the back of the campus. The institution has an acute problem of infectious liquid waste, containing pus, being disposed off in the sewer.

DOs

1. Waste segregation must be properly done
2. Posters/ stickers on waste segregation must be put up all waste collection points
3. All waste must be disinfected with 10% hypochlorite / bleach solution at the ward level
4. Sputum and sputum collection devices should be disinfected with hypochlorite
5. Gloves and masks must be worn by people handling bio-medical waste
6. The bin for general waste should be kept away from the other bins
7. Keep the bins for bio-medical waste out of the reach of patients and attendants
8. An autoclave should be dedicated for the treatment of bio-medical waste

DON'Ts

1. Never handle bio-medical waste with bare hands especially sharps
2. Never mix bio-medical waste with general waste such as paper and packaging
3. Never incinerate mixed bio-medical waste
4. Never bury mixed bio-medical waste

PART II

AUDIT AND SURVEY OF CBWTFs

This CBWTF audit had been included under the long-term plan since eventually a centralised facility to dispose waste is easier to run and monitor (environmentally and economically) than several onsite facilities. The presence of the existing two CBWTFs gives an opportunity to examine the possibility of the government hospitals also sending their waste to one or the other or indeed a third CBWTF for final disposal in the long run. It was therefore felt that an audit of the existing facility be conducted immediately.

Hence, the TNPCB asked (*Ref:* letter no. TNPCB/BMWM/19002/04-1 dated 25-6-2004) CAG and Toxics Link Chennai to conduct a study and analyse the quantity and quality if waste being received at the CBWTFs and at the same time assess and gauge the CBWTFs capacity to handle more wastes.

A questionnaire was prepared to elicit the necessary information (Refer Annexure) and representatives of CAG, Toxics Link Chennai and Srishti visited (Refer Schedule) the two facilities.

Rapid Audit and Assessment of CBWTFs in Kancheepuram district

Common Bio-Medical Waste Treatment Facilities (CBWTFs) assessed:
I - CBWTF run by GJ Mulitclave Pvt Ltd.
II – CBWTF run by Tamil Nadu Waste Management Ltd (A division of Ramky Group)

The Guidelines for the Common Bio-medical Waste Treatment Facility (CBWTF) were issued by the Central Pollution Control Board (CPCB) in 2003 (Refer Annexure). Below is an audit and assessment of the CBWTFs in the Kancheepuram district catering to the private-run healthcare institutions in Chennai and nearby areas. This exercise is to evaluate the adherence to the said Guidelines.

The first part specifically deals with assessing the quantity of waste collected and disposed in order to analyse the feasibility of the addition of more healthcare units to the CBWTF as well as the overall assessment. The second part constitutes the Recommendations.

PART I – CBWTF Assessment

Location:
The GJ facility is situated at about 2 kms from Thenmelpakkam, the nearest village. TNWML facility is also situated at about 2 kms from Oragadam, the nearest habitation spot. Thus the facilities are reasonably far away from residential areas and the location does not appear to have impacted any local community. However, the flip side of this 'benefit' is that there is no community monitoring of the functioning of the facilities possible. Thus the responsibility of monitoring falls squarely on the TNPCB.

Land:
Both the facilities have adequate land considering that the Guidelines suggest a minimum of 1 acre.

Coverage:
GJ caters to 162-165 healthcare institutions (HCIs) amounting to a total bed count of about 7000 beds since most of the HCIs are large and perform multi-speciality services. TNWML caters to 300 healthcare institutions, most of which are small HCIs and clinics, amounting to a total bed count of only 3700 beds.

As is evident, neither of the facilities is running to the full capacities of the technologies (24-hr operation) installed – which are for 10,000 beds each.

Treatment Equipment / Technology:
Before discussing the merits or otherwise of the equipment being used by the CBWTFs, the audit team found some discrepancies in the data of waste received by the facilities. The data obtained from the records of the CBWTFs suggest that they receive the following quantities of waste:
GJ:
Incinerable Waste – 1500-1600 kg/day
Autoclaveable Waste – 50-60 kg/day

TNWML:
Incinerable Waste – 250-300 kg/day
Autoclaveable Waste – 75-80 kg/day

As is evident there is a discrepancy in the quality of waste being received by the CBWTFs – with GJ receives atleast 150% more waste per bed from their HCI in comparison with TNWML. Similarly, GJ is incinerating thrice the quantity of waste that TNWML incinerates. **This data needs further investigation since this kind of discrepancy only proves arbitrary noting and collection of data.**

Incinerator
GJ has an incinerator of 200 kg/hr capacity. (This assessment does not carry a technical assessment of the incinerator based on the 'Guidelines for design and construction of Bio-medical waste incinerator' issued by the CPCB in 2003). During the audit, the burner of the incinerator developed a problem and was being fixed by the manufacturer.

TNWML has an incinerator of 150kg/hr capacity. (This assessment does not carry a technical assessment of the incinerator based on the 'Guidelines for design and construction of Bio-medical waste incinerator' issued by the CPCB)

Autoclave
Both GJ and TNWML have pre-vacuum autoclaves of a capacity of 300 lt/cycle. TNWML also has a standby autoclave of 50lt/cycle

The autoclave at GJ, which was intended for **automated loading is currently not being used** in the manner explained by the operating manual. Waste is still being manually loaded. During a demonstration of the functioning of the autoclave during the visit, the autoclave got jammed at an inclined position.

During the 2nd visit to TNWML, **the main autoclave was under repair** with a defect in the steam valve. The back-up autoclave was being used.

The audit team is unaware if this information (regarding breakdown and failure) is shared with the TNPCB. This information is critical in the development of the overall framework of waste management since there is complete dependence on the ability of the facilities to function continuously and round-the-clock.

Shredder
Both shredders are similar and appear to be functioning normally. **However, unshredded full syringes were seen in the shredded waste bin at TNWML.** When asked by the audit team, the personnel agreed to run the syringes through the shredder another time. However, it is unknown if the shredder was inherently defective or whether syringes were dumped without shredding. In either case, monitoring by the TNPCB is critical in ensuring that these types of problems do not recur.

Sharp pit/Encapsulation
GJ has already utilised about 35 sharps pits of diameter 5 ft x 3 ft. **Observation revealed that mixed waste including syringes were seen in these pits.**
At TNWML, one sharp pit has been constructed but is not in use.
Neither facility has explored the possibility of metal recover from sharps.

The vehicle/Container washing facility and the ETP appear to be in appropriate working condition.

Infrastructure
While both the facilities have large equipment rooms, the room of GJ does not appear to have adequate ventilation. The GJ facility also does not have a main waste storage room, though it is recommended in the Guidelines. TNPCB may consider the necessity of such a pre and post-treatment storage rooms, especially when specific plans are developed for future waste management – especially for plastic recycling, metal recovery etc. **Neither of the facilities have a separate cabin to supervise the operation of the equipment as prescribed by the Guidelines.**

Most other guidelines, except those with respect to signboards, appear to have been adopted. **Signboards have not been put up** outside the facility**.** Signage is important especially for emergencies and therefore must not be compromised.

The Green Belt is still 'under development'. Odour control too has not been developed except at the ETP.

Protective gear has been supplied, though the regular usage of the gear needs monitoring.

Record keeping

The detailed information and record keeping as suggested by the 2003 Guidelines does not appear to be in practise. The facilities do possess one or two registers / log books. However, the data / information in these registers appears inaccurate and as such this system needs constant supervision.

To illustrate, the data obtained from the records of the CBWTFs suggest that they receive the following quantities of waste:

GJ:	TNWML:
Incinerable Waste – 1500-1600 kg/day	Incinerable Waste – 250-300 kg/day
Autoclaveable Waste – 50-60 kg/day	Autoclaveable Waste – 75-80 kg/day

As is evident there is a wide discrepancy in the quantity of waste being received by the CBWTFs – with GJ receives atleast 150% more waste per bed from their HCI in comparison with TNWML. Similarly, such discrepancy is evident in the quality of the waste too with GJ incinerating thrice the quantity of waste that TNWML incinerates. **This data needs further investigation since this kind of discrepancy only proves arbitrary noting and collection of data.**

Collection and transportation

According to the estimates of the facilities' supervisors, an average of about 50-60 % of waste received alone is segregated. **A large portion of the waste collected has general waste mixed with it.**

The audit team found that while care has been taken to ensure that the transportation of waste takes place with minimum risk, the understanding of the waste handling personnel on possible risks associated with poor handling and management of the waste was limited.

At the GJ facility, the audit team observed that all bags from a HCI are further packed into one (yellow) bag during collection by the CBWTF van. At the facility this (yellow) bag is opened and the different coloured bags are separated and subjected to disposal. Bags with discernible blood material are incinerated and the red bags are autoclaved. Sharps (with Hypo) are separately collected in a large plastic bin from the HCI and brought to the facility and shredded.

At GJ, incinerator ash is landfilled, sharps are buried in concrete bins and autoclaved plastics are either landfilled or buried in concrete bins. At TNWML the incinerator ash alone is landfilled, while sharps and shredded plastic are stored, with the operators awaiting further directions from the TNCPB.

Miscellaneous

GJ:

The facility comprises of a vast expanse of land. The 'Green belt' is as mentioned earlier 'under development'. The facility receives electricity and the functioning of the facility begins at around 7.30 pm when the collecting trucks (3 nos.) are scheduled to arrive. The vehicles

cover a total distance of 250 kms. Staff comprises of 12 -15 persons including the plant supervisor, driver and pick-up assistants.

TNWML:
The facility is spread over 5 acres of land, with inadequate green coverage. The green belt needs to be developed some more since the green belt plays an important role in reducing odour and noise. The plant is run on generator as there is no power supply in the area. The facility uses two Tata vehicle (model 407) and two autos for waste pick-up. These vehicles cover approximate distances of 180 kms to collect waste. Staff of 10 people which includes the drivers, supervisors and pick-up assistants.

Recommendations on CBWTFs

1. **Quantity of waste & waste segregation** - Both the facilities receive waste at a quantity less than the stipulated bed strength. To make effective use of the two facilities the incinerator and the autoclave must be operated to its full capacity. However, the segregation levels are not satisfactory. Therefore, any further load of unsegregated waste at this point of time will jeopardise further the smooth functioning of the facility. The HCIs attached to the respective facilities need to be trained and monitored further on segregation.

2. **Final disposal of plastics** - GJ is landfilling the plastic waste, which increases the burden on the landfill constructed in the premises. The TNWML facility is however storing the waste for about a year now. The storage space has run out and treated plastic waste bags can be seen lying outside. This calls for an expeditious decision on the final disposal/reprocessing of the plastic waste being collected by the facilities. Ideally, the TNPCB needs to authorise certified re-processors to collect and reprocess/recycle the waste from these facilities.

3. **Teething problems with equipment** – During the visits to GJ and TNWML it was seen that teething problems exist with the incinerator, autoclave and shredder. In general it is recommended that the TNPCB check the equipment periodically to ensure effective functioning. Further, it is advisable that the TNPCB develops a back-up plan to tackle the waste problem in light of emergencies or the complete breakdown / failure at one or both facility.

4. **Monitoring of incinerator emissions on a regular basis is mandatory.**

5. **Education of personnel** – Interaction with the workers revealed that they were not fully aware of bio-medical waste and the issues involved, including those pertaining to worker risks. Therefore, the workers of the facilities need to be trained thoroughly.

6. **Signboards and Directions** – No signboards and directions have been put up to show the existence of the facility, particularly in the case of GJ. The erection of signboards has to be immediately implemented as per the Guidelines as these are critical in instances of emergencies.

PART III

PART III –Training of HCIs

Though this Report does not discuss the details of the training for HCIs, it is important to note that training was discussed as a key and mandatory module for the management of BMW. Based on the premise that '*A chain is only as strong as its weakest link*', a core team was formed in each HCI whose specific task would be bio-medical waste management.

The core team will also be responsible for imparting training to the rest of the staff of the institution through a ToT.

Similarly, all necessary equipment and instruments for setting up of the waste management system was to be procured immediately by each of the HCIs as the staff were being trained to use the facilities for waste management. The DME's office was requested to take the necessary steps.

The creation of a model HCI became a logical objective of the plan. For this purpose Stanley Medical College and Hospital in North Chennai was identified as a possible candidate to be converted to a model HCI. The details of the training programme are not discussed in this project report and will be covered separately.

ANNEXURE I

Schedule of site visits to HCIs and CBWTFs

S.No.	Date	HCI
1.	5.7.2004	Kasturba Gandhi Hospital
2.	6.7.2004	Govt. Royapettah Hospital
3.	7.7.2004	Kilpauk Medical College and Hospital
4.	8.7.2004	Institute for Child Health and Hospital for Children
5.	9.7.2004	Stanley Medical College and Hospital
6.	13.7.2004	IOG and Hospital for Women and Children
7.	14.7.2004	Govt. Eye Hospital
8.	15.7.2004	Govt. General Hospital
9.	16.7.2004	R.S.R.M. Lying-in Hospital
10.	20.7.2004	Govt. Peripheral Hospital, Tondiarpet
11.	21.7.2004	Govt. Peripheral Hospital, Anna Nagar
12.	21.7.2004	Govt. Peripheral Hospital, Periyar Nagar
13.	22.7.2004	Govt. Peripheral Hospital, KK Nagar
14.	22.7.2004	Govt. Hospital for Rehabilitation Medicine and Artificial Limb Centre
15.	23.7.2004	Institute of Mental Health
16.	23.7.2004	Govt. Hospital for Thoracic Medicine, Otteri
17.	26.7.2004	Govt. Hospital, Saidapet
18.	28.7.2004	Govt. Hospital for Thoracic Medicine, Tambaram
19.	28.7.2004 &14.9.2004	Thenmelpakkam CBWT Facility
20.	4.8.2004 &15.9.2004	Chennakuppam CBWT Facility

ANNEXURE II

Waste Survey & Audit sheet

Location	Categories and Amount of Waste						Mode of
	Anatomical (1)	Lab (3)	Sharps (4)	Infected Solid waste (6)	Infected plastic waste (6)	Non-Infected plastic (7)	Disinfection / Treatment / Disposal

Equipment	Number of	Location	Status
Bins / bags			
Autoclaves			
Needle cutter / destroyer			
Gloves, mask etc			
Sharps container			

No. of staff involved in waste collection:

ANNEXURE III

Questionnaire to obtain Status Report from each HCI

As the project was progressing, a need was felt to make a real-time evaluation of the efficacy of the steps being taken. TamilNadu Pollution Control Board and the Directorate of Medical Education (DME) were keen on making such an evaluation to monitor the improvement taking place especially because other stakeholders such as the Department of Health, Chennai Corporation and TamilNadu Medical Services Corporation were simultaneously involved and coordinating other facets of the project such as provision of needle destroyers, bins and bags, purchasing of autoclaves, etc.

A simple 10-point questionnaire was developed for this purpose, so that the DME's office can send the questionnaire to 18 HCIs and ask them to submit this status to the TNPCB.

The following is the questionnaire:

I Formation of Core group for bio-medical waste management

1. Has your hospital identified a nodal officer for bio-medical waste and constituted a core group to undergo training and implement the waste management system? Yes / No
If yes,
Name of Nodal Officer:
Names of Core group members:

II Status of Segregation

2. Has your healthcare institution isolated and separated the general waste from infectious bio-medical waste? Yes / No

3. Has your institution procured enough bins and bags for segregation? Yes / No
If yes,
No. of bins:
No. of bags:
Colour of bins and bags:

III Status of Disinfection

4. Has your hospital started disinfection of syringes, needles and other sharps with 1% Hypochlorite solution? Yes / No

5. Has your hospital started the practice of disinfecting body parts especially placenta with bleach solution? Yes / No

IV Status of Disposal

6. Has your hospital identified a separate area for bio-medical waste collection and storage. Yes / No
If yes,
Where in the hospital premises:

7. Has your hospital installed concrete bin provided by the Corporation for disposing sharps. Yes / No

If yes,
Where in the hospital premises:

V Status of Instrumentation and equipment

8. Has your hospital bought needle destroyers? Yes / No

If yes,
No. of pieces:
Location of each piece (which department):

9. Has your hospital allocated a dedicated autoclave for bio-medical waste management? Yes / No
If yes,
Capacity:

10. Have all staff dealing with bio-medical waste been provided with gloves and masks? Yes / No

ANNEXURE IV

Questionnaire for Assessment of CBWTF

Name of the facility		
Where is the facility based		
Location		
Total Land Area	*Covered space*	*Open area*
Green Belt		
How many beds is it catering		
Number of subscribers	*Private*	*Govt.*
Number of vehicles		
Type of vehicle and its design features		
Approx. distance covered by each vehicle		
Total area covered by the facility		
Treatment Technologies and their capacity		
Standby technology		
Amount of waste incinerated		
Amount of waste treated by alternate method		
Final disposal method- for incinerated waste		
Disposal of autoclaved waste		
Any tie ups with recyclers		
Tie up with corporation		
Fees paid to corporation		
Amount charged (per bed, per kg)		
Validation and pollution control tests		
Discharge and testing of the liquid effluent		
Problems faced		
Authorization status		
Frequency of monitoring by TNPCB		
Power back up		
Record maintenance		

GENERAL		
Name of the facility		
At what distance is the facility located from residential area		
Total Land Area-	*Covered space*	*Open area*
Green Belt		
Amount charged (per bed, per kg)		

COVERAGE AREA		
How many beds are being catered to		
Number of subscribers	*Private*	*Government*
Area covered by the facility		
(in terms of km)		

TRANSPORTATION
Number of vehicles
Type of vehicle and its design features
Approx. Distance covered by each vehicle
The no.of facilities covered by each

TREATMENT TECHNOLOGY
Treatment Technologies and their capacity
Autoclave/Microwave/Incinerator/Shredder
Alternate Technology (Autoclave/Microwave/ Hydroclave)
Which type of waste is autoclaved

Standby technology
Amount of waste incinerated
Amount of waste treated by alternate method
Final disposal method- for incinerated waste
Disposal of autoclaved waste
Any tie-ups with recyclers
Tie up with corporation
Fees paid to corporation
Validation and pollution control tests for machines, frequency of test etc.
Discharge and testing of the liquid effluent
Problems faced
Frequency of monitoring by SPCB

WASTE SHARPS
How are waste sharps treated?
What is done to waste sharps after treatment.
Is there any recovery of metal from sharps?

STORAGE ROOM
Details

MISCELLANEOUS
Power back up
Record maintenance
Is there records maintained for accidents
Is the ground water, in & around the facility monitored for contamination?
Authorization status