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**Indian Society of Hospital Waste Management**

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## Indian Society of Hospital Waste Management

**Volume - 1   Issue - 1**  
**April - 2002**

*For Private Circulation Only*

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## CONTENTS

✦	<b>Editorial Note</b>	I
✦	<b>President's Page</b>	III
✦	<b>ISHWMCon 2002</b>	V
✦	<b>Articles</b>	
	1. <b>Hospital Waste Management Quality Assurance</b> Col. NK Parmar, VrC, Lt. Col. RK Chaturvedi, Wg. Cdr. RK Ranyal	1
	2. <b>Quantitative Analysis of Biomedical Waste in a speciality hospital</b> Maj R K Agarwal, Brig K B N S Dod, Col N K Parmar, VrC, Lt Col R K Chaturvedi	5
	3. <b>Injuries due to sharps in hospitals</b> Wg Cdr JN Srivastava	14
	4. <b>Attitudes towards Safe management of Health Care Waste - an exploration</b> Ramakrishna B Goud, Girish N. Dayananda M, Narasimha Murtly, Gopinath D, Shivaram C	22
✦	<b>Agenda</b> Prof. A.K. Agarwal	24
✦	<b>Concern</b> A N Yellappa Reddy	26
✦	<b>Reflections State</b>	
	1. <b>Andhra Pradesh in Bio-medical Waste Management. In the right lane?</b> Jyotsna and Satyavir Chauhan	29
	2. <b>Status of implementation of Bio-Medical waste (Management and Handling) Rules-1998 in the state of Karnataka</b> Dr. Lakshimikantha H.	38
✦	<b>Reflections Institution</b>	
	1. <b>Command Hospital Air Force Bangalore - Hospital Waste Managment System</b> Sp Cpt H S R Arora	42
	2. <b>Cost Effective Waste Management for Large Hospitals St. John's Hospital A Case Study of a Medical Teaching Hospital</b> Wg Cdr Franklin	49
✦	<b>Reflections Organisations</b>	
	1. <b>CEE's Experience in Bio Medical Waste Management</b> Vittal Kumar A	52
	2. <b>Health Care Waste Management Cell- Genesis and Activities</b> Raghunandan K L, Dr. N Girish, Dr C Shivaram	57
✦	<b>In muse</b> <b>Autobiography of Disposable plastic syringe with needle</b>	64
✦	<b>Report of the Conference</b>	65

**Dr. D Gopinath, Editor-in-chief**

The inaugural issue of the Journal of the Indian Society of Hospital waste management is being released during the second annual conference of the society at Jaipur on 11<sup>th</sup> April 2002. It stands out as another milestone in the growth of ISHWM.

On the threshold of the new millenium, we have till date witnessed far-reaching decisions impacting environment and human health and safety that have been taken and also implemented. It is time that we look back before we look forward (simhaavalokan - just like the majestic lion looks back periodically before it moves forward).

Codes for health promotion and personal hygiene are contained in manu smritis. We see codes for cleanliness in sushruta samhitha and charaka samhitha - the great contributions of Ayurveda to mankind. We see the practice of not allowing everybody to the place where recently delivered mother and baby are cared for at home - by our elders. We saw the era of germ theory of disease and measures for antiseptis. In the midst of this, why are we not keeping our health centers, clinics, hospitals clean? Why have we ignored these basic principles that enable better upkeep of our health care settings and practices? Today, we see the situation of health care settings contributing to ill health. Are we in a civilized society? These are not just dilemmas, but realities.

The next question is - what is the solution? Do we need legislations to keep ourselves better? Our health care premises better? Our practices of caring better? Why are some health care settings are kept better? Why some are not kept better? Increase in population, increase in the number of health care settings, use of disposables, pandemics of HIV and Hepatitis B and commercialization of health care with lesser sensitivity to health promotion and specific protection have added to the problem. What next is the enigma! Should we not do something about it?

Is training a solution? Is attitudinal change a solution? Do we have the models and examples of better methods? Do we have positive examples? Don't we have the expertise to address it? Don't we have resources? When we can reduce human suffering /disease and disability, don't we have methods and means for better health care? Or are we simply callous and taking things light? I am sorry that we have to ask so many questions to ourselves.

The inaugural issue of the journal - we are proud to say has some answers - with articles by experienced colleagues. We hope it will inspire a few of us to make changes in our settings and the settings of our neighbours. It focuses on the happenings and the outcome of the ISHWM Conference 2001, Bangalore.

True to its name and purpose, the Journal of ISHWM will continue to respond and reach out to document these events 'de jure'. It intends to be proactive in identifying the changes and make it available for sharing. It is being nurtured to provide a platform for exchange of scientific thoughts and deeds. It will be our constant endeavour to make this scientific document your reference and resource material. We would like to appeal to all to suggest features that you think should be in the journal. Please feel free to communicate your thoughts to us. Share a copy of the journal and let us reach out to those 'who still remain unchanged'.

The next issue of the journal which will be published for the year 2003 during January - March 2003 will have as its theme **"Bio-medical Waste - Policy and legislation"**.

In our endeavour of brining out this journal, we would like to specifically acknowledge the continued support, encouragement and leadership provided by Air Marshall L K Verma, President of ISHWM. His team at Delhi has indeed been very helpful to us in brining out this document.

We would like to express our sincere gratitude to Dr. C. Shivaram, Chairman of HCWMCCell who has been our source of inspiration. We remain highly indebted to Sri A N Yellappa Reddy who with his visionary zeal has helped us individually and collectively scale new heights in making our environment safe.

We would also like to place on the records the inputs from the ISHWMCon 2001 organising committee. Special thanks to Dr. S Chandrashekar Shetty, Vice Chancellor, Rajiv Gandhi University of Health Sciences, Bangalore. We acknowledge the very important financial support the journal has received from the office of the University.

The publishing of the journal would not have been possible but for the efforts of my colleagues Dr. S Pruthvish, Associate Professor and Dr. N. Girish, Assistant Professor from the Department of Community Medicine, M S Ramaiah Medical College, Bangalore. Sri Raghunandan was in charge of the process of bringing out this Journal and the editorial team thanks him immensely and appreciates his inputs.

Dr. Leonard Machado and Dr. T Hemanth require special mention for their untiring work. The credit for all the good in the journal definitely goes to our institution - M S Ramaiah Medical College and more particularly the department of Community Medicine - for it has been the unstinted support of Dr. Sandhya Belawadi, Principal and Dean, Dr. K Jayanth Kumar, Prof and HOD and Mr. Murthy and other colleagues which permitted us to work uninhibitedly.



**Air Marshal L K Verma,**

President, ISHWM, New Delhi

- ♦ Environment is defined as "Something that surrounds". Ecosystem is the most important and all pervasive ingredient of environment. The word ecology has been derived from Greek word "Oikos" meaning habitation and "logos" meaning discourse or study. Many definitions of ecology have been tried. But the most apt definition is : "Study of animals, plants and their relationship to each other and to its environment". The importance of ecological balance cannot be over emphasized. It is crucial and only dominant factor for preservation and sustenance of life on earth. However, during present era, the inanimate forces of eco system are so great that it tends to alter the balance. Therefore, when we talk of ecology and environment together, study of environmental forces should be included in the concept of ecology.

- ♦ Degradation of environment are largely caused by human activities which are

- (a) Procreation
- (b) Migration
- (c) Living

All these activities effect the environment in one way or other, directly or indirectly Procreation results in population explosion and many concomitant adverse effects on ecology. Similarly migration from rural and urban areas cause overload on urban societies. Living by itself is an activity which leads to desire to achieve higher and better living style calling for enormous industrial activity which throws up pollutants and tend to disturb ecological balance.

- ♦ In the nature, everything has cyclic existence and thus balanced. For the ecological balance even a blade of grass is important since this is the primary producer.
- ♦ It is agreed that eco-system has a great capacity to clean waste generated by activities of living species but this is not unlimited as the atmosphere we live in is not unlimited. Generation of waste is directly proportionate to living species and therefore increasing population day by day causes overload on the cleansing apparatus of the environment. The was can be municipal, industrial and hospital waste.
- ♦ The hospital waste has been defined as " any waste which is generated during diagnosis, treatment or immunization of human beings or animals or any research activities pertaining thereto or in the production of testing of biological". Basically hospital waste is not different than other solid waste and liquid waste except the fact that it is infected. Treatment options to render it non-infective are many and it is incumbent on the part of the health care provider to prevent damage to environment and to minimize spread of infection in the society. The quantum of hospital waste depends upon many factors and the most

important being quantum of disposables used. It varies greatly from developing countries to developed countries and under developed countries.

- ✦ **Laying down a proper hospital waste management system is complex and cumbersome and calls for perseverance. The first activity is the inventory survey and compilation, and determining points of generation. This is not undertaken by the health care institutions for some reason or the other and that is why the health care institutions have not even now properly planned any effective waste management system.**
- ✦ Many options are available for treatment of hospital waste, apart from incinerators (which in any case is not eco friendly). However, It will depend upon specific hospital and a plan of hospital waste management has to be hospital specific and also department specific.
- ✦ There is a void existing in this country as far as art and science of taking care of infected waste is concerned. It is well known that the WHO, as an initiative, started 11 pilot projects. One project was undertaken by the Armed Forces and proper system has been laid out at Air Force hospital at Bangalore.
- ✦ To fill the void, the Indian Society of Hospital Waste Management (ISHWM) has played a pivotal role, which cannot be over emphasized. This scientific body has been formed in the year 2000 only, but its many activities including the first annual conference at Bangalore in the year 2001 ; played a vital role in bridging the gap. Workshops and seminars held in different parts of the country have helped in spreading awareness and generating ideas, questions and call for solutions in the minds of people. This is a positive step but it needs to be further nurtured.
- ✦ Scientific journal is mirror of any scientific body or society and it reflects the concept and work being undertaken by the society. It is a welcome step that the first issue of journal of Indian Society of Hospital Waste Management is a reality today which will further help in spreading awareness on this important topic.
- ✦ I take this opportunity to congratulate the editor-in-chief and the editorial Board for bringing out the first issue of the journal and I am sure that we will have at least one journal every year, The contents of the journal speak for itself and in the coming years, I will expect a large number of scientific papers on different aspects of hospital waste management.

*My best wishes*



ISHWMCon 2001- The organisers





ISHWMCon 2001-The Inauguration



ISHWMCon 2001-The Audience



ISHWMCon 2001-Technology Exhibition

## **International Conference on Hospital Waste Management: 11th & 12th April 2002 at Indian Institute of Health Management Research (IIHMR) at Jaipur**

The Indian Society of Hospital Waste management (ISHWM) in collaboration with the Indian Institute of health Management Research (IIHMR) will be organizing an International Conference on Hospital waste Management with the main theme of 'Hospital waste management: Future strategies'. This Conference succeeds the first Conference, which was held at Bangalore in May 2001.

Management of biomedical waste is a global problem and its utmost importance needs not be over emphasized as the deleterious effects of mismanagement of hospital waste can affect the individual and the environment. Biomedical waste generated by various hospitals in our country runs into many hundred thousands of kilograms and proper disposal of it is a Herculean task.

The Conference will provide an ideal platform to interact and discuss with many experts including many from abroad on various technological options and recent advances in the field of hospital waste management.

Topics of special interest viz. various technologies available and criteria for selection, occupational safety and health issue, common treatment facilities (CTF), concept of waste to energy re-cycling, waste management practices; a few success stories, infection control and protection to waste handlers and role of Hospital Waste Management in hospital acquired infection (HAI).

During the Conference there will be discussion papers, keynote address and presentations by international experts. The Conference is specially designed for hospital administrators, Government officials, doctors, nurses, paramedics and of course all those who are interested in environmental protection

### ***Coordinators :***

**Brig. (Retd.) S. K. Puri, VSM**  
President, Organizing Committee

**Dr. D. B. Acharya**  
Secretary, Organizing Committee

**Dr. Hari Singh**  
Joint Secretary, Organizing Committee

## HOSPITAL WASTE MANAGEMENT: QUALITY ASSURANCE

Col. NK Parmar, VrC\*\*\*, Lt. Col. RK Chaturvedi\*\*, Wg. Cdr. RK Ranyal\* \*

In today's technologically fast developing world, the health care providers must go for Quality Assurance in every field of health care to achieve the Primary Aim of 'Quality Patient Care.'

Health care providers have failed to assure safe and quality disposal of waste generated while imparting health care to the people. The concern by public, which was rightly highlighted in the media, led to laying down of Bio-Medical Waste (Management and Handling) Rules, 1998, by Ministry of Environment and Forests through Gazette notification. To assure strict compliance, the Honourable Supreme Court has also intervened. Pollution Control Boards have been appointed as the regulatory authority.

To assure the success of any 'Hospital Waste Management Programme', it must start with basics of Information, Education and Communication. Following are the suggested guidelines to achieve quality in waste disposal system.

1. **Commitment from the top.** No programme can be successfully implemented unless the decision-making bodies i.e. Board of Directors; Trustees etc. show their involvement and commitment. They must undergo awareness programme to get abreast with the scientific management system and its importance and benefits to the patients, staff and the community as a whole. A definite dedication of resources to the project of 'Hospital Waste Management' is the most important indication that the administration is backing up.
2. **Education and Training of Health Care Personnel.** The aim to training is to develop awareness of the health, safety, and environmental issues relating to health care waste and how these can affect employees in their daily work. It should highlight the roles and responsibility of all health care personnel in the overall management programme
  - (a) Training programme should incorporate
    - (i) Teaching
    - (ii) Discussion
    - (iii) Feedback
  - (b) Training Modules are to be designed specifically for different health care personnel.
    - (i) Hospital managers and Administrative staff
    - (ii) For medical doctors
    - (iii) For Nursing staff and paramedical staff
    - (iv) For the Ward boys / nursing orderlies
    - (v) For Safaikaramcharis / Janitors
    - (vi) For staff who transport waste.

\*\*\*Prof. & HOD, \*\*Assoc. Prof. \* PG Officer, Dept. of Hospital Administration, AFMC Pune.  
This paper was presented during the First annual conference of ISHWM at Bangalore



(vii) For Treatment plant operators.

(viii) For Landfill Operators

- (c) On-going Education and Training, Continuing Medical Education and update should be held at regular intervals.
- (d) The subject is to be added to the curriculum of all the health care training courses for postgraduates and undergraduates-Medical, Nursing as well as Paramedical courses.

**3. Planning of New Hospital Buildings.** While planning new health care facilities following points need to be incorporated.

- a) Separate 'Hospital Waste Corridor'
- b) Separate chute for transportation of the waste
- c) Fire resistant construction of waste storage area
- d) Adequate access for vehicles to service areas
- e) Ventilation and cooling requirements
- f) Washing and Changing facilities for the staff
- g) At least 48 hrs storage capacity for the waste
- h) A separate storage area for recyclable materials.
- i) The estimate of need for the power supply, fuel storage, water supply, and drainage.

**4. Planning of management process.**

- (a) **Standards.** First, formulate 'Hospital Waste' Standards and Operating Procedures, including that of the equipment.
- (b) **Basic principles.** The principle of 'doing something' is better than 'doing nothing'. So, some efforts should be directed in every field with aim to reduce, segregate, safe transport, and eco friendly disposal of waste.
- (c) **Waste segregation.** It is the key to any waste management scheme. It should be carried out at the point of generation and helps an establishment to
  - (i) Reduce total treatment costs
  - (ii) Reduce impact of this waste on the Community
  - (iii) Reduce the chances of infecting workers
- (d) **Waste Reduction, Reuse and Recycle.** These three principles will help developing countries to large extent, where cost is an essential consideration even in health care sector.
- (e) **Final treatment technology.**
  - (i) Common regional facilities should be encouraged for better management and economy.
  - (ii) Use of eco-friendly and better engineered technology like Microwave, Medical Waste Sterilisation Unit, or Autoclave as a substitute to unsatisfactory Incinerators should be undertaken.

- (f) **Internal Audit.** Hospital Waste Management Committee has to conduct regular evaluation of the process, correct the deficiencies in the system.
  - (g) **External Audit.** Central Pollution Control Board, the regulatory authority, should evaluate complete waste management process in a health care establishment and not merely the final treatment technology, Annual inspection should be mandatory.
5. **Incentives.** In the present fast moving world, incentives help to motivate. the following steps will enhance staff and public participation.
- (a) **Comfort and safety of workers.**
    - (i) Personal protective clothing and equipment for health care workers.
    - (ii) Adequate facilities for hand washing, drinking water and cafeteria facilities
  - (b) **Financial gain.** Honour and reward those, who excel in waste management programme. Such as effective programme reduces the quantum of waste, thereby reducing the cost in the final treatment and disposal.
  - (c) **Status.** Hospitals can be declared environmentally and eco-friendly, thereby giving boost to the image of the hospital in the community.
  - (d) **Team Spirit.** Group pressures or peer pressure will automatically motivate other co-workers.
6. **Public Education.** Every member of the community has the right to be informed about health hazards of health care waste. The more the ideas, the better it is. Involve public and press. It can further contribute to success.
- (a) Welcome the suggestions from community and media
  - (b) Accept and discuss their ideas.
  - (c) Media should be used as Information, Education and Communication tool.
7. **Legislative framework.** Legislation on bio-medical waste management should be enforced strictly. Individual health care establishment should evolve and adopt a system that suits them best.

**To achieve quality in disposal of bio-medical waste the health care establishments should have a transparent holistic approach in medical services. This should include management of their waste in an environmentally friendly manner.**

Adhering to quality management in all the aspects, no matter how small, will help the hospital create a niche for itself.

Every hospital should take care of people and also take care of the environment.

### Conclusion :

To make any programme successful in achieving quality, the five areas that need focus are: the commitment from the top, infrastructure, availability, process planning, education and training and involvement of community by awareness drives. These are essentials to the success of hospital waste management in any health care establishment.

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- c. Ranyal R.K. *A study of Hospital Waste Management System in Command Hospital (Southern Command), Pune Dissertation. University of Pune, 2001*

"I do not think government can do everything, and the more you realize that we have a role as society to do the things needed by society on a decentralized basis the further we will develop and move. It is not administrative what we want in larger numbers but entrepreneurs and socially active and alert individuals who will provide leadership and that is what the society will I hope depend (upon) and in this area of hospital waste management do what is needed for the country"

- Prof. M G K Menon, in his inaugural address at ISHWMCon2001



## QUANTITATIVE ANALYSIS OF BIOMEDICAL WASTE IN A SPECIALITY HOSPITAL

Maj R K Agarwal<sup>1</sup>, Brig K B N S Dod<sup>2</sup>, Col N K Parmar, VrC<sup>3</sup>, Lt Col R K Chaturvedi<sup>4</sup>

### ABSTRACT

*The analytical study of quantum and type of Biomedical waste is a critical step for development of appropriate waste management system. The quantity of waste generated in medical care facility is influenced by many parameters. In the study conducted in a 600-bedded hospital providing cardio thoracic and respiratory disease treatment facilities, it was found that waste generated per admitted in-patient per day is as low as 378 gms and if general waste is excluded, health risk waste generated is 82.73gms per admitted patient per day. This would reduce further by 50% if bed occupancy of 48-50% is taken into consideration. This quantity is far below the level of 1 kg per bed used for planning of Biomedical waste management in India. Therefore, each hospital must analyse the quantity and type of waste as a prerequisite to develop a waste management system.*

### INTRODUCTION

The 600 bedded, 4 storied hospital is spread over 64.5 acres of land. It offers all types of cardio-thoracic surgery, interventional vascular radiology and tuberculosis diagnostic and treatment facilities. It has a staff of 430 medical, nursing and paramedical personnel including Specialists / Super specialist doctors. It has 20 clinical wards and departments.

The hospital treats both cardiac cases and tuberculosis cases. The tuberculosis patients generally stay for 5 months and are provided with domiciliary treatment, where as the cardiac cases stay for about a month. Out of 600 beds, 383 beds are reserved exclusively for chest diseases-mainly tuberculosis. Out of these 383 beds, 125 beds are for active diseases while 258 beds are for follow up. 81 beds are exclusively for the cardiac cases while rest of them are mixed i.e. either cardiac or thoracic cases.

### METHODOLOGY

The prospective study was conducted from August 2000 onwards as under: -

The existing waste management system was observed for a period of 3 months (August 2000 to October 2000) to study various aspects ranging from generation of waste till final disposal.

1. Trainee, Dept of Hospital Administration, AFMC, Pune.

2. Affiliated Faculty, Dept of Hospital Administration and Commandant, Military Hospital (CTC), Pune

3. Professor and Head of Department, Dept of Hospital Administration, AFMC, Pune

4. Associate Professor, Dept of Hospital Administration, AFMC, Pune

The amount of waste generated in the hospital was weighed category wise at the points of generation. The quantity of waste at the generating centres were summed up to calculate the total waste brought for disposal everyday.

## **OBSERVATIONS AND DISCUSSIONS**

A Standard Operating Procedure (SOP) was laid down by the hospital after the Govt of India Gazette Notification on Biomedical Waste (Management & Handling) Rules, 1998<sup>5</sup>. The salient features of this SOP are as follows: Core Group consisting of Administrators, Principle Matron, Station Health Officer and Sanitation Supervisor (JCO) was formed. The group suggested two colour codes for Waste Management i.e. Yellow and Blue. Yellow container is for incinerable waste and blue container for non-incinerable (plastics). According to SOP the waste in the blue container has to be mutilated after shredding, the kitchen waste is to be used for vermiculture or as animal feed and the administrative waste is to be recycled or incinerated. Various responsibilities to the staff were also identified.

## **WASTE MINIMIZATION<sup>6</sup>, RECYCLING, AND REUSE**

### **Waste Minimization**

The waste minimisation programme has once again been revived for the hospitals with the realisation of limited waste disposal options and the damage that it causes to the environment. The use of disposable items and packing add to the volume of biomedical waste generated. Therefore, the reverting to reusable items, like glass syringes and catheters will help in waste minimization. The problems for implementation are as follows : additional workload for sterilisation, difficult to device foolproof method of sterilisation and the patients' reluctance for using the reusables in this era of HIV and Hepatitis B.

However, the colour coded waste bags have been avoided (except for OT, CCL & ICU) for waste disposal, and instead the waste is directly put in colour coded plastic containers. If the waste bags are used in all wards/departments, additional daily weight of approximately 20 Kgs will be produced in the form of collection bags and an additional cost of Rs 783.2 per day as the cost of these bags is to be met.

### **Recycling**

Presently 'Recycling' of Silver from radiology department, I/V fluids, bottles and office waste of newspapers and magazines is being carried out. The defective equipments are off-loaded to army depots for further disposal.

### **Reuse**

Only reusable items such as Petri dishes and glass vials meant for blood sample collection and some costly disposables which are in short supply or those which the patient cannot afford are 'reused'. Otherwise all disposables are used only once.

## **WASTE GENERATION AND DISINFECTION/TREATMENT AT SOURCE**

### **Waste Categorisation**

Before starting the study, the waste was categorised into Infected Waste, Sharp Waste, Plastic Waste, Discarded Medicine, Office Waste and Food Waste.

Infected Waste included Category 1, 3 & 6 of Biomedical Waste (Management & Handling) Rules, 1998 i.e. items contaminated with blood, and fluids including cotton, dressings, other material contaminated with blood but excluding waste sharps and plastic disposables.

Waste Sharps – Category 4 of Biomedical Waste (Management & Handling) Rules, 1998, included needles, syringes, scalpels, blades, glass (broken/unbroken), etc. that may cause puncture and cuts.

Plastic Waste –Category 7 of the Biomedical Waste (Management & Handling) Rules, 1998, included waste generated from disposable items other than the waste sharps such as tubings, catheters, intravenous sets etc.

Discarded Medicines – Category 5 of the Biomedical Waste (Management & Handling) Rules, 1998

Office Waste - Non-infected waste such as paper, cardboard boxes, wrappings etc.

Food Waste – Left over food from various wards, departments, cook house and canteen

### **Collection and Measurement of Waste**

Plastic containers of two colours were issued to all wards and departments. (Yellow containers were replaced with Red containers). Sharps were collected separately in small containers made of paper / cardboard /or plastic and contained in the Blue coloured containers alongwith these small containers.

A Waste Collection team daily visited all wards/departments, for quantification of waste using a spring balance and transfered that in the buckets (Food and office waste is measured but not carried by them but, directly sent to waste dump). Waste generated from wards / departments was thus quantified.

### **Waste Generation**

The total average of Daily Waste generated from all the wards/departments varied from 95.756 Kgs to 140.468 Kgs with the average of 114.957 Kgs/day (Figure 1). Infectious waste generated per day was 9.814 Kgs, maximum was from operation theatre, family ward & ICU, with the daily average weight of 9.814Kgs, 4.833Kgs & 3.226Kgs, respectively (Figure 2). Canteen and patient cookhouse generated maximum general waste.

On an average, 270gms of food waste, 25.2gms of office waste, 23.47gms of infected waste, 49.5gms of plastic waste and 9.74gms of sharp waste per occupied bed is generated i.e. a total of 378.19 gms of solid waste per occupied bed is generated as shown in Figure 3. In

other words, 82.095 Kgs of food waste, 7.6 Kgs of office waste, 7 Kgs of infected waste, 15 Kgs of plastic waste and 2.96 Kgs of sharp waste per day is generated as shown in Figure 4. Taking into account average bed occupancy of 50%, these figures will reduce by another 50%, if calculated as per available bed instead of per occupied bed.

The true waste quantity generated per bed would be arrived if the calculations were based on the average occupied beds. In case, the denominator used is the total bed strength, then it will give a false picture because the total waste quantity per bed would come down, as it reflects even the unoccupied beds. Thus, all the calculations for total waste per bed should be on the average occupied beds instead of total bed strength of the hospital.

This waste generation per bed per day is quite different than the ones studied by NICH-1995 (1), Survey Team, AIIHPH, Calcutta-Private Hospital/Nursing Home (2) and District Hospitals (3), Hospital Waste Management Project-1999<sup>7</sup> (4), Singh, Major K B, AIIMS-1983<sup>8</sup> (5) as shown in the following table:

**Table 1 : Comparison of Solid Hospital Waste Generation Per Bed Per Day**

	1	2	3	4	5	This Study <sup>9</sup>
<b>Waste (Kgs) /bed/day</b>	1-5	1.044- 1.368	0.379	1.174	1.59	0.191

<sup>1</sup> Calculations based on average bed occupancy of 303.96 beds.

It is evident from above that the waste generated per bed per day varies from hospital to hospital. Hence, the waste generation per bed cannot be generalised for all hospitals.

As shown in the Figure 5, on an average solid waste comprised of 71.41% of food waste, 13.09% of plastic waste, 6.66% of office waste, 2.57% of sharps and medicines less than 1% (Figure 5). This composition is quite different than the ones studied by Survey Team, AIIHPH, Calcutta (A), Malik, I & et al-1996<sup>5</sup> (B), Hospital Waste Management Project-1999 (C), Singh, Major K B, AIIMS-1983 (D) and by National Environmental Engineering Research Institute, India, 1997. (Please see table 2)



**Table 2 : Comparison of Percentage Composition of Solid Waste Generated from Various Hospitals**

Waste Type	A	B	C	D	E	This Study
Infected Waste	19-30%	19%	1.6%	8.8%	1.5%	6.21
Plastic Waste	3 to 19 %	25.3%	4.09%	1.9%	10%	13.09
Waste Sharps	2.8%	-	-	1.21%	5%	2.58
Food Waste	50-74%	-	80%	78.88%	53.5%	71.41
Office Waste				9.2%	30%	6.66
Medicine	-	-	-	-	-	0.05

**Relative Composition Of Plastic & Waste Sharps ( Figure 6-9)**

The Waste Sharps contributed to 17.30% and plastics contributed to the remaining 82.70%.

Plastic Waste composed of I/V bottles - 30%, Oxygenator - 18.14%, Gloves-14.53%, I/V sets - 10%, Syringes - 6.25% and Plastic / Rubber tubings etc - 20.67%.

Waste Sharps contributed to 95.12%, Glass bottled/tubes - 4.32%, Needles and 0.56% Blades.

**Table 3 : Waste Generated In CCL & OT**

Waste Types	WPP
Medicine	0.033
Sharp Waste	0.588
Office Waste	1.382
Infected Waste	1.874
Plastic Waste	5.324
<b>Total</b>	<b>9.200</b>

The analysis of various types and quantities of per procedure-generated waste in CCL & OT was carried out. In both OT and CCL, the main type of waste generated was of plastics followed by infected waste. In OT, the generated waste of the plastics was 9 times and infected waste around 6 times the similar waste generated by CCL. The details are as under :

**Table 4 : OPERATION THEATRE CARDIAC CATH LAB**

<b>Waste Type</b>	<b>WPP</b>
Office Waste	0.138
Sharp Waste	0.109
Infected Waste	0.359
Plastic Waste	0.559
<b>Total</b>	<b>1.165</b>

The above mentioned OT waste is an average of waste generated from 95 open heart surgeries, 10 closed heart surgeries, 07 thoracic (non cardiac) surgeries, 19 Vascular and miscellaneous surgeries carried out over a period of 3 months. Similarly, CCL waste is an average of 247 procedures carried out over the same period.

#### **General & Health Risk Waste**

1. **Composition of General Waste varied from 77.69% to 78.32% while that of Health Risk Waste varied from 21.68 to 21.72% with an average of 21.90%.**
2. **Finally, the waste generated per patient per day was 378.01gms; it falls to 330.46gms, if wards of patients admitted for review and the follow up wards are excluded.**
3. **If General Waste is excluded, Health Risk Waste Generated was 82.73gms per patient per day.**
4. **If further General Waste and wards of patients admitted for review and follow up, are excluded, the average waste generation rises to 135.38 gms per patient per day.**
5. **Total bed days for August, September and October was 27965 with the Average daily patient census during this period being 303.96.**

The variation can be explained by the fact that in Laboratory, the blood collection vials and Petri (culture) Dishes were reused after cleaning and autoclaving, the weight of which varied from 1.5 Kgs to 3 Kgs per day, which were not included in the study. Also, sputum was not measured since after disinfection, it was poured down the drain.

#### **CONCLUSION :**

Liquid waste like Liquid Hypo waste generated in Radiology department was not included in this study though the Hypo waste generated in these three months was 195 litres. Moreover, the Biomedical Waste was not measured by calculating the items given to wards/departments (Input) but whatever was produce on the ground was measured (Output). Output waste is always lower than the Inputs. Calculation of waste generated per occupied bed is influenced by the number of interventions and procedures carried out. Number of interventions being carried out in operation theatres and CCL of this hospital is lower than those being performed at

comparable facilities. This is lower due to relatively healthy military clientele, options for them to go to the other facilities, facility lying idle in evening and at night and less workload. In OT, CCL and ICU, there are costly disposables that are in short supply or which the patients cannot afford, are reused after sterilisation.

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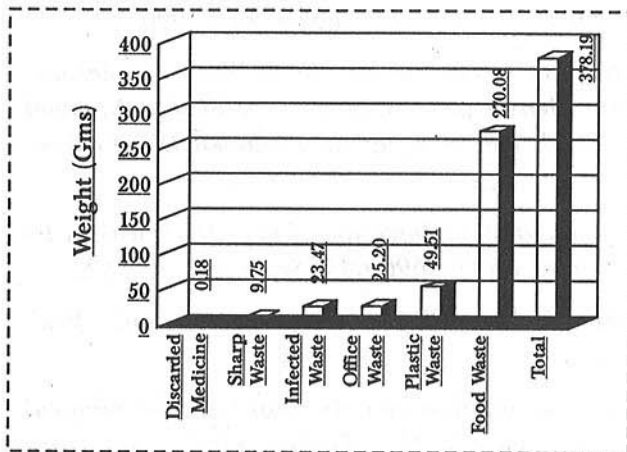
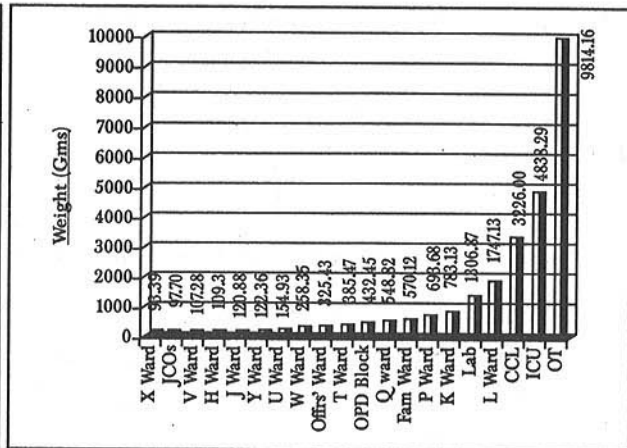
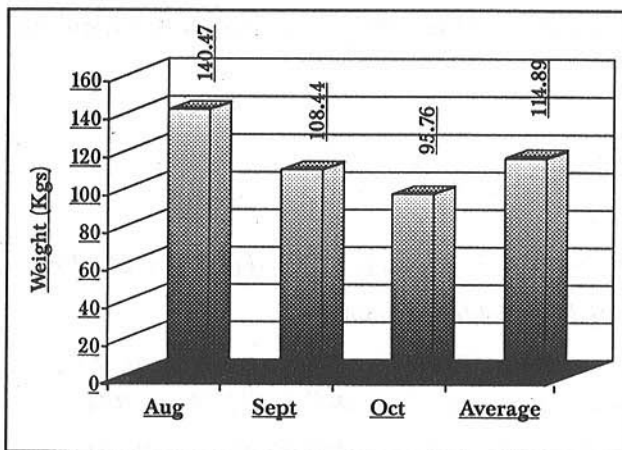


Figure 3 : Average Daily Solid Waste  
Per Occupied Bed Per Day

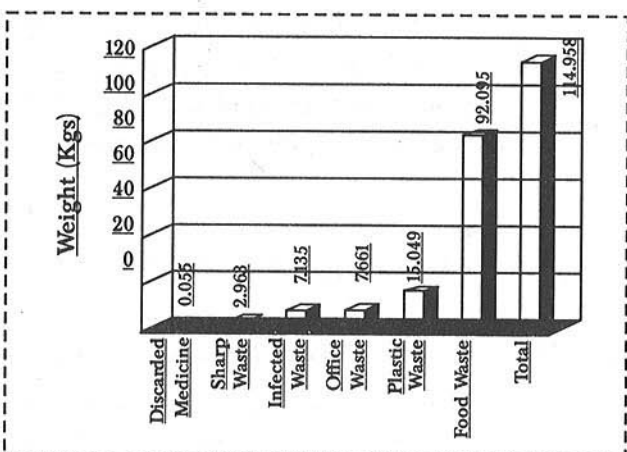


Figure 4 : Average Daily Solid Waste

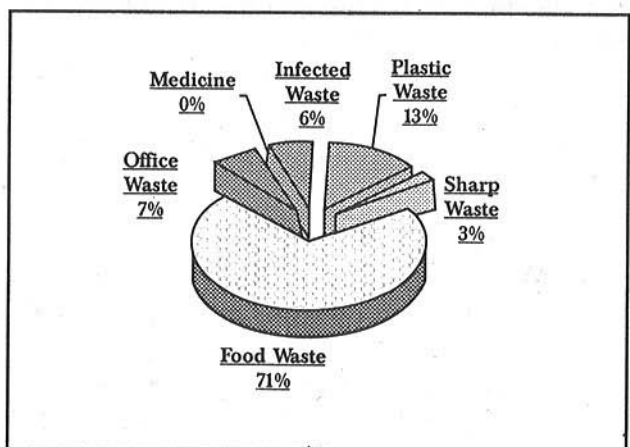


Figure 5 : Composition of Solid Waste

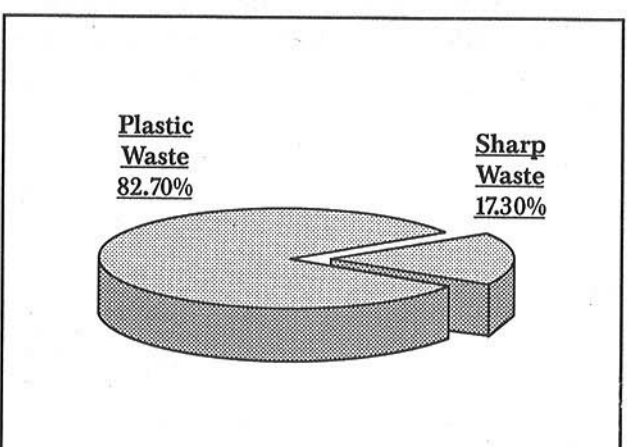


Figure 6 : Ratio of Plastic & Sharp Waste by Weight



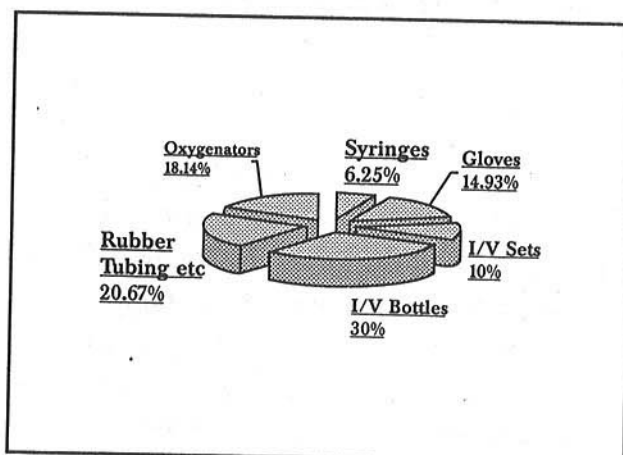


Figure 7 : Composition of Plastic Waste by Weight

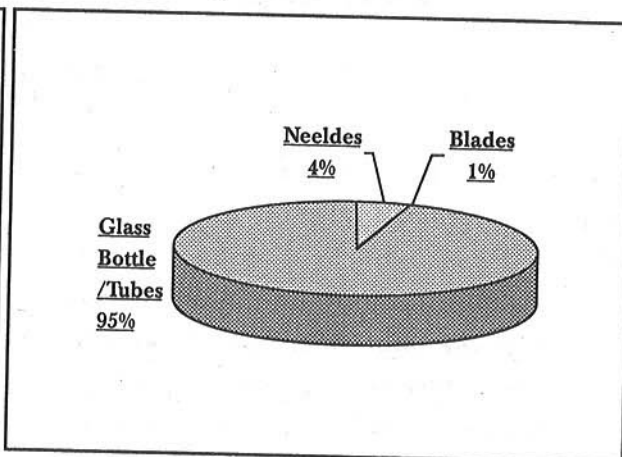


Figure 8 : Composition of Sharp Waste by Weight

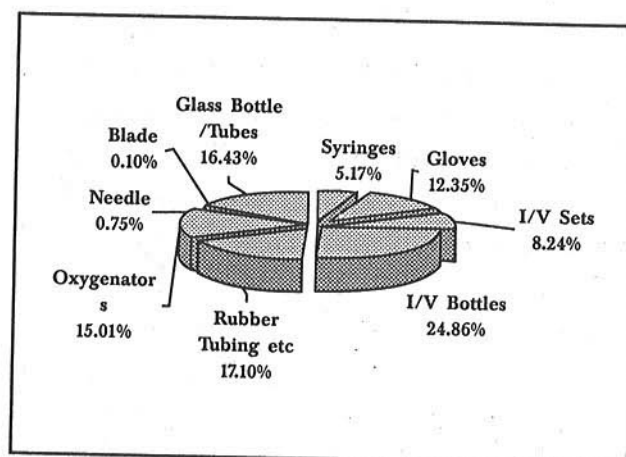


Figure 9 : Relative Composition of Plastic & Sharp Waste by Weight

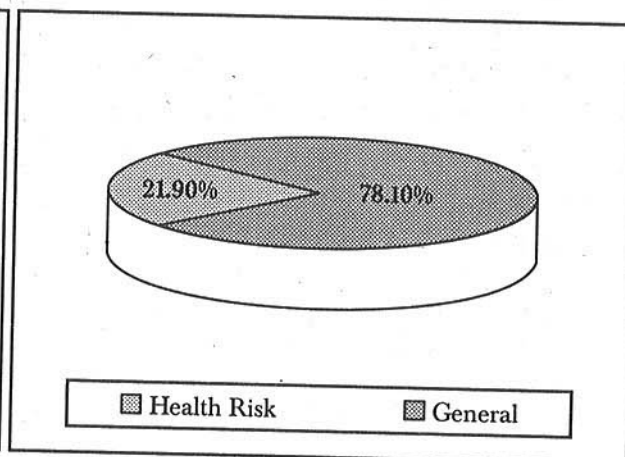


Figure 10 : Ratio of General & Health Risk Waste

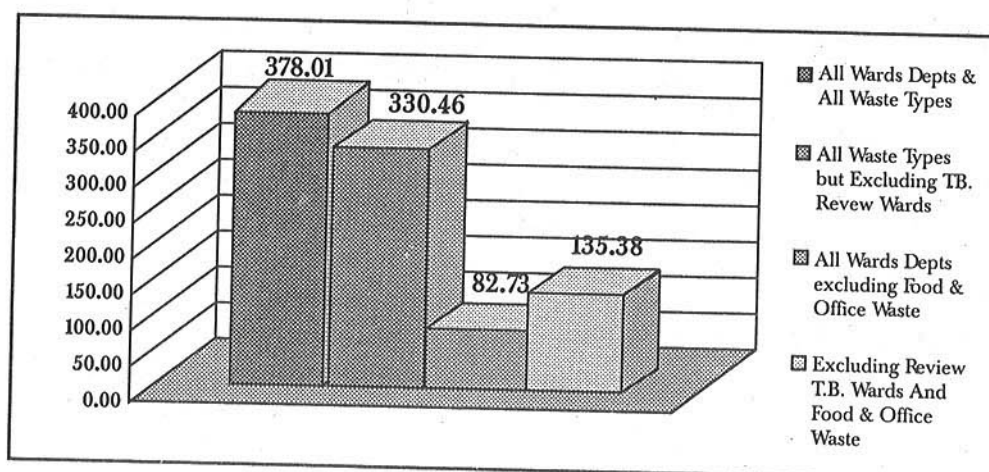


Figure 11 : Solid Waste Per In Patient Per Day (Gms)

## INJURIES DUE TO SHARPS IN HOSPITALS

Wg Cdr JN Srivastava

**Abstract-** *Injuries due to waste sharps are very common, but grossly under-reported. These injuries can result in transmission of very serious infections like HIV, HBV and HCV. Risk of transmission varies and is dependent on many factors. There is an urgent need for hospitals to start an Injury Prevention Programme, which will go a long way in reducing the morbidity and mortality among health care personnel due to hospital acquired infections. Prompt reporting and treatment of Needle-stick injuries is equally important in reducing the risk of transmission of serious infections like HIV.*

**Key Words** - Sharp injury, Needle-stick injury, HIV, HBV & HCV, Post- exposure treatment

### INTRODUCTION

Sharp-injuries mainly due to needlestick are very common occurrence among doctors, nurses and other para medical staff. Magnitude of the problem is much more than what is actually reported. Morbidity among health care personnel due to hospital-acquired infections remains very high in spite of introduction of newer antibiotics and treatment procedures. Common modes of transmission of infections to Health Care professionals are: -

- (a) Injuries due to waste sharps
- (b) Inhalation
- (c) Contamination of Surgeon's Conjunctivae

Transmission of infectious diseases by droplet infection is a well-known route of transmission.

Contamination of surgeon's conjunctivae due to blood spillage etc has been brought to notice recently. Even simple surgeries like tonsillectomy can cause transmission of infection via surgeon's conjunctivae. In a prospective study of 100 consecutive tonsillectomies in Scotland in 1990, 46% of surgeon's visors were found to be contaminated with blood. (Kelly et al: 2000).

Theoretically almost all blood borne infections can be transmitted by a single needle stick injury. However all needle-stick injuries do not culminate into an infection. Sharp injuries sustained in following circumstances are more hazardous (Cardo et al).

- (a) A visibly blood soiled device
- (b) A procedure that involved placing a needle in a patient's vein or artery
- (c) Deep injuries

Common infections likely to be transmitted by needle stick injuries are given in Table-1.

**TABLE 1: INFECTIONS TRANSMITTED BY NEEDLE STICK INJURIES**

IMPORTANT	OTHERS	UNCOMMON
1. HIV	1. Herpes	1. Blastomycosis
2. Hepatitis B	2. Malaria	2. Brucellosis
3. Hepatitis C	3. Staphylococcus aureus	3. Cryptococcus
	4. Diphtheria	4. Streptococcus
	5. Syphilis	5. Mycobacteriosis
	6. Toxoplasmosis	6. Mycoplasma
	7. Sporotrichosis	

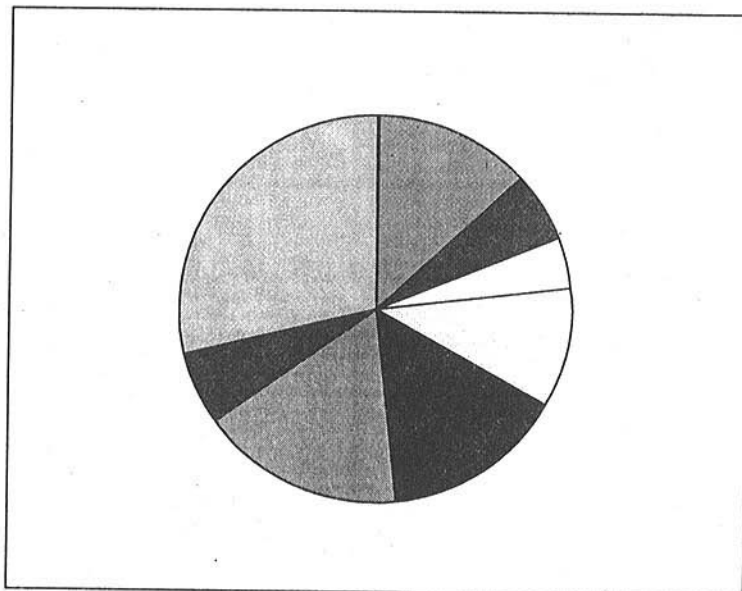
## INCIDENCE

In March 1999, the Health and Safety Director of Service Employees Union testified that 3000 workers a day are being stuck by needles in USA. According to OSHA, (Occupational Safety & Health Administration), health workers alone experience an estimated 800,000 needle stick injuries annually. About 2% or approximately 16000 of these are likely to be contaminated by HIV. Needles stick injuries account for 80% of all accidental exposure to blood. In another study it was found that hospital workers (including physicians) incur approx 30 needle stick injuries per 100 beds per year. It has also been observed that 38% of percutaneous injuries occur during the use of a needle and 42% occur after-use, but before disposal. These figures are grossly under reported, to the tune of 70-95% by the physicians.

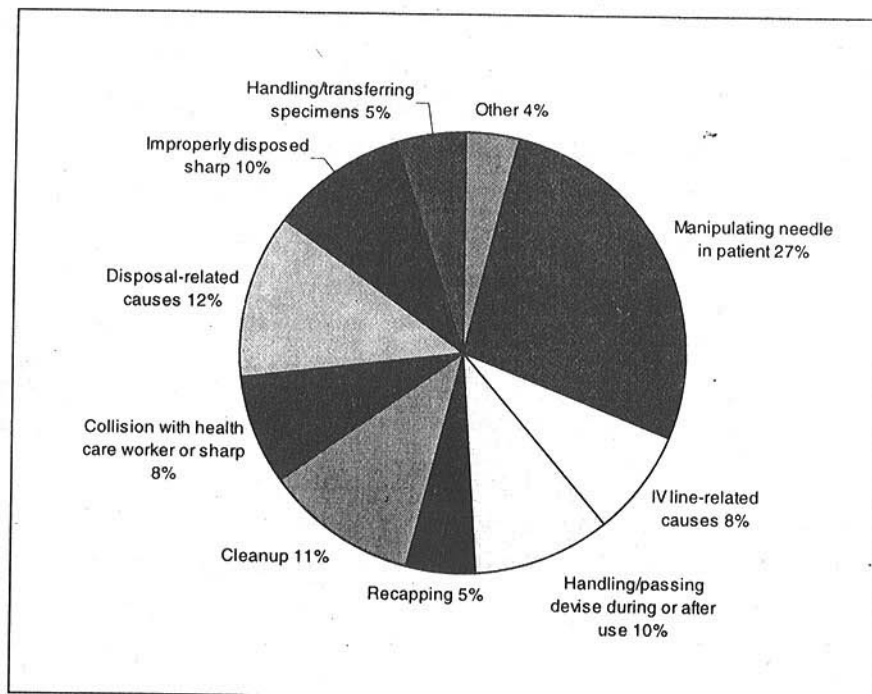
Regrettably data pertaining to incidence of injuries due to sharps in Hospitals, Laboratories, blood bank and Dental clinics are not available in our country

Figure 1 shows the extent to which needles and other sharp devices contribute to the burden of percutaneous injuries, in hospitals covered under National Surveillance System for Hospital Health Care workers in a study carried out by CDC Atlanta.

**Figure 1. Hollow-bore needles and other devices associated with percutaneous injuries in NASH hospitals (n=4,951), June 1995—July 1999. (Source: CDC [1999])**



**Figure 2. Causes of percutaneous injuries with hollow-bore needles in NASH hospitals, by % total percutaneous injuries (n=3,057), June 1995—July 1999. (Source: CDC [1999].)**





Following procedures are more commonly associated with needle stick injuries.

- (a) Recapping
- (b) Transferring body fluids between containers
- (c) Failing to properly dispose used needles etc.

Common causes of percutaneous injuries are given in Figure 2.

### **OCCURRENCE OF COMMON INFECTIONS AFTER SHARP INJURIES**

- (a) **HIV Infection** Out of the 52 confirmed documented cases of occupationally acquired HIV infections, 45 resulted from needle stick or cuts according to a CDC HIV/AIDS Surveillance report published in 1997. Based on various studies average rate of transmission of HIV has been found to be 0.3% after exposure to HIV positive blood by Sharp injury.
- (b) **HBV Infection** The rate of HBV transmission to susceptible Health Care workers ranges from 6% to 30% after a single needle stick exposure to an HBV – infected patient (CDC 1997b). However, Health care workers, who have antibodies to HBV either from pre-exposure vaccination or prior infection, are not at risk. Post exposure prophylaxis with Hepatitis 'B' immunoglobulin and initiation of Hepatitis B vaccine in a susceptible individual provides protection upto 90%.
- (c) **HCV Infection** Prospective studies of Health care workers exposed to HCV through needle stick injury have found the incidence of Anti HCV sero-conversion at 1.8% per injury. Currently no vaccination exists to prevent HCV infection and neither Immunoglobulin nor antiviral therapy is recommended as post exposure prophylaxis.

### **Causes of Needle stick Injuries**

Needle stick injuries can occur while workers dispose used needles. . The common injuries are typically on the index finger and thumb, more so in 'OT setting'. Common points of occurrence of injuries are:-

- (a) While capping the needle
- (b) While carrying the needles to the needle destroyer or disposal container
- (c) While emptying disposal container

### **Prevention of Needle sticks injuries**

Preventing needle stick injuries is the most effective way to protect health care workers from diseases that needle stick accidents transmits. A comprehensive needle stick injury prevention programme should include following :-

- (a) Training
- (b) Recommended Guidelines
- (c) Safe recapping procedures
- (d) Effective disposal systems
- (e) Surveillance Programmes
- (f) Improved equipment design

**Staff Training Programme** – The programme needs to cover following aspects: -

- (a) Use of needles and correct disposal practices
- (b) Risk of Injury
- (c) Recommended precautions for use and disposal of needles
- (d) Procedure for reporting injuries
- (e) SOP for post exposure prophylaxis

**Recommended Guidelines:** -

The following guidelines should deal specifically with needle safety: -

- (a) Adopt universal precautions – All needles, scalpel blades and other sharp instruments should be considered infectious and handled with care.
- (b) Disposable needles, scalpel blades and other sharp items should be placed in puncture resistant containers located near area of use.
- (c) Safe Recommended Procedure – Recapping of needles after use must be prohibited.

**Disposal**

An effective system for disposing use needles is crucial to prevent needle stick injuries. Needles should be placed in wide mouth, puncture-proof containers, which should be replaced, when containers are full.

**Surveillance**

There is still a serious lack of information about the various factors that cause needle stick injuries. Surveillance programmes are necessary to assess the magnitude of problem. The goals of these programmes should include: -

- (a) Determination of rate of needle stick injuries
- (b) Investigation of factors, attributable for the accident.
- (c) Proper post exposure prophylaxis and follow-up
- (d) Identification of areas, requiring improvement
- (e) Evolving practical strategies

**Continued Innovation**

There is a need for further investigation and innovation to develop means for prevention of needle stick injuries in order:-

- (a) To identify the type and design of needle instruments, having potential to cause injury
- (b) To understand handling of devices
- (c) To find methods for improving work practices

## **Guidelines for Managing Exposures to Blood-borne Pathogens**

### **Occupational Exposure to Blood/Body Fluids**

#### **A. Initial Management Guidelines**

##### **I. General Measures**

- Allow the wound to bleed freely
- Cleanse the wound thoroughly with soap and water
- If contact is with mucous membranes (eyes, nose, or mouth), flush well with water
- Remove clothing that is contaminated with blood or body fluids

##### **II. Evaluate the Significance of the Exposure**

III. Patients with significant recent exposures to blood or body fluids should be immediately referred to the nearest Emergency Department for treatment.

##### **IV. Serologic Testing for HBV, HCV and HIV**

###### **i. Test the Source Patient**

- If possible, perform serologic testing for HBV, HCV and HIV in the source patient.
- Informed consent must be obtained from the source prior to testing and the source must be aware that the results will be disclosed to the exposed patient.

###### **ii. Test the Exposed Patient**

Obtain consent from the exposed patient to do baseline and follow-up serologic testing for HBV, HCV and HIV irrespective of whether or not prophylaxis is initiated.

Recommended testing is as follows:

- Baseline: antibody to HBV, HCV and HIV;

**Note: Without baseline data, any future claim for compensation for occupationally acquired HIV illness could be jeopardized.**

- Repeat HIV serology at 6 weeks, 12 weeks and 6 months (if negative on previous testing);
- Repeat HCV and HBV testing at 3 months and 6 months if negative at baseline.
- It is also recommended that for those with high-risk exposures (exposures where antiretroviral therapy is recommended) be tested again at 12 months post exposure

#### **B. Post Exposure Follow-up: Human Immunodeficiency Virus**

##### **I. Risk of HIV Infection Post Exposure**

The average risk of acquiring HIV infection following a percutaneous exposure to an infected source is currently estimated at 0.3%-0.4%. The risk of HIV transmission following a mucocutaneous exposure is 0.1%.

## II. Efficacy of Antiretroviral Chemoprophylaxis

A case control study published in the MMWR December 1995, showed that post exposure prophylaxis with zidovudine (AZT) for occupational exposure to HIV, reduced sero-conversion by 79% (44:929-33). The New England Journal of Medicine also confirmed this earlier finding (Cardo, D.M., et al., 1997, 337;1485-1490).

## III. Importance of Timing

If antiretroviral therapy is indicated, it should be initiated as soon as possible after exposure, preferably within 2 hours to offer the best chance of preventing HIV transmission.

**Table 2**  
**Prophylaxis after exposure to Human Immunodeficiency Virus**  
(Adapted from Gerberding JL Ann Intern Med 1996;125:497-501, MMWR 1996;45:468-472)

Attributes of exposure	Attributes of the source patient			Antiretroviral regimen
	Asymptomatic, Known Low titer, unknown HIV status but has risk factors	AIDS, symptomatic infection	Pre-terminal AIDS, acute infection, known high titer	
<b>Percutaneous injuries</b> Superficial injury Visibly bloody artery or vein Deep intramuscular injury or actual injection	Offer Recommended  Strongly encourage	Recommend Recommend  Strongly encourage	Strongly encourage Strongly encourage  Strongly encourage	ZDV + 3TC ZDV + 3TC +/- IDV ZDV + 3TC + IDV
<b>Mucosal contacts</b> Small volume and brief contact  Large volume or prolonged contact  Large volume and prolonged contact	Offer  Recommend  Recommend	Offer  Recommend  Recommend	Offer  Recommend  Strongly encourage	ZDV + 3TC ZDV + 3TC +/- IDV ZDV + 3TC + IDV
<b>Cutaneous contacts</b> Small volume and brief contact  Large volume or prolonged contact  Large volume and Prolonged contact	Offer only if obvious portal of entry Offer (recommend if obvious portal on entry)  Offer (recommend if obvious portal of entry)	Offer only if obvious portal of entry Offer (recommend if obvious portal of entry)  Recommend (especially with portal of entry)	Offer only if obvious portal of entry Offer (recommend if obvious portal of entry)  Recommend (especially with portal of entry)	ZDV + 3TC ZDV + 3TC +/- IDV ZDV + 3TC +/- IDV

ZDV - Zidovudine 200 mg tds, 3TC - lamivudine 150 mg bd, IND -indinavir 800 mg qid



**C. Post exposure Follow-up: Hepatitis B Virus (HBV)****I. Post exposure prophylaxis for HBV**

The management of persons with possible exposures (percutaneous or mucosal) to hepatitis B is outlined in Table 3. For persons who previously received a full course of hepatitis B vaccine, it is important to determine whether an adequate level of anti-HBs Ag has been previously documented.

**Table 3**  
**Hepatitis B Post Exposure Prophylaxis**

Exposed Person		Source	
Vaccination Status	Antibody Hepatitis B level (Anti HBs)	HBsAg Positive	Unknown Status
	> 10 IU/L documented Known non responder (anti HBs level $\leq$ 10 IU/L after vaccination) *	No action necessary HBIG *	No action necessary HBIG *
Vaccinated	Level unknown and unable to determine within 48 hours - regardless of having Hepatitis B series previously	HBIG Single booster	HBIG <sup>2</sup> Single booster
Unvaccinated	$\geq$ 10 IU/L	No action necessary	No action necessary
	Unknown level	HBIG Full vaccine course	HBIG Full vaccine course

Hepatitis B immune globulin 0.06 ml/kg should preferably be given within 48 hours of exposure. Efficacy decreases with time and is unknown after 7 days.

\* If exposed person has received only three vaccine doses, an additional 3 dose series may also be given.

**D. Post Exposure Follow-up: Hepatitis C Virus (HCV)**

Prophylactic therapy with immune globulin or anti-viral agents does not reduce the risk of HCV transmission following significant exposures.

**E. Post Exposure Counselling**

Follow-up counselling should include more in-depth counselling and emotional support for this critical incident.

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## Attitudes towards Safe management of Health Care Waste - an exploration

Ramakrishna B Goud<sup>1</sup>, Girish N<sup>2</sup>, Dayananda M<sup>3</sup>, Narasimha Murthy<sup>4</sup>, Gopinath D<sup>5</sup>, Shivaram C<sup>6</sup>

Safe Management of Health Care Waste has come to be recognised as being more of problem of attitudes and thereby of practices by the Health care personnel rather than that of providing technology or mere facilities.

In this context, a larger study was undertaken as part of the dissertation thesis for MD in Community Medicine of Rajiv Gandhi University of Health Sciences, Bangalore at the Department of Community Medicine, M S Ramaiah Medical College, Bangalore titled "Determinants towards Safe Management of Health Care Waste"

The study involved the probing into the attitudes of the Health Care Personnel, HCP towards Safe Management of Health Care Waste. The following paragraphs discuss responses to some of the questions probed.

The purposive study was undertaken in 88 health care settings and a total of 303 (125 Doctors, 80 Nurses, 55 Laboratory technicians, 43 Ayahs / wardboys) health care personnel were interviewed. A major assumption underlying this study is that all the personnel have been combined together as constituting one collective group. This is necessitated due to the realisation that it is individual and thereby the collective will of the health care setting finally decides the prevalent system for management of health care waste.

Of the 303 Health care personnel, 236(77.8) responded in the affirmative opining that Safe Health Care Waste Management is an important issue. 229(75.6), of HCP agreed that health care waste has potential to be hazardous. It was observed that 234 (77.2) of the HCP felt that there was a requirement for enacting Legal provisions to ensure safe management of HCW. 138(78.2), HCP appreciated the need for health care institutions to frame Waste Management policies. But on the question of pinning down responsibility 33% opined that it was the governments responsibility.

Though 256(84.5), of the health care personnel opined that Segregation is the single most important step in safe management of health care waste 55% have opined that this practice might increase injury to the waste handlers. This contrasts and brings to the fore the inherent dilemmas in the practice of waste segregation. This aspect has a major bearing in the training and orientation of the health care personnel. The above responses when viewed critically points to the fact that HCP do exhibit awareness about the importance of SMHCW but desirable attitudes have to be reinforced during the formal training and reorientation sessions.

Use of plastic avoids re-use. An attitude towards management of plastics could be due to the overwhelming fear of pilferage. Probably the failure to appreciate the fact that, if plastic health care wastes is disinfected and (possibly) disfigured, they could be safely recycled.

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Statements	SCALING			
	DNA	-	=	+
Safe management of health care waste is not an issue at all	26 (8.6)	24 (7.9)	17 (5.6)	236 (77.8)
Health care waste has the potential to be hazardous/dangerous	38 (12.5)	14 (4.6)	22 (7.3)	229 (75.6)
Safe management of health care waste is the responsibility of the government	29 (9.6)	149 (49.1)	24 (7.9)	101 (33.3)
Segregation of waste at source increase the risk of injury to waste handlers.	34 (11.2)	91 (30.0)	7 (2.3)	170 (55.1)
Safe management of waste does not help in controlling hospital acquired infections	36 (11.9)	40 (13.2)	6 (2.0)	121 (70.9)
Plastics should be incinerated to avoid reuse	53 (17.5)	126 (41.6)	12 (4.0)	112 (37.0)
All types of waste can safely be incinerated	49 (16.2)	136 (44.9)	11 (3.6)	107 (35.3)
Lack of awareness is the main reason for mismanagement of health care waste	46 (15.2)	123 (40.6)	8 (2.6)	126 (41.5)
Safe Management efforts by hospitals increases financial burden on management	51 (16.8)	98 (32.3)	45 (14.9)	109 (36.0)
Safe Management endeavours by hospitals increases financial burden on patients	47 (15.5)	63 (20.8)	48 (15.8)	145 (47.8)
Safe management of Health Care Waste is an extra burden on work	41 (13.5)	105 (34.6)	46 (15.2)	118 (39.0)

+ Positive attitude, - Negative attitude, = No Comments, DNA did not answer figure in brackets indicate percentages

One hundred and forty four of the respondents (47.5%) felt that there was a need to develop a process for recycling of plastics as a mode of management and 126(41.6) felt that incineration should be considered as an option.

A notable factor in the overall attitude towards responsibility for safe management of health care waste here is the overwhelming response to the role and responsibility of Patients /attendants in waste management. Majority of the HCP felt that waste management is team work and that there can be no single category of HCP responsible for its safe management.

In consideration of the responses related to lack of awareness, the perceived financial burdens on hospitals and perception of those costs which are passed onto the patients it becomes imperative that if systems for safe management are to be instituted these "other" issues need to be tackled sensitively and realistically.

In summary it may be inferred that, **before instituting systems for Safe Management of Health Care Waste, a detailed probing into the prevalent attitudes of the different categories of respondents is indeed worthwhile. The training and orientation sessions need to address these concerns and opinions of the health care personnel.**



**Prof. A.K. Agarwal**

## **Role of IGNOU (Distance Education ) in Training and Development in Bio-Medical Waste Management**

The Central Pollution Control Board has written to the Director-General of Health Services, Union Ministry of Health, and the Director-General of the Indian Council of Medical Research, and Medical Council to start formal courses on management of hazardous medical wastes. The CPCB Chairman has gone on record to say that there was a lacuna in this area as medical and other health staff were unaware of how to deal with hospital wastes. According to Mr. Delip Goswami, Secretary, Society for Development of Environmental Laws. "While Delhi hospitals generate about 20 tonnes of medical wastes per day that is incinerated, there remains the problem of where to dump these incinerated wastes. There is also the problem of transporting the wastes". Though 60 tonnes of medical waste is generated in Delhi per day and 20-30 incinerators were installed in different hospitals, which can incinerate the waste generated. Nearly half of these incinerators were not utilized to their full capacity. The Article 21 of the Constitution enshrines "Right to life and any citizen can knock the doors of The Supreme Court or The High Court under Article 226 of the Constitution and challenge health hazards due to pollution and even non-treatment of the hospital wastes.

In 1998, the Ministry of Environment formulated standards and the guidelines to be followed by every hospital, nursing home, clinic, dispensary, vaterenary institution and animal house, Pathological laboratory and blood bank. The details are given in the Bio-Medical Wastes (Management and Handling ) Rules, 1998. From January 01, 2000, these guidelines have been enforced strictly on All-India basis. Today, we are standing at the cross road with regard to the hospital waste management. A modest begining has been made in 2000 by floating a professional body -Indian Society of Hospital Waste Management, ISHWM and since then ISHWM has been doing the pioneering work in promoting the cause of this complex problem.

It is imperative to train and educate a large body of health professionals in bio-medical waste management and treatment technologies. It has now become a disipline by itself and requires the development of scientific training and education programs. Since this has to be done on a countrywide basis and at a large scale any one conventional institution will not be able to address to such a gigantic task. However, this can be effectively accomplished through distance education. The Distance Education System is an excellent blend of flexibility in terms of time, place and space while ensuring an objective, standardized and replicable approach to learning and evaluation so as to achieve the democratization of education. Integration of distance education technology in national health delivery system could ensure not only quality but cost effectiveness and self-reliance.



Indira Gandhi National Open University IGNOU has been established as an apex central university by an act of Parliament in 1985-86. The Cumulative enrollment as of today is to the tune of over 800,000 students. The annual enrollment in 2002 in over 70 different programmes is around 300,000 students. IGNOU is the 2nd largest open university in the world with its study centres in over 15 countries.

The school of Health Sciences, Indira Gandhi National Open University has already made a mark by successfully launching a variety of health programs through distance education. The various programs of the School of Health Sciences are imparted through a rich blend of multimedia technology such as transferring the technical/clinical skills to the learners at identified hospitals/study centres, self-instructional material, strategy for monitoring the hands on training, teleconference, and many others.

The five such programs already on offer are as under :

1. B.Sc. (Nursing)
2. Post Graduate Diploma in Maternal & Child Health
3. Post Graduate Certificate in Rural Surgery
4. Post Graduate Diploma in Hospital & Health Management
5. Certificate in Health and Environment

The implementation model involves a 3-tier mechanism comprising of the Program Study Centre (PSC) which is located in large hospital/institution, the Skill Development Centre (SDC) for the hands on training at the secondary level and the learners' own work place. Similarly, the monitoring is also carried out at three levels i.e. by the core faculty of the School of Health Sciences, at the state level by the Regional Health Sciences Advisory committee and, at the peripheral level by the Regional consultants. The certification of the Students/learners is done by giving proportionate weightage to every level of hands on training, and also for every component on curriculum.

**IGNOU and Indian Society for Hospital Waste Management (ISHWM) can join hands in developing a Certificate/Diploma program in Bio-Medical -Waste Management through Distance Education.** In fact, the two (IGNOU and ISHWM) have worked together and successfully developed a video film on Bio-Medical waste and its Safe Disposal. To begin with, a 3-6 month education and training program should be developed through distance education for the in-service health professionals.

*A N Yellappa Reddy,*

**Safe Management of Health Care Waste - yet to gain full attention from all concerned**

John Lockie a Philosopher of the 18<sup>th</sup> Century said, “ (my) belief was in law of nature governing human society similar to those governing the physical universe. As the atoms in a gas would establish a balanced state, so human individuals would settle down in a society, in a state of nature. Thus the function of government was not to impose its laws on the people, but rather discover and enforce natural laws that existed before any government was formed”.

1972 - Milton Friedman, while addressing the American Economic Association said that “ I believe that we economists in recent years have done most harm to society at large and to our profession in particular by claiming more than we can deliver.”

1978 - Michael Bluementhal said, “ I really think the economic profession is close to bankruptcy in understanding the present situation. I feel every profession need a self introspection to redress the damage inflicted on life supporting resources of the planet and to create a ecologically harmonious social order”

Thus the challenge today is to take stock of the progress made and to chalk out the path for future endeavours. What we need is sustainable development. What we need to demand is ecologically safe development.

In the last five decades, environmental factors have emerged as a major cause of global increase in illness and deaths. This is despite the fact that substantial amount is being spent on health care. In United States alone medical care cost \$12 billion in 1950 and \$160 billion in 1977, even though most of it was avoidable.

**As per the 8<sup>th</sup> World resources Report (Washington), nearly 11 million avoidable child deaths are due to environmental factors. The poor and the children are the most vulnerable victims.**

The children of ragpickers and the pourakarmikaas are most severely affected. The Slum scenario and Ragpicker's scenario is a negation of human rights, the like of which no eye has seen, no heart conceived, no human tongue can adequately tell. Soul sensitive compassion and humanism is writ into Article 51A - spelling out the fundamental duties of every citizen. The treatise on these aspects are well emphasised in medical profession.

Besides, the Supreme Court of India has also assailed and magnified the majestic spectrum of right to Health Care and need of precautionary principles as implicit in Article 21. Any management producing hazardous waste is also liable for criminal prosecution and shall have to be viewed as culpable homicide, if they fail to operate safety measures or if there are any illegal omissions in adopting the required safety measures.

In the context of Safe Management of Health care Waste, the proverbial statement applies in words and spirit, i.e., an ounce of prevention is worth a pound of cure.

**There have been systematic endeavours across the country. Both, individuals and institutions have demonstrated the capability to work beyond the constraints of the existing systems for Waste management.**

We can look up to the future when the Waste from Health Care settings are being managed safely. Complacency at this stage is detrimental. Let us carefully study the loop of Mercury, its impact on life also in relation to the Health Care Waste. Let us understand the unfinished agenda in front of us.

Mercury has the ability to pass all the three delicately designed barriers of human body the skin, the blood, the brain and the placenta. It is being consumed via food, inhaled and also absorbed through skin. Mercury exposure leads to pneumonitis, Bronchitis, muscle tremors, irritability and personality changes. Effects on the nervous System include Impaired vision, impaired hearing, paralysis, insomnia, emotional instability, development deficits during foetal growth, attention deficit and growth delays during childhood. When ingested by pregnant women methyl Mercury readily crosses the placenta and targets the developing foetal brains and the central nervous system.

In America, studies reveal that 340 lakh Mercury is bioaccumulated and the Mercury contamination is a problem of the future. When liquid waste from Dental clinics, solid waste when burnt will get mixed with rainwater and gets into the tanks and water bodies. The bacteria convert it into Methyl Mercury. Small fish eat the bacteria and as the food chain works up the highest pyramid get the maximum dose of the poison. Even 1/70<sup>th</sup> of a teaspoon in a tank would contaminate a 25-acre tank to a point where the fish are unsafe to eat.

Mercury finds it uses in Medicine is a large number of ways.

- in thermometers, Blood pressure apparatus, Feeding tubes, Dental amalgams, Fluorescent tubes, as laboratory reagent and as histological fixtures.

Mercury is a global pollutant and it can travel long distances carried by wind and comes back with rain. Mercury is an extremely volatile metal that can be transported to greater distances after it is spewed into the atmosphere. Once it reaches an aquatic environment Mercury is transformed into methyl Mercury-a potent neuro-toxin. Mercury does not break down. It accumulates in the muscles of animals, concentrating as it moves up.

In any Hi-tech health care establishment 50 times more Mercury is generated in hospital wastes. This is true of the current day Municipal waste also, the largest sources being from thermometers and Dental clinics.

**National Academy of Scientists have estimated that 60,000 American Children may develop neurological problems or learning disability each year.** Realising this San Francisco, Boston and New Hampshire have banned the manufacture or import of fever thermometers.



In 1972 WHO sets a standard safe dose on 0.47 Micrograms / kg bodyweight. In 1985 the dose permissible was reduced to 0.30 micrograms and in 1995 to 0.10 micrograms. EPA is thinking to reduce it to between 0.06 to 0.025 micrograms.

In our own country observations or umbrageous studies have not been undertaken to assess the damage. Around suburban Bangalore tonnes of Municipal waste is being dumped and burned in most haphazard way. These wastes get into the nearest tanks, ponds, cesspools and valleys. We are still sticking to 1972 standards only. More often than not no monitoring is being done.

Thus Mercury is major worldwide environmental problem with serious, immediate and long-term implications for human health. The future generation is exposed for the injury, impairment and other health hazards.

**The next issue of the ISHWM Journal which will be published for the year 2003 during January - March 2003 will have as its theme "Bio-medical Waste - Policy and legislation". The Editorial Board invites articles, reflections, experiences, reviews, status reports and related scientific thoughts for publication.**

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*Jyotsna and Satyavir Chauhan*

## Andhra Pradesh in Bio-medical Waste Management. In the right lane?

It takes the effort of four good, synchronized wheels to drive a car in the fast lane. And yet another wheel in the boot to play it safe. The bio-medical waste management drive in Andhra Pradesh is an example of how the four wheels/ pillars or the arch on which the movements rests have all worked with a single minded aim and have worked concertedly to put the car into overdrive – in the fast lane. However it's not been simple. The road at times was difficult to navigate; many hairpin bends slackened the pace and many a speed breaker had to be negotiated carefully. Today, AP cruises along if not in the absolute comfort zone, but in a different and new zone, where the learning's are there for many to learn. Yet, milestones to reach are still very many.

The taking off...jerky, on a rough road

While the Bio-medical Waste Management Rules, 1998 were on the threshold of enforcement, they continued to plague the various stakeholders at every level. The regulatory body was looking at appropriate strategies to implement the rules and set the ball rolling. The health care establishments did not know where to begin. Awareness was dismal. Interest and priority extremely low and the attitude- pathetic and resistant. "We're doctors and our role is to safeguard health and not waste disposal" Or that 'why bother us, it's a matter that involves the sanitation and house keeping person'. Investors were skeptical on Rate of Return as much as the Govt. medical dept on the seriousness of enforcement. Generally inertia at every level made it difficult to think let alone pump up any adrenalin.

### **The four wheels of progress**

- 1. Healthcare establishments – Private, Govt.**
- 2. Treatment & disposal facility- operators end of the pipeline solution providers**
- 3. The NGOs/ Nursing homes associations**
- 4. The Regulatory body - APPCB**

To make things worse multi pronged strategies were required to target the different stakeholders. Safe management & disposal of infectious and hazardous waste meant investments- in bags, disinfectants and also technologies. A far cry really from a system of paying a paltry sum to the Municipal Corporation. A cost to change phenomenon, there were few takers who even believed in the theory of safe management & disposal of waste let alone invest in technologies. While the health care establishments can be broadly classified into two - Private and Govt., both of them had to be approached differently. Budgets and investments both in time and money became an issue of debate. Belling the cat was difficult, but not impossible.

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\*Jyotsna Chouhan Society, Hyderabad. Paper presented in ISHWMCOn 2001 at Bangalore

Then there were investors exposed to a new opportunity of transporting, treating and disposing waste as a line of business. A worried lot considering that minimum volumes were required to run the technologies at the plant. Worse, unless waste was segregated at source, they couldn't operate their technologies within the mandates of the BMW rules. Added to this was the fear of policing – by the regulatory body, public groups, HCEs and NGOs. Awareness, understanding and training thus became the buzzword. However being in a nascent stage as a concept there was hardly any expertise/ organizations to offer these services. Other than the health care establishments and investors unsure of investments in treatment and disposal facilities, the State Pollution Control Board was also at sea. Their staff was not aware or geared to deal with infectious, hazardous waste. They had no exposure of health care settings and absolutely no clue on what this kind of waste looks like. "Handling industries is one matter, we can tackle them, prosecute them, close them for non-abeyance, but doctors? ... It's difficult'. But the pressure from the NGO's was tremendous, the attitude of the man in chair at the PCB –positive and raring to go, and by sheer dint of luck, the response came from unexpected quarters, nursing homes associations, Govt., Voluntary organizations, NGOs... all tricked in. Till they formed a stream.

A good omen at the start off point

Flagging off the movement in the twin cities of Hyderabad & Secunderabad since the cities had a population of over 30 lacs and hence were in the first schedule of deadlines was a brainwave of the APPCB. Laying impetus on the concept of common waste treatment facilities for transport, treatment and disposal of bio-medical waste, the APPCB, disallowed setting up of incinerators at individual sites and instead implored HCEs to tie up with common waste treatment facility operators on user- pay charges. This envisaged not only convenience to HCEs but also a sigh of relief from investing in technologies on site at hospitals. The concept of CWTF's easily got the nod from the HCEs and 2 facility operators were given Consent for Establishment in Hyderabad. The same paradigm is now being replicated in other cities in the State

The first leg

**Authorizations:** Every HCE was asked to apply for authorization as per Form – I laid down in the rules to the APPCB. A fee of Rs. 100/- per bed was fixed.

**Awareness, Training & Implementation and setting up waste management systems.** Simultaneously the HCE was to take up the issue of creating awareness, training of staff and set up a good waste management system.

**Tying up with Common waste Facility operators for transport, treatment & disposal.** All the HCEs were asked as part of the authorization to tie up with either of the 2 facilities in Hyderabad.

**Inspection & Monitoring** by the APPCB to check if procedures were being followed on the mandates prescribed in the BMW Rules, 1998.



### **Initiative taken by the Municipal Corporation**

In Hyderabad, to enforce implementation of the Rules, the MCH too, rose to the occasion. As a policy the MCH decided that it will not pick-up any bio-medical waste. Any bio-medical waste therefore had to be segregated as per the colour codes of the MOEF rules and handed over to the common waste facility operator. Foreseeing the threat that some hospitals may dump infectious waste in the municipal bin, the MCH initially decided not to pick-up any hospital waste infectious or non – infectious. Or rather they would not be coming to the hospital at all for any kind of collection. A press release and an advertisement to this effect was inserted in the newspapers saying that MCH would not pick-up waste from 1st of Feb, 2000 from all those HCE's that have obtained authorisation and from the 1<sup>st</sup> of March, 2000 for all HCE's whether they have obtained authorisations or not. Thus both the Common Waste Treatment Facility Operators had no option but to pick up both wastes- bio-medical & general until the MSW Rules came in when the responsibility of collecting general waste now became only MCH's.

### **The Regulatory wheel – The role of the Andhra Pradesh Pollution Control Board.**

As the Regulatory Body, the APPCB had a difficult task at hand. Yet a good beginning was made. To start off, The Member Secretary of APPCB was appointed as Prescribed Authority for the State. Soon after the Advisory Committee was formed consisting of members from various departments like Medical and Health, Municipal Administration, A.P. Nursing Homes Association and NGOs. The responsibility of the Advisory Committee is to advise the Prescribed Authority on matters related to the implementation of the Rules. The Advisory Committee then constituted the Technical Committee consisting of Doctors from Private Hospitals, Government Hospitals and NGOs as members.

In a remarkable move, the committees decide that no individual incinerator will be allowed to operate in the habited areas. This put pressure in quickly encouraging the CWTF to be set up.

#### **The three types of Authorizations in A.P**

**GREEN** – HCE's where the common treatment facilities are available. The applicants are given the names and addresses of the Common Waste Treatment Facility Operators. The choice of approaching the facility for tie-up is left with the HCE.

**BLUE** – For towns where population is 30 lacs and no common treatment facility is available. It is suggested that disinfect ion after source segregation is done as per Bio-medical Rules before it is handed over to the Municipal Corporation. This will be an interim direction until a common waste facility is installed. Once that happens, fresh authorizations will be given appropriately.

**YELLOW** – For HCE's situated in area having population less than 30 lacs with adequate space within premises for setting up treatment facility, it is recommended that on-site arrangements for disinfect ion and deep burial be implemented as per the provisions of the notifications. Individual incineration by the HCE's is not encouraged

The process of authorizations then set course. In the 1<sup>st</sup> year 480 hospitals in A.P were issued Authorizations. While the concentration in the 1<sup>st</sup> phase was on Hyderabad and big cities, authorizations from hospitals in small cities begin concurrently.

To speed up the process of implementation of the rules two CWTFs in Hyderabad City, one in Visakhapatnam City and one in Vijayawada have been given consent for establishment by the APPCB to collect, treat, transport and safely dispose the Solid Waste generated in different HCEs and hospitals. Of the 4 facilities both the Hyderabad facilities have started their operations treating 60% of the BMW from the twin cities.

The economics of these CWTFs were widely debated upon. The charges either on bed basis or on volume basis were discussed in detail. The charges on volume basis were not found feasible and practical. Though the hospitals were not giving the right number of beds, this approach was still found to be practical.

To train the staff of APPCB an orientation programme on Bio-Medical Waste Management was done by M/s Jyotsna Chauhan Associates for the Regional Officers and the Zonal Officers of the APPCB in June 2000 with practical demonstrations and testing of the new inspection and monitoring formats devised by JCA.

Considering that the APPCB is short staffed, it resorted to using NGOs and trained Regional Officers of APPCB. Therefore a networking system of interaction – APNA with PCB, PCB with NGOs, NGOs with Govt. and APNA thus began and paved way for concerted effort put in across the board by all stakeholders.

The PCB organized workshops at Hyderabad, Visakhapatnam, Nellore, Tirupathi, and Kurnool etc

. Last year a workshop- Medwaste Strategies 2000 was organized at Visakhapatnam in association with JCA- Society of Jyotsna Chauhan

As per the Member Secretary The CWTFs are being treated like an industry and the CFE, CFO and other mandatory requirements have to be obtained.

To monitor the implementation a Task Force for monitoring the HCEs in Secunderabad & Hyderabad Cities has been constituted and is operational. The Task Force comprises of a member of JCA, APNA, CRE and two officers of the APPCB. The Task Force has already completed inspecting the HCEs in the first year.

### **The 2<sup>nd</sup> Wheel: The Health care establishments**

With Authorization being made mandatory, HCEs began to follow suit. But what and how next continued to embroil them. Systems needed to be set, awareness & training required to start off, people had to be made accountable and a money's needed to be allocated both to tie-up, use and pay for common waste treatment facilities and also in buying bins, bags, disinfectants and safety gear- a mammoth call really.



## Private HCEs

Rising to occasion, the Andhra Pradesh Nursing Homes Association took the lead. Interacting with the Prescribed Authority at the PCB, they first negotiated with the CWTF Operators in Hyderabad. Having debated on whether it should be based on per kg cost of treatment, volume or bed, a per bed per day situation seemed to the most practical both to the HCE as well as the CWTF operator. An initial price of Rs. 3/- per bed per day was fixed which on further negotiation got settled at Rs. 2/- per bed per day. Simultaneously, APNA began helping HCE's to get their authorizations. While the smaller to medium HCE's got their Authorization forms routed via the APNA, some of the larger HCE's applied for it independently. Concurrently, APNA organized common orientation sessions for staff of HCEs with support of NGOs, CWTF Operators and PCB. However, the job at hand wasn't easy. Organizing orientation sessions – off site did not cover most staff and there was need to train them on not just segregation but also other principles of waste management.

Realizing that training of staff and setting up of proper systems was the key to the survival of their operations, one of the Operators- GJ Multiclave enlisted the support of JCA- Society of Jyotsna Chauhan an NGO with a track record in training & capacity building in bio-medical waste management. JCA had already trained APVVP Hospitals in Hyderabad (under the Andhra Pradesh First Referral Health Systems Project – World Bank Funded), Osmania General Hospitals by then and also the Andhra Pradesh Pollution Control Board. JCA thus started on-site training of all HCEs tied up with GJ Multiclave. Different training modules were developed to address different cadres of staff, simple, lucid step-by-step procedures were listed in a guide that was distributed and posters designed and printed to increase visibility at the HCE. To help the HCE's sustain and minimize expenses that needed to be incurred, a system of waste funding the system by appropriate recycling was set. This helped the HCEs to recycle non- infectious waste, the money earned from which helped them offset cost, thus paving way for a sustained system. The results began to trickle in. Segregation, disinfect ion, collection, storage, record keeping, recycling and safety of the health worker started getting adhered to. And systems slowly started getting set. To instill accountability, role-plays of each health care worker was detailed and a Waste Management Committee at every HCE was set-up to educate, inform, interact, implement, record, update and monitor the waste management system. Inertia soon paved way for action from all quarters so much so, that the other operator realizing the merit of training opted and offered for a similar system of training for all HCEs tied with them. However, credit also goes to both the CWTF's for not only offering training to staff at HCEs but for also for the necessary follow up without which it would have become difficult for the movement to sustain.

The CWTFs thus widened their canvas from offering transport, treatment & disposal to include training with support from NGOs as well as printing of posters etc for promotion of better practices of segregation. In addition since procurement of bags printed as per the rules were difficult to source by HCE's as were needle cutters/terminators, both the CWTF's also started offering these to the HCEs at a cost.



## **Government HCEs**

Unbelievable as it may sound, it was the Govt. that took the lead in Hyderabad and that too much before – 13 months before the first deadline of 30<sup>th</sup> June, 2000. Under the stewardship of Mr. M Nagarjuna IAS, (Referred to as the father of the bio-medical waste management movement) the then Project Director of the Andhra Pradesh First Referral Health Systems Project and Ex Officio Secretary, Dept. of Health, Andhra Pradesh Vaidya Vidhana Parishad hospitals in Hyderabad- King Koti District Hospital, Nampally Area hospital & Golconda Area hospital were trained by Jyotsna Chauhan Associates and systems had been established for safe management and disposal of bio-medical waste. The Waste Management Committees at these hospitals had begun to take charge of this new line of priority. Since neither of the CWTF's were operational then, the hospitals used to disinfect all mutilated sharps and plastic and rubber waste before handing over to the Municipal Corporation in colour coded, bio-hazard symbol marked bags. In addition the hospitals were also trained on methodologies for sustenance with introduction of policies on recycling non-infectious waste and this considerably reduced the burden on the hospitals in terms of moneys spent.

However, as far as the other Govt. HCEs were concerned, the passage was far more difficult. While a dynamic Principal Secretary in Mrs. Rachel Chatterjee and Mr Nagarjuna had opened a gateway, inertia was a difficult problem. To break the ice workshops were held, debates ensued, action plans chalked out. To begin with a Core Committee was formed and made in-charge of all issues related to bio-medical waste. The Committee also had one representative of APPCB. The Core Committee as a first step called for the formation of Waste Management Committees at all hospitals and do a waste audit and also draw lists of the equipment/consumables required so that budgets could be drawn. Based on the requirements of all hospitals budgets were finalized for one-time equipping and also for tying up with CWTFs. All the Waste Management Committees of hospitals in Hyderabad, Secunderabad and Warrangal were trained in setting up systems and training by JCA. Simultaneously, dialogue began with both the CWTFs. On negotiating the Govt. got a good deal- Rs. 2 per bed per day for general hospitals and a fixed price for specialty hospitals like eye, mental, dental etc. In addition training as well as colour coded bags would be provided by CWTF's with in the cost of their services. With budgets having come and allocated, all hospitals, thus geared up to setting up systems and implementing rules. And the training process started on the same basis as in the private HCEs. The only hospital that had, had an exposure to training was Osmania- the largest tertiary hospital in the state by JCA earlier but considering its size, more interventions were required. The hospitals in the Govt. sector were divided between both the CWTFs. This formidable number of beds in Govt. sector began to discover a new kind of management – bio-medical waste management, a management that they had to be a part of- like it or not.

## **The Common Waste Treatment Facility Operators – the third wheel**

With the APPCB encouraging CWTF as against individual facilities, and more and more HCEs preferring them as a better- no headache option, Andhra is the first State to have established this new concept not only for Hyderabad but also for Vizag and Vijaywada with M/s Maridi

Ecotherm and M/s SafeEnviron for Vizag and Vijaywada being given Consents for Establishment by the PCB. Both the facilities – Vizag and Vijaywada are expected to commence operations by end of December.

Presently 2 facilities in Hyderabad, GJ Multiclave India Pvt. Ltd and Medicare Incin Pvt. Ltd are operational. They have been collecting bio-medical waste from 16,400<sup>1</sup> no of beds in the cities of Hyderabad and Secunderabad. 413 HCEs have so far subscribed to the facility<sup>1</sup>. In addition to transport, treatment & disposal both the facilities offer free training and consumables like bags at a nominal cost.

**GJ Multiclave India Pvt. Ltd.**

Incinerator: 100kgs per hour.

Microwave: 60ltrs/cycle.

2 Standby Autoclaves: 120ltrs & 30 ltrs/cycle

Shredder

Chemical Disinfection

Secured Landfill

ETP

2 vehicles (Trucks) with compartments for transportation of waste

No. of beds tied up: 9200

**Medicare Incin Pvt. Ltd**

Incinerator: 100 kgs per hour

Autoclave: 120 ltrs per cycle

Shredder

Chemical Disinfection

ETP

Needle Bunkers

Tie-up with Hazardous waste Treatment, Storage & Disposal Facility (TSDF) for landfill (Expected to commence shortly)

3 vehicles for transport of waste

No. of beds tied up: 7200

### **NGOs, public groups and voluntary organizations- the 4<sup>th</sup> wheel.**

Aiding the movement by acting as catalysts, the role of NGOs/ voluntary organizations/public groups has helped sustain the movement in A.P. Working in close coordination with the Govt., PCB, APNA and inter- networking, the community has facilitated and fostered the movement by giving it the fillip it deserves. JCA- Society of Jyotsna Chauhan CRE & Parirakshana have worked relentlessly to pave way for better norms of waste management – in a manner that it does not endanger the environment and human health.



Notable amongst them is the work of JCA, who have not only put in a lot of effort in training and capacity building both at HCE level as well as regulatory bodies but also for the pivotal role that they have played in coordinating and pressurizing the Govt. and private HCEs on the need for bio-medical waste management. Coordinating with the Govt core committee, the health dept and the PCB, they have been an important catalyst in mobilizing the Govt. to give bio-medical waste management the priority it deserves. Their study on how waste can fund the waste management system to a large extent has helped both the Govt. as well as private HCEs reduce their financial burden considerably and their Training Manual: 'Getting to know waste management- a step by step guide for healthcare establishments' by Jyotsna & Satyavir Chauhan has been approved as a standard training manual for the state.

### **Legal interventions/PIL- the spare wheel in the boot**

A last resort really, fortunately AP has not seen many of them. With bio-medical waste management finding more and more acceptance at all level, AP hopes that this wheel will remain in the boot until such time that it becomes necessary.

However, with the Task Force at work and based on their recommendation, the APPCB has today resorted to sending notices to 6 HCEs in Hyderabad. Prosecution is being initiated against these HCEs for not obtaining authorizations and implementing the rules.

### **The current scenario**

The Bio-medical Waste Management Task Force constituted by APPCB and comprising of members from PCB, JCA. CRE and APNA) has so far inspected 425 HCEs in Hyderabad-Secunderabad, Ranga Reddy (adjoining Hyderabad)

### **The findings of Task Force are:**

In the areas inspected so far, there is 90% awareness of the Rules.

75% HCEs have begun implementation of a waste management system. Some very well and most – average.

While some hospitals have set up extremely good systems of segregation, disinfection etc others though have initiated, still need to put in more inputs before being put into the very good category.

On an average, 60% of BMW is now being segregated

All Government Hospitals have tied up with Common Waste Treatment Facilities. With a year and a half of experience behind them, both the CWTFs today treat approx 16,400 beds from the twin cities of Hyderabad and Secunderabad

Training and follow-up training continues at HCE level and monitoring of CWTFs begins to take place.

Two more Common Waste Treatment Facilities are expected to get commissioned shortly - Maridi for Visakhapatnam and Safe Environ for Vijayawada.



The second stage – renewal for Authorizations has begun – for this year. The APPCB had earlier decided that this year again HCE's will get authorizations for a period of 1 year and if they manage their systems better by next year only then will they be given a 3 year authorization.

### **Eco-friendly technologies**

With JCA's impetus and crusade on non-burn technologies, it is heartening to say that there is now awakening at APPCB. The APPCB is now focusing on non-incineration technologies all over the State even at CWTFs. There is now a positive ray of hope as more and more like-minded people and organizations take up the cause with the belief that the future lies in good, standardized alternate technologies.

### **Alas! The drive would be smoother if...**

The management at the HCE's take a little more initiative in motivating staff to perform as well in managing bio-medical waste as they do in clinical matters. Proper follow-up in training were constantly followed and testing facilities for testing incineration ash etc, monitoring of HCEs as well as CWTFs, their handling, treatment and disposal methodology, stack emissions needs to be done more thoroughly and equipment to monitor dioxins and furans available.

The drive's just begun. The destination is far away. Only if the right fuel and the right pressure is maintained, will Andhra Pradesh taste a sense of satisfaction and reach even the nearest milestone.

Note: All figures mentioned have been ascertained on the basis of verbal interaction (telephonically) with APPCB and the Common Waste Treatment Facility Operators

<sup>1</sup> Source: APPCB & CWTF Operators ( refer note at end)

#### **Abbreviations:**

**BMW:** Bio-medical waste.

**HCE:** Healthcare establishment

**CWTF:** Common waste treatment facility.

**PCB:** Pollution Control Board. **A.P:** Andhra Pradesh

**"Of course, the most important element is to realize that the aspect which is crucial and which is not really understood is that of education, awareness, and training. One of the basic laws of pollution control is to prevent pollution at source, in the very beginning of the processes..... It has to be in-built into medical education"**

**- Prof. M G K Menon in his inaugural address at ISHWMCon2001**

\* Dr. LAKSHMIKANTHA H

## STATUS OF IMPLEMENTATION OF BIO-MEDICAL WASTE (Management and Handling) Rules-1998 IN THE STATE OF KARNATAKA

### ABSTRACT :

In the name of civilization, during the recent decades industrialization and urbanization has substantially grown up leading to environmental pollution in all aspects. The damage/pollution caused to soil, water and air has received vital importance by the public all over the world. The issue of pollution has become a matter of concern to human community. The service of medical facility to humans is inevitable and commendable. Surprisingly, scientific disposal of the waste generated by these facilities were not given much importance. The Ministry of Environment and forest, GOI notified Bio-Medical Waste (Management and Handling) Rules 1998, under the provisions of Environment Protection Act (Environmental Protection Act ) 1986. The said Rules extend to whole of India. These rules shall apply to all persons who generate, collect, receive, store, transports treat and dispose Bio-Medical Waste (BMW) in anyform. The occupier shall make an application with prescribed fee for grant of authorization. Violations of the provisions of Bio-Medical Waste (Management and Handling ) Rules attract action under Section 5 and 15 of Environmental Protection Act 1986. Efforts have been made to implement the said Rules in the state of Karnataka. The paper highlights the status of the implementation of the Rules by Karnataka State Pollution Control Board.

### INTRODUCTION

The Ministry of Environment and Forests, Govt.of India notified the Bio-Medical Waste (M&H) Rules,1998 under the provisions of the Environmental Protection Act, 1986.The said Rules extends to whole of India and came into effect from 20/7/1998. The Govt. of Karnataka, Department of Forest, Ecology and Environment, Constituted prescribed authority for implementation of the said Rules in the state Karnataka (Govt. Order No. FEE/126/ENV/98, dated 23/4/1999). Government of Karnataka fixed fees, letter no. FEE/126/ENV/99, dated 17/7/99. These Rules will apply to all persons who generates, collects, receives, stores, transports, treats and disposal of Bio-Medical Waste in any form. The Bio-Medical Waste means any waste which is generated during diagnosis, treatment or immunizatio of human beings or animals or research activity. Every occupier of an institution generates, collects, receives, stores, transports, treats, disposes and/ or handles Bio-Medical Waste in any form, shall make an application in Form-1 to the Board for grant of authorization of incinerator, autoclave, microwave systems for the treatment of waste by 30<sup>th</sup> June 2000 or earlier. Where as the Health Care Establishments with 50 beds and above

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\*Assistant Environmental Officer, Karnataka State Pollution Control Board, Bangalore-560 001, Karnataka



but less than 200 beds in towns with population less than 30 lakhs by 31<sup>st</sup> December 2001 or earlier, and for all other Health Care Establishments by 31<sup>st</sup> December 2002 or earlier.

The Bio-Medical Waste should be segregated into 10 categories for its storage, treatment and disposal. Further, the authorized person is required to maintain the records relating to the quantity of generation, collection, reception, storage, transportation and disposal of the BMW and also submit the Annual report to the Board indicating the details of the quantity of generation, collection, reception storage, transportation and disposal of the BMW at their HCE, every year on or before 31 January.

#### **ACTION TAKEN BY THE BOARD :**

1. Notification in news papers and individual notices to all identified Health Care Establishments were issued after obtaining the list of Health Care Establishments from Office of the Director of Health and Family Welfare department, GOK, Bangalore.
2. Training in Bio-Medical Waste Management is being conducted through Environmental Training Institute for Health Care Establishment's and Officers of the Board on implementation of the Bio-Medical Waste Rules.
3. Deputy Commissioner of all the Districts in the State of Karnataka have been requested to identify and provide land for setting up of common Bio-Medical Waste Treatment facility. Also all Local Bodies have been requested to handle Bio-Medical Waste Scientifically.
4. Board has initiated action to set up common Bio-Medical Waste Treatment facility at outskirts of Bangalore, Consent for Establishment has been issued to two firms to set up common Bio-Medical Waste Treatment facility at outskirts of Bangalore City. Board is encouraging such facility in other Districts also.
5. Letters have been issued to Academic Institutions to include subject on Bio-Medical Waste Management.
6. Board is also encouraging Association/Institutions to conduct studies on Assessment of the Bio-Medical Waste.
7. All Regional Officers of the Board were informed to identify all the Health Care Establishments coming under their jurisdiction through private agencies or consultants. Survey reports have been received from all districts except Bangalore Urban and Rural Districts.
8. Recently a committee has been formed under the Chairmanship of Dr. N.D. Beljekar for effective implementation of Bio-Medical Waste (M&H) rules in the state of Karnataka. The committee comprises of two segments 1. for Southern part of Karnataka (five districts) 2. for Northern part of Karnataka (five districts). The committee comprises of following members.

i) for southern part of Karnataka.

Dr. N.D. Baljekar

Dr. K.H. Jituri

Mr. Ganesh G. Hegde

EO (Gulbarga),

ii) for Northern part of Karnataka.

Dr. N.D. Baljekar

Mr. L.H. Bidri

Dr. M.S. Patil

KSPCB

9. Directions were issued to the Non-complied health care establishments and called for Personnel Hearing and also served with Final Show-cause. Notice has been issued and material evidence is being collected for initiating legal action against defaulting Health Care Establishment's.
10. Recently a sub-committee has been formed to inspect the Government Health Care Establishments in the State of Karnataka. The committee comprises of Environmental Officers, Deputy Environmental Officers of KSPCB and Deputy Director, KHSDP, Government of Karnataka.
11. As on date nearly twenty health care establishments are having individual incineration facility at their premises.
12. The Board has issued more than one thousand authorizations in the state.
13. The Board in association with Tata Energy Research Institute had developed Web site on the Bio-Medical Waste (Management and Handling) in Karnataka. The web site is designed to show the details on the following items/issues related to the concerned and the general public.
  - ◆ Home Page
  - ◆ Waste generation Matrix
  - ◆ Waste Characterization
  - ◆ Quantity of waste generated
  - ◆ Legislation and Policies
  - ◆ Bio-Medical Waste (Management and Handling ) Rules, 1998
  - ◆ Application form
  - ◆ Technology Options
  - ◆ Standard operating Procedures
  - ◆ Do's and Don'ts
  - ◆ Manufacturers List
  - ◆ Good management Practices
  - ◆ Ready reckoner
  - ◆ Other Features
  - ◆ FAQ's (frequently asked questions)
  - ◆ Ask an Expert



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  - ◆ Ready reckoner
  - ◆ Other Features
  - ◆ FAQ's (frequently asked questions)
  - ◆ Ask an Expert

**COMMON TREATMENT FACILITIES**

Sl. No.	Name of the firm	Location	Status
1	Maridi Eco Industries	Bangalore	Operating with valid consent and authorization of the Board
2	Medicare Incin Pvt. Ltd.	Bangalore	Operating with valid consent and authorization of the Board
3	Shree consultants	Mysore	Under installation after obtaining consent for establishment of the Board
4	Center for Environment Education	Gulbarga	Under installation applied for CFE
5	Association for Nursing homes	Belgaum	Under installation applied for CFE

Apart from the above, the Board had constituted a separate cell by name "Bio-Medical cell" at Head office, which comprises of an Environmental Officer, Deputy Environmental Officer and two Assistant Environmental Officers to expedite the process implementation of the Rules.

**Experience by the author during the course of implementation of the Rules:**

The author felt comfortable in conveying the information/message/Rules to the occupiers all over the state as the occupiers involved in the issue are of educated, many of them are very receptive and had taken the issue as their obligation. It was also felt by the author that, just because of the payment of fees involved in getting authorization (which is a part of compliance of the Rules), a substantial part of the Health Care Establishments have not taken authorization from the Board, which is serious violation of the Rules and are punishable under the provisions of the Rules.

**Future Plans :**

The Board is exploring the possibility of going for online application submission (Form-1), submission of Annual report, payment of authorization fees and even granting online authorization to all Health care establishment in the state.

**Conclusion :**

The continuously increasing quantities of hazardous Bio-medical wastes generation in India cities and its illegal disposal are great threats to the human and environment both due to disease causing and polluting characteristics. Unfortunately, even after the implementation of the Environmental Protection Act and Rules for Medical waste management, waste generation and controlling institutions have not initiated adequate awareness and controlling strategies.

**References :**

Bio-Medial Waste (Management and Handling) (second amendment) Rules, 2000, dated 2<sup>nd</sup> June 2000.

**Acknowledgment :** The author records his gratitude to Karnataka State Pollution, Control Board, Bangalore, Karnataka for granting permission to publish this information



Gp Cpt H S R Arora\*

## COMMAND HOSPITAL AF BANGALORE HOSPITAL WASTE MANAGEMENT SYSTEM

"Hospital waste are hazardous, before it leaves the hospital it should be safe to humans, animals & environment, its moral & legal responsibility". Subsequent to issue of Govt. of India notification issued by Ministry of Environment. & Forests, New Delhi on 20 July 1998. CHAFB was selected as one of the hospital for WHO aided project on Hospital Waste Management in India. The WHO project was initiated by the office of the DGAFMS in Dec 1998. Air Mshl LK Verma AVSM PHS DGMS (Air) was the principal worker of the project. The project commenced at CHAFB on 10 Jan 1999 and completed successfully by Dec 1999 and was recognized as "Model Hospital" on Hospital Waste Management by WHO. In 2000 CHAFB was declared as centre for training on Hospital Waste Management for Medical Personnel by the WHO.

To ensure that the Hospital Waste Management system functions effectively, a formal organization in the form of a Hospital Waste Management Committee was made.

Command Hospital Air Force follows multi option approach for final disposal facility i.e, Oil fired incinerator, Hydraulic hydroclave, Microwave, Autoclave, Plastic Shredder, Needle Destroyer & Vermicomposting.

CHAFB is a 830 bedded multi discipline Super speciality tertiary care hospital with PG teaching facilities. The hospital is spread over 79 Acres of land with high density of tree coverage. The average solid waste generation at CHAFB is approx 1.12 kg/ bed / day.

To effectively manage the generated hospital waste CHAFB follows scientific system approach in handling and treatment of the Biomechanical waste.

CHAFB generates following quantity of the Hospital waste:-

a)	Human Tissues and Body parts	-	2.90%
b)	Sharps	-	3.66%
c)	Soiled cotton, dressing & gauze with Blood, pus & other body discharges	-	26.2%
d)	Plastics	-	6.32%
e)	Hospital Domestic waste	-	60.92%

CHAFB follows the "path to success" line diagram devised by Air Mshl LK Verma DGMS (Air) for management of Hospital waste.

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\* Senior Registrar, Command Hospital, Air Force, Bangalore



**Steps in Hospital Waste Management at CHAFB:****a) Hospital Waste Categorisation (colour coding of Hospital Waste)**

- i. Yellow waste – Human tissue, body parts & placenta etc from OT, Lab & labour rooms.
- ii. Red waste – cotton, gauze, dressings, POPs soiled with blood, pus and other human discharges.
- iii. Blue waste – All types of plastics i.e plastic syringe I/V lines, I/V bottles, bags, dialysers etc.
- iv. Green waste – leftover food in patients plates, stationary, fruits waste, unsoiled dressings gauze & cotton.
- v. White waste – soiled linen of patients from isolation wards, intensive care units, acute wards, OT & labour room.
- vi. Sharps – I – needles, blades, vial cutters.
- vii. Sharp – II – Broken glass, bottles, tubes vials, ampules, petri dishes.
- viii. Discarded medicines – Toxic drugs & expired drugs.
- ix. Microbiological & other Pathological specimen waste.
- x. Liquid waste from wards / departments & Autopsy room.
- xi. Nuclear medicine dept. waste
- xii. Silver nitrate – Radiology dept waste
- xiii. Mercury waste – Broken BP instrument / thermometer etc.
- xiv. Aerosol containers
- xv. Blood bank waste – Discarded/ expired/ infected blood & its products.
- xvi. Incinerated Ash.
- xvii. Hydraulic Hydroclave end products.
- xviii. Hygiene chemicals and its containers
- xix. Waste stationery from offices
- xx. Intact glass bottles, vials, Petri dish, tubes etc.

# CATEGORY, LOCATION, SEGREGATION > INSITU TREATMENT, TRANSPORTATION, STORAGE, END TREATMENT & DISPOSAL

Sl No	CATEGORY	LOCATION	SEGREGATION	INSITU TREATMENT	TRANSPORTATION	STORAGE	END TREATMENT	DISPOSAL
1.	Yellow Waste	OT, Labour Room, Lab	Colour code, collected in yellow plastic bags kept in yellow bucket	-	Immediately sent by waste collection rickshaw	Kerb collection Site	Incineration	Ash sent to municipal land fill by external conservancy contract
2.	Red Waste	(a) All wards (b) Renal dialysis OT, labour room, Lab, ICU, Acute wards, Isolation wards	-Red bucket lined with red plastic liners -stored in red drums with plastic liners	Renal dialysis Waste treated in Microwave	Transported by waste collection rickshaw daily	Kerb collection Site	(a) Hydroclaved with green waste (b) Vermicompositing (c) Incineration of Red waste - OT, Lab, Labour room, Isolation ward	End product is sent for land fill part is used as manure
3.	Green Waste	All wards & departments	Green bucket lined with green plastic liner. Stored in green drums with plastic liner	-	Transported by waste collection rickshaw daily	Kerb collection Site	(a) Hydroclaved with red waste (b) Vermicompositing	End product is sent for municipal land fill, part is used as manure
4.	Blue Waste	(a) All wards & departments (b) Special area Renal dialysis	Blue bucket & stored in blue drum lined with blue plastic liner	(a) 5% sodium Hypochlorite (b) Microwaved & then treated with Sodium Hypochlorite	Transported by waste collection rickshaw daily	Kerb selection site	Shredded with shredder	Plastic pieces are sold to vendors

SI No	CATEGORY	LOCATION	SEGREGATION	INSITU TREATMENT	TRANSPORTATION	STORAGE	END TREATMENT	DISPOSAL
5.	White waste soiled linen of patient	2 OT, Labour room, ICU's, Isolation wards, Acute wards, Renal dialysis	3 White drum with 2.5% Cresol	4 2.5% Cresol for 45 min.	5 Mechanical laundry transport	6 Mechanical laundry	7 Washed in Mechanical laundry	8 Re-used after wash
6.	Sharps (a) Metallic  (b) Broken glassware	(a) All wards & Departments  -do-	Pearl pet I with 2.5% savlon  Pearl pet II with 2.5% savlon	2.5% Savlon  -do-	Transportation everyday by rickshaw in bucket from blood collection centre, OT & other departments every 4th day. -do-	Final kerb site at hospital  -do-	(a) Land burial at hospital with lime salt and bleaching powder  (b) Kept stored	(a) Deep burial in pit in hospital.  (b) Sold to vendor
7.	Discarded Medicine	Kept at medical store after collection from dept.'s	Kept segregated in secured box at medical store	...	...	...	Incinerator	...
8.	Microbiology dept, Waste, Pathology specimen's (blood/urine)	Lab's	Red bucket	5% Hypochlorite for 45 Min.	...	...	...	Liquid discarded in drainage



Sl No	CATEGORY	LOCATION	SEGREGATION	INSITU TREATMENT	TRANSPORTATION	STORAGE	ENDTREATMENT	DISPOSAL
1	2	3	4	5	6	7	8	
9.	Liquid waste from Autopsy/wards	All wards / Depts and Autopsy	...	5% hypochlorite	...	...	...	Drainage System
10.	Nuclear Medicine Dept. Waste	....	As per BARC Provision					
11.	Silver Nitrate	X-ray dept	Plastic containers	...	X-ray Dept.	...	Sold to vendor	
12.	Mercury from Thermometer/ BP instrument	Departments	Glass bottle with water	...	At Medical Store	...	Sold to vendor	
13.	Aerosol container & Hy. Chemical containers	-OT, Surg Dept & other dept.'s	kerb collection point	5% Hypochlorite	Kerb Collection site	Mutilated in shredder	Sold to vendor	
14.	Incinerator Ash	Incineration unit	Plastic drum	...	Incineration Unit	...	Land fill by Conservancy contractor	
15.	Hydroclaved end products	Hydroclave unit	Trolley	...	Trolley	...	(a) used as manure municipal (b) Landfill	
16.	Intact vials, glass tubes petridish empty glass bottles	Lab, other dept's Medical store	In carton in wards, departments	5% Hypo chlorite then washed with water	Waste collection rickshaw	Autoclave room Minlab	Autoclaved in lab	Recycled in Hospital for collection of lab specimen
17.	Office stationary waste	Dept's & stores	In cartons	...	-do-	...	Shredded by stationary shredder	Sold to Vendor

9. The entire process of waste management at CHAFB involves handling by Doctor, nurses.
  - (c) Average length of stay of patient has shown declining trends
  - (d) No ill effects on population living inside the hospital; near to incinerator, as observed during three monthly medical inspections of families.
  - (e ) We still use basic anti-biotics; sensitivity culture by organism may be due to effective Hospital Waste Management system.
  - (f) Recycle glassware by autoclaving for laboratory tests, thus reducing plastics & saving public money.
  - (g) We have ensured 100% mutilation of plastic medical appliances thus denying re-circulation by rag pickers, thus preventing spread of HIV, hepatitis B & C.
  - (h) Converting waste into manure by hydroclaving and vermicomposting thus preventing environment degradation, converting useless waste to useful product.
  - (i) Training and awareness.
  - (j) Cleaner environment.

Para medicals, safai karmachari's & waste treatment & disposal staff –All the staff wear protective clothing to save them self from hazards & injuries from hospital waste and follow universal code of precaution.

10. Continuous monitoring by all functionaries are ensured, all waste treatment options are subject to micro-biological assessment, sterilization norms, chemicals & poison testing protocol.
11. Waste audit at generation and final treatment facility are ensured and documented for research planning finances & procurement of different appliances for management.
12. CHAFB has combined three important aspect i.e HWM system, hospital infection control & house keeping system for ensuring cleaner environment inside & outside the patient areas.
13. CHAFB has been running regular training programmes on Hospital Waste Management for doctors, nurses, nursing cadets, paramedical staff & safai karamcharis of own hospital & all Armed Forces Medical Services Personnel.
14. Benefits of effective Hospital waste management systems has benefited us in following manner –
  - (a) Great reduction in population of dogs, cats, monkeys & rats.
  - (b) Hospitals infection rate has shown declining trends.

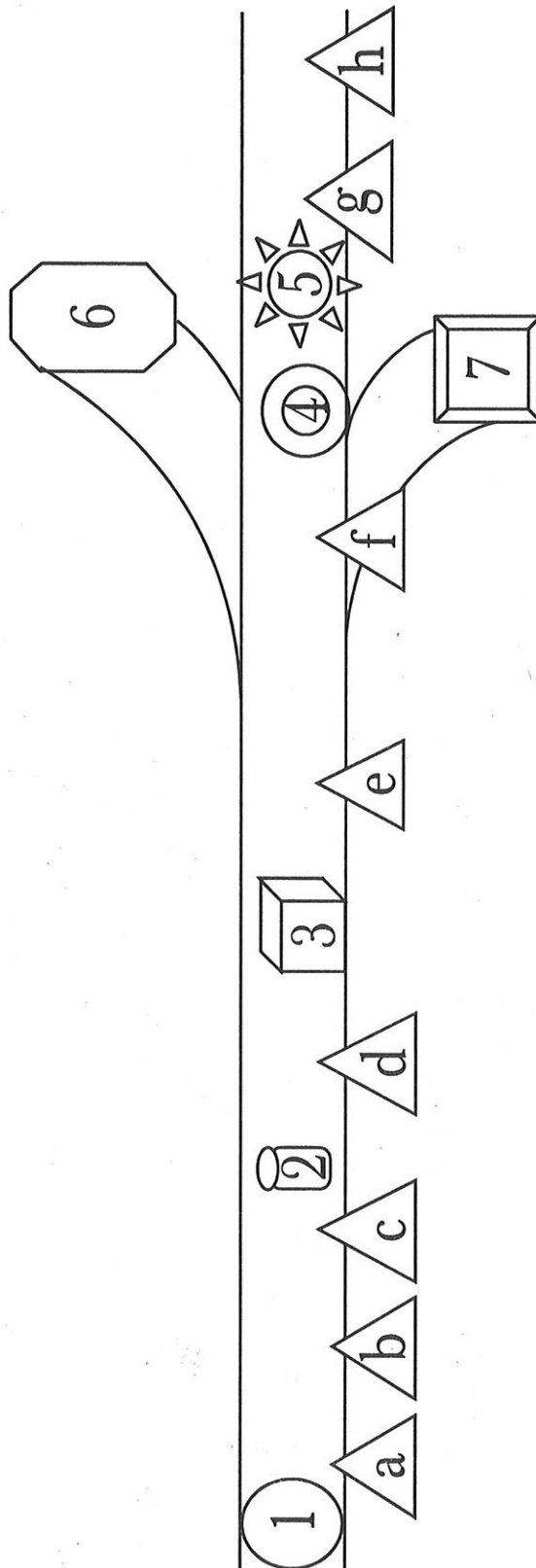






# PATH TO SUCCESS

## LINE DIAGRAM : MOVEMENT OF WASTE AND INTERVENTIONS



### INTERVENTION

- (a) Disinfection
- (b) Mutilation by Needle destroyer, Syringe cutter, Scissors, etc.
- (c) Segregated collection in colored containers / buckets etc. with same colored plastic bag inside
- (d) Movement to Kerb collection point
- (e) Movement by covered hand carts
- (f) Recycling of certain waste
- (g) Regular monitoring
- (h) Waste Audit

### MOVEMENT OF WASTE

- 1. Point of Generation
- 2. Collection at point of generation
- 3. Kerb collection area
- 4. Final Treatment option
- 5. Secured landfill area
- 6. Vermicomposting area
- 7. Recyclables to Vendors

Note : In case common use facility is planned to be used, movement of waste by road in appropriate container is to be planned.

RE : Air Mshl LK Verma



Wg Cdr Franklin\*

## Cost Effective Waste Management for Large Hospitals

### St. John's Hospital - A Case Study of a Medical Teaching Hospital

#### Introduction

Health care activities generate waste at the rate of 1.0 - 1.5 kg/bed at a hospital. A small percentage of this waste is toxic and harmful, not only to the staff and patients, but also to the general public/community at large. Unless sufficient care is taken to neutralize the toxicity, and make this waste productive, communicable diseases are likely to spread; especially in an urban environment, where the density of population is high. In succeeding paragraphs, methodology of 'Waste Management' at St. John's Medical College Hospital, a large teaching hospital with over a thousand beds is given.

#### Segregation

Segregation of waste at source is an in-house activity. The percentage of toxic waste is between 5 to 10% of the total. Proper segregation into 'color-coded bins' with colored plastic bags will ensure that the toxic waste would be below 10% of the total, thus ensuring easier handling and decontamination. The color code for bins and bags are given below:

<b>Light Yellow</b>	-	<b>Plastics</b>
Dark Yellow	-	Bandages
Blue	-	Sharps
Green	-	Clean Plastics
White	-	Ampules

The training of Medical and Nursing staff on proper segregation was facilitated by

'M.S. Ramaiah Medical College, Health Care Waste Management Cell' (Dr. Gopinath and Dr. Girish).

#### Cartage

The movement of toxic waste from its location (wards) after 'segregation' to the area where treatment and final disposal takes place is extremely important. These are done in trolleys/boxed carts, painted Red, with the 'Bio-Hazard' symbol. The staff involved in the carriage of toxic waste to the toxic waste-handling department are separate and exclusive, and are not to be used for any other work. Protective clothing like goggles, masks, boots, aprons and gloves are essential for this activity, and are considered essential so as to be safe both to the handlers and the ambient area.

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\* Consultant, Maintenance Department, St. John's Medical College, Bangalore



## Final Disposal of Toxic Waste (Two Systems)

The final disposal of toxic waste has many solutions. Two of the cost-effective systems are given below:

- |    |                              |   |                          |
|----|------------------------------|---|--------------------------|
| A. | i) Chemical De-contamination | - | for plastics/sharps.     |
|    | ii) Incineration             | - | for body parts/bandages. |

### Alternative

- |    |                  |   |                          |
|----|------------------|---|--------------------------|
| B. | i) Autoclaving   | - | for plastics/sharps.     |
|    | ii) Incineration | - | for body parts/bandages. |

Other sophisticated systems like Hydroclaving, Hammermill and Microwaving are comparatively capital-intensive, with costs above Rs. 3/- per bed per day and initial investment of Rs. 50 lakhs or more.

At St. John's Hospital, we have at present adopted Plan 'A'. Plan 'B' will be implemented as the 'Steam Services' improvement takes place.

The chemical de-contamination is carried out in a de-contamination tank, of approximately 24' x 16' dimensions specially made for this purpose. It provides for water and drainage facilities, and also a 'chain-and-pulley' block, to lift the crates for loading/introducing operations of the large buckets, in which the plastics and 'needle sticks' are placed for de-contamination. The de-contamination tank is within the 'Integrated Waste Management' facility, which, in addition, also has the following equipment/facilities:

1. Plastic-shredding machine.
2. Needle-tip crusher.
3. Storage area for plastics/needle sticks.
4. Water and toilet facilities for handling staff.
5. Tools for cutting, etc.

The complex is fully covered with lockable gates, thus preventing any pilferage and re-use. This ensures the correct 'protocol' to which these toxic material needs to be subjected to.

A 'Twin-chamber Incinerator' with a 30 meter stack, that runs on diesel (LDO) and capable of attaining a temperature of over 1000 degrees centigrade, is used to handle the 'pathological waste' and 'infected bandages'. The quantity of material incinerated in a day is of the order of 200 kg, which is achieved by proper segregation. No plastics, syringes or needle sticks are permitted for incineration. The incineration area has a storage space, which can handle the waste generated in two days.

## **Disposal of Incineration Ash**

The ash generated by the incinerator is disposed off in an '*engineered land-fill*' of 10' x 10' x 10' deep dimension, which is chemically treated to prevent seepage of metal into the earth. Ash generated by incineration will contain Mercury, Arsenic, Lead and Cadmium, all heavy metals harmful to the human body. The act of Waste handling at St. John's Hospital costs less than Re. 1/- per bed per day, and for a 1000-bed institution, this is highly cost-effective. Central facilities planned at Bangalore will cost Rs. 3.50/- per bed per day.

## **Advantages of using Chemical De-Contamination**

### **Qualities of Sodium Hypochlorite**

1. Cost-effective
2. Broad-spectrum disinfectant
3. Easy to handle
4. Water-soluble
5. Comparatively less harmful (to waste-handlers)

## **Conclusion**

Environmental degradation is today a fact of life. The urban scenario in India is bleak with mushrooming population, excessive air pollution due to industries and automobiles, and ground-water pollution through seepage of toxic heavy metals.

**The policy adopted by St. John's Medical College Hospital is to provide a clean and healthy environment, for the staff, patients and visiting public. The installation of a scientific '*Waste Management System*' has achieved this to a large extent, and the campus of the hospital and college present a serene and calm picture.**

St. John's Medical College Hospital has already achieved clearance for Waste Management activities from the '*Karnataka State Pollution Control Board*' in December 2000. We further aim to get ISO 14001 clearance (for environment) at a later date.

**"The hospitals, which are meant for treatment of patients, which is the custodian of healthcare, they themselves have become the force of spreading infection. If doctors cause disease to the patients we call it iatrogenic diseases, but I don't know what you call of hospitals, which create nuisance, public health nuisance"**  
**- Dr Maalaka Raddy, Hon. Min. of Health, Government of Karnataka in his inaugural address at ISHWMCor.2001**



- Vittal Kumar A\*

## CEE's Experience in Bio Medical Waste Management

### Centre's activities towards Safe Management of Health care Waste

Centre for Environment Education is a National Institution, set up by Ministry of Environment and Forests (MoEF), Government of India as a Centre of Excellence. With its Head quarters at Ahmedabad, CEE has a mandate of promoting Environmental Education and Awareness nationwide and started its activities since 1984. CEE aims to provide Environment Education to children, youth and the general community and various other target groups.

CEE's main thrust areas include:

- ❖ Environmental Education in Schools
- ❖ Interpretation
- ❖ Training
- ❖ Eco-development
- ❖ Experiencing Nature
- ❖ Media
- ❖ Urban Programmes

CEE's Southern Regional Cell is functioning from Bangalore since 1988, involved in Environment Education activities throughout Southern parts of the Country. Urban Programmes basically aims at developing some basic environment management plans such as Solid Waste Management, Sanitation etc. CEE South has developed working models of Solid Waste Management in various localities of Bangalore.

Health Care Waste being a part of Solid Waste, CEE South also took up this burning issue of Health Care Waste Management as one of its priority. Some of the important Seminars, Workshops organised by Centre to train the concerned is enlisted here.

- CEE South organised a Training Workshop on Sanitary Landfill Management for Engineers and Health Officers of Bangalore City Corporation on 15th October 1995 at Mayo Hall.
- CEE South and the Bangalore City Corporation jointly organised a "Workshop on Hospital Waste Management" for Doctors and Medical Superintendents of Bangalore Mahanagara Palike (BMP) Maternity Homes and Dispensaries, on 26th and 27th December 1995 at Mayo Hall.

---

\* Project Assistant, CEE South, Bangalore - 1, Paper Presented at ISHWMCon 2001



- Helped Bangalore City Corporation to set up an Infection Control Committee and organised first coordination Committee meeting for Bangalore on 18th March 1996 at Mayo Hall.
- Organised a National conference on 'Hospital Waste Management – Strategies for Implementation' on 22nd and 23rd November, 1997 at Mayo Hall.

Apart from organising workshops, seminars, conferences and training CEE - South and M. S. Ramaiah Medical College jointly conducted a survey on Waste Management practices in Hospitals of Bangalore. Centre has also conducted Studies on Hospitals, clinics, nursing homes and several other healthcare establishments in Bangalore and suggested ways of managing their waste. Series of training programmes were organised for health care personnel including doctors, staff nurses and group IV workers of KIMS Hospital.

### **New Delhi Experience**

CEE Delhi has implemented Healthcare Establishments Waste Management & Education (HEWMEP) Model (refer Annexure I) Hospital in Indraprastha, New Delhi. HEWMEP Model was also successfully implemented in smaller Hospitals and Nursing Homes too. A Study has been undertaken on implementation of BMW(M & H) Rules in health care establishments at Delhi. This study is being carried out for Ministry of Environment and Forests, Government of India to know the present status of implementation of BMW (M & H) Rules, in Delhi.

Aims and Objectives of this study being Collection of data on quantity and quality of waste generated by healthcare establishments in Delhi, Status of implementation of biomedical waste regulations in Delhi, Recommendations to concerned authorities on improving the situation based on the above study and seeking their cooperation in implementing them.

### **Gulbarga Project**

Gulbarga is a District Headquarters in the northern part of Karnataka. The city level project involving all health care establishments and CEE is facilitating setting up of a common collection, treatment and disposal facility in Gulbarga city. The project has come through Government of Karnataka, funded by Indo-Norwegian Environment Programme (INEP).

### **Overall Objectives of HEWMEP Gulbarga**

- ❑ To set up a completely operational common facility for Bio-medical Waste Collection, Transportation, Treatment and Disposal for Healthcare Establishments (HCEs) in Gulbarga
- ❑ To train hospital staff regarding methodology for proper Bio-Medical Waste Management in their HCEs
- ❑ To create awareness among the general public regarding Bio-Medical Waste and its hazards
- ❑ To prepare Educational materials regarding Bio-Medical Waste Management

CEE's Gulbarga Field Office (CEE GFO) has been set up to coordinate all activities related to HEWMEP Gulbarga project. Along with the district Administration various Committees were formed for effective coordination and implementation of HEWMEP. implementation of the project.

- ❑ Common Facility Committee headed by Deputy Commissioner, to decide on land and technology and equipments to be installed.
- ❑ Building and Purchase Committees headed by Chief Engineer, CEE and INEP Coordinator respectively, for construction of Common Facility and purchase procedures.

For Common Waste Treatment Facility District Administration has leased 5 acres of land to CEE for construction of common waste treatment facility (CWTF) 8 kms away from the city.

Regarding Training and Awareness activities on biomedical waste management, CEE GFO is conducting Training and Educational Programmes for the health care personnel in all the major hospitals and nursing homes.

As per the decision of District Implementation Committee, CEE also helping Gulbarga Municipal Corporation in Solid Waste management and conducted door-to-door motivation and education activities for SWM in the city. A pilot project has been launched to introduce door step collection of garbage at Aiwan-E-Shahi area.

### **Tirupur experience**

Tirupur is a small town near Coimbatore. CEE Tirupur Field Office (CEE TFO) has taken the waste management initiatives right from its origin in Tirupur. The Urban Local Body (ULB) and IMA Local chapter were keen motivators to start the activities on Biomedical Waste management. A small scale, separate collection and treatment of hospital waste has started in assistance with Municipality, coordinated by CEE TFO, along with conducting education and training of many health care establishments in Tirupur and Coimbatore.

### **CEE's Model – Integrated Hospital Waste Management Plan (IHWMP)**

A detailed Survey to be conducted to know the status of present waste management practices in a health-care establishment, followed by Characterization and Quantification of biomedical and general waste streams. Survey emphasizes on Epidemiological and Occupational health survey of health-care personnel, Air quality, Water quality, Stack monitoring, Effluent monitoring and Microbiological testing etc. An option of Treatment, whether to be within a health care establishments or to opt for a common facility, is given and feasibilities of both options will be discussed. This will be followed by Implementation such as organizing segregation, transport, storage and treatment within health care establishments.

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testing etc. An option of Treatment, whether to be within a health care establishments or to opt for a common facility, is given and feasibilities of both options will be discussed. This will be followed by Implementation such as organizing segregation, transport, storage and treatment within health care establishments.

### **Healthcare Establishments Waste Management and Education Programme (HEWMEP)**

- ❖ Based on the survey, making the Integrated Hospital Waste Management Plan (IHWMP) for the individual Health care Establishment (HE)
- ❖ Identifying the groups of personnel and key motivator who are/have to be involved in HWM in the HE.
- ❖ Integrating the results of the survey and development /dissemination of educational material relevant for each group
- ❖ Training of each group in batches, evaluation and follow up (refer Annxure I) Some of the Educational Materials developed by CEE on Biomedical Waste
- ❖ IHWMP Plan – a Spread out poster based on the recent BMW (M&H) Rules, which describes about various types of wastes and flow diagram of treatment options to be followed.
- ❖ 'Towards Better Management of Hospital Waste' – FAQ's on BMW (M & H) Rules, 1998 - Frequently Asked Questions and answers for them on the issue of Biomedical Waste management, for various target groups
- ❖ Set of 150 Slides on BMW – specially used during training sessions
- ❖ 'Reference Material on Hospital Waste Management' – a document for reference

### **National Kit**

A proposal to "Biomedical Waste (Management and Handling) Rules", 1998 and the time frame prescribed by the authorities for setting up waste treatment facilities, it has become imperative for the healthcare waste generators, in abiding to the notification. At this critical juncture the Centre and its other regional offices in the country are involved in the task of "Preparing a National Kit of training and Educational materials on Biomedical Waste Management" funded by WHO and the Bangalore centre is networking with the Healthcare Establishments / institutions / NGOs in the states of Karnataka and Andhra Pradesh.

**A National Kit would be the first of its kind, which would be a set of standard training materials in different media forms to be used nationwide for creating awareness about the managing waste, rules, and related matters in various vernacular languages, for different stakeholders along the chain of Biomedical waste generation and management. The project strategy involves collection, collation, Analysis, Documentation and Translation of educational materials, Printing of Training manual and other IEC material and training of master trainers and field testing these materials in healthcare settings across the country.**



## Annexure I

Healthcare establishment waste management and education programme (HEWMEP) strategy

### STEP 1: waste reduction at source

Many of the specialist surgeries and other medical applications use a lot of disposables, where some expert surgeons feel that it is possible to rescue the use of these disposables and bring down the consumption to almost half. In ICUs, CCUs and high dependency areas, there is a tendency to use excessive amounts of disposables. Judicious use of disposables for very infectious conditions, while avoiding frequent contamination by being consciously careful must be advocated.

### STEP 2: segregation at source

e.g.    General Waste - Kitchen waste  
           Dry waste  
           Sharps  
           Infectious waste  
           Chemical waste  
           Infected Plastics

- STEP 3:        Disinfection by dipping in 1% bleach or Sodium Hypochlorite For 6-8 hours
- STEP 4:        Transportation and routing of hospital wastes from different zones and wards to the decentralised place of treatment
- STEP 5:        Autoclaving of waste & shredding (for plastics, gauze, etc.)
- STEP 6:        Separation of metals & sharps
- STEP 7:        Incineration/Microwaving
- STEP 8:        Radioactive Waste - Must be stored in lead containers according to BARC regulations until the half life period of the wastes is over, before returning to BARC
- STEP 9:        Cytotoxic Waste - Deep burial or landfilling
- STEP 10:       General Waste - Composting,  
                     - Recycling (Stores) Office Confidential paper to be shredded and then sent for recycling
- STEP 11:       Hazardous chemical plastics, Should not be shredded. Separate collection for these, should be organized for making into structurals such as, girders for buildings, culverts, lamp posts and telephone posts etc.
- STEP 12:       Training and education for achieving the above step

<sup>1</sup>Raghunandan K L, <sup>2</sup>Dr. N Girish, <sup>3</sup>Dr C Shivaram

## HEALTH CARE WASTE MANAGEMENT CELL – Genesis and Activities

Health Care Waste Management Cell, HCWMCCell is a group of the concerned citizens of Bangalore towards endeavours of Safe Management of Health Care Waste.

The origin of the activities of the cell can be traced back to January 1995. The issues related to improper disposal of waste from hospitals were discussed in a meeting of all Principals of Medical Colleges and Heads of the Department of Community Medicine from Medical College's in Bangalore City. The meeting was convened by the then Secretary to Government of Karnataka, Department of Environment, Ecology and Forests Sri A N Yellappa Reddy. Expressing concerns about indiscriminate dumping and hazards from the waste generated in the hospitals, those present at the meeting decided to systematically address the issue.

In the background of the first notification in the gazette by the Ministry of Environment and Forests, Government of India. another endeavour was organised by the Centre of Environment Education – South, Bangalore and Bangalore Mahanagara Palike on 25<sup>th</sup> and 26<sup>th</sup> December 1995. **Two** important recommendations were made

- Setting up of a City Infection Control Committee
- Developing of Training / Reference Manual as an information support.

The recommendations were presented to the Administrator of Bangalore Mahanagara Palike, Dr A Ravindra. The Department of Community Medicine, M S Ramaiah Medical College was entrusted with the task of giving inputs to the second recommendation. The Department of Ecology, Environment and Forests, Government of Karnataka, came forward to support the endeavour in its entirety.

As the information applicable to Indian situation was meagre, Dr S Pruthvish and Dr D Gopinath from the Department of Community Medicine, M S Ramaiah Medical College, alongwith Dr M Jayachandra Rao from Bangalore Mahanagara Palike and Ms P Bineesha from CEE under the guidance of Dr C Shivaram undertook an in-depth study in different categories of Health care institutions across the city. The information obtained from 86 health care institutions was analysed and documented as the status report on health care waste Bangalore city and was titled **Health Care Waste Disposal - an exploration**. The document included an extensive review of available literature and also the findings from the study. This was presented to the Dept. of Environment, Ecology and Forest and also to the standing committee on health of Government of Karnataka and accepted for adoption.

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<sup>1</sup> Research Assistant <sup>2</sup>Co-ordinator <sup>3</sup>Chairperson-HCWM, Department of Community Medicine, MSRMC, Bangalore -54.



With this background, a working manual for safe management of health care waste was drafted keeping in mind the then scenario and also the need to strive towards safety of human health and environment. Designed to be an Information and Learning resource, the document with its 10 modules has completed the field testing in all categories health care institution.

The process of field testing saw the beginning and establishment of the Health care waste management cell in the dept of Community Medicine at M S Ramaiah Medical College, Bangalore. The composition of the Cell is as follows:

Chairperson	:	Dr. C Shivaram
Director	:	Dr. D Gopinath
Co-ordinator	:	Dr. N. Girish
Members	:	Dr. S. Pruthvish
		Dr. Pankaj Mehta
		Smt. Anjana Iyer
		Sri. A. N. Yelappa Readdy
		Ms. P. Bineesha

Hailing from an academic institution and realising the need for systems development and capacity building, the Malleshwaram health care waste management pilot project was initiated as a demonstration project with financial support from the Urban Waste Expertise Program of the Government of Netherlands. The multipartner endeavor has just completed the project period and has documented unique learnings (success of incremental approach; need for initiating systems for Waste Sharps Management; need for an exclusive parallel transport systems; only a staggered collection system ensures a segregated waste stream; appropriate waste management practices generate revenue). The Project staff have been : Sri. Francis Xavier Joseph, Sri Raghunandan. K. L, Smt. Veena, Sri Venkatesh B. K.

The practical problem solving endeavor adopted the ward approach for initiating and establishing systems both within and outside the 92 health care institutions which included 8 nursing homes/ maternity homes, 6 diagnostic centres and 2 blood banks others were general practioners clinic.

The entire project activities were conceived under the banner of SWABHIMANA - a city government initiative of the Bangalore City Corporation. The vehicle for the waste transportaion to the regional co-operative waste management facilty from the project area was by the Rotary club of Bangalore East

### **Strengths and achievements of the Cell**

Over the period of five years the Cell has come to be recognised as the major resource group in not just the city of Bangalore but across the entire State of Karnataka.



Apart from training different categories of health care personnel and providing information support for issues and concerns for Safe Management of Health Care Waste, the Cell currently networks with more than 300 institutions in the State of Karnataka both Governmental and non-governmental.

Sensitising the Health and Family Welfare committee of the Karnataka Legislative assembly, the co-ordinator of the cell is on the Advisory board for the Bio-medical Waste in Karnataka.

The Cell has actively contributed towards Systems development for various agencies - the Task Force on Health and Family Welfare, Government of Karnataka, Bangalore Agenda Task Force (BATF), Bangalore Mahanagara Palike (including the India Population Project 8), Indian Medical Association Karnataka State Branch, Indian Medical Association Tamil Nadu State Branch, Indian Medical Association Kerala State Branch, Karnataka Health Systems Development Project, Karnataka Urban Infrastructure Development Finance Corporation.

Dr. D Gopinath and Dr. N Girish from the Cell presented the Exploratory Study results at WASTECON 98, The World Congress on Solid Waste Management at Charlotte North Carolina, USA, which was jointly organised by International Solid Waste association ISWA and Solid Waste Association of North America, SWANA in October 1998.

**The members of the Cell have proactively interacted and have jointly (with Centre for Environment Education, and Tata Energy Research Institute) initiated a host of endeavours in the city. An ambitious project being contemplated is the consortium of trainers for safe management of Health Care Waste in Karnataka.**

The members of the HCWMC as resource persons have shared their experience with nearly 10,000 health care personnel across the country (Mysore, Chickmagalur, Bijapur, Dharwad, Gulbarga, Hubli, Kodagu, Chennai, Hyderabad, Trivandrum, Mumbai, New Delhi, Nagpur, Vadodara, Baroda, Cuttack, Erode, Tirupur, Nellore) for safe management of health care waste..

445 students of Diploma in Sanitary Health Inspectors from All India Institute of Local Self Government, Mumbai, Bangalore Branch, have undergone the certificate course of one-day on hands on Experience in the last two years. The medical students of M S Ramaiah Medical College are oriented, sensitised and trained in both the theoretical and practical aspects of Safe Management of Health Care Waste regularly during their courses.

### **The Inaugural National Conference of the Indian Society Of Hospital Waste Management.**

Being the founder members of the Indian Society of Hospital waste management® and with its expertise, the Cell hosted the first Inaugural National Conference on Hospital Waste Management for Indian Society of Hospital Waste Management on the 25<sup>th</sup> and 26<sup>th</sup> May 2001. More than 200 delegates from amongst Environmentalists, Defence services, Government Hospitals, Private Hospitals and Nursing Homes, Social activists, NGO's, Manufacturers of hospital waste management equipment and technologies participated in the event held at the J R D Tata Memorial Auditorium at the National Institute of Advanced Studies, Bangalore and took stock of the situation of health care waste management in the country.

### **Vision, Mission and Goal:**

It is the ardent wish of the members of the Cell to establish a training centre of excellence in Bangalore catering to the needs of not just the local but also regional and international community with special focus on developing countries. A news letter in this context is also being envisaged.

Interested Medical Colleges, other academic and Research of Institution; Government; NGO's ; Community base group; Environmentalists ; Sensitised Citizens; UN and allied agencies interested in collaboration withus are welcome, please write to :

Health Care Waste Management Cell  
Department of Community Medicine  
M.S. Ramaiah Medical College  
M.S.R.I.T. Post, Bangalore- 560 054.

### **An appeal**

The individual health care setting's policy towards endeavours of Safe Management of Health Care Waste is a major factor for establishment of systems within the institution. A written policy is a critical determinant. It simultaneously sets the goal for the institution and identifies for all its staff the delineated roles and responsibilities.

The members of this paper would like to share the institutional policy for safe handling and management of health care waste for critical suggestions and comments. It was developed during the process of facilitating for capacity building. The policy was initially shared at 14<sup>th</sup> Karnataka Association for Community Health conference.

### **The Policy of..... towards Safe Management of Health Care Waste**

#### **Introduction: (*The Mission and vision of the Institution*)**

#### **Preamble:**

Health Care Waste needs to be handled carefully. Mismanagement of this potentially hazardous waste will affect not just the generators or operators of this waste but also the general community. All efforts in Safe Management of Health Care Waste must have the common end point of being Eco-friendly.

Towards this end,..... will ensure the following:

- a) The Health Care Waste generated in ..... will be managed in such a manner so as not to pose special risk to the individuals and to the community



- b) The Health Care Waste will be managed in an environmentally friendly manner.
- c) .....will make all attempts and facilitate for an Integrated Waste Management System both within and outside the institution.
- d) All necessary steps and precautions will be undertaken to provide appropriate protective measures including preventive measures to all the Health Care Personnel who come into contact with the Health Care Waste.
- e) .....will proactively reach out, interact, co-operate, collaborate, undertake research and network with both governmental, Non-governmental and other agencies for Safe Management of Health Care Waste.
- f) ..... will undertake any other endeavour required to promote Safe Management of Health Care Waste.

Towards operationalizing these aspirations .....will sincerely implement the following Codes of Practice.

#### **CODES OF PRACTICE.**

CODE 1	Health care establishments will evolve an appropriate institution policy for Safe Management of Health Care Waste
CODE 2	All efforts will be made to involve the Health Care Personnel in evolving the Institution policy towards Safe Management of Health Care Waste
CODE 3	A house-keeping policy will be evolved and streamlined for effectiveness and efficiency
CODE 4	The Institution Committee for Safe Management of Health Care Waste will bear the responsibility of implementing, monitoring and evaluating practices for Safe Management of Health Care Waste by developing suitable indicators
CODE 5	A designated Waste Management Coordinator will liaison for effective management of Health Care Waste
CODE 6	The Institution specific Action Plan will be prepared in a participatory manner for a definite duration; periodically reviewed, evaluated and modified accordingly
CODE 7	All the Health Care Personnel will be made aware of the different points of generation of waste, types of wastes generated, precautions to be taken while collection, handling, transportation and disposal. Towards this end a formal orientation for the new incumbents and a periodic (annual) orientation for all the staff will be conducted
CODE 8	All Waste generated will be segregated at the point of generation according to statutory guidelines and options available for waste management
CODE 9	An efficient mechanism consonant with the philosophy of waste management (Reduce,



	Reuse, Recycle) will be developed to collect, transport and dispose off the Waste after ensuring that it is non-infectious and non-hazardous
CODE 10	All potentially infectious waste will be decontaminated-disinfected before it is transported outside the point of generation; where required a separate discard autoclave will be maintained or any other appropriate method will be utilized for this purpose
CODE 11	All soiled linen will be disinfected before being transported to the laundry
CODE 12	The institution specific disinfection policy will be reviewed, defined, delineated and monitored
CODE 13	All attempts will be made to provide adequate number of toilets, a system for its maintenance including providing for adequate water and patient education for effective use
CODE 14	The segregated Health Care Waste will be transported in appropriate containers with minimal handling by the Waste Handlers to the intermediate storage area (or the disposal site) within the institution
CODE 15	A separate area will be designated for storage and (if required for) sorting of the Health Care Waste
CODE 16	A daily register indicating and recording the type and quantity of Waste handled will be maintained. The document will be scrutinised periodically
CODE 17	Health care establishments will periodically submit the prescribed reports to the statutory authority
CODE 18	The Organisation Chart of the personnel/ mechanism of Waste Collection-transportation-disposal will be prominently displayed
CODE 19	All attempts will be made to ensure an adequate supply and usage of protective devices like masks, gowns, boots, aprons, goggles, etc., to all Health Care Personnel especially Waste Handlers
CODE 20	Appropriate Immunisations and Periodic Medical Examinations will be undertaken for all the Waste Handlers
CODE 21	Practice of Universal Precautions will be made mandatory for all categories of the Health Care Personnel
CODE 22	A system of recording, reporting and notifying illness, injuries and accidents consequent to Waste handling will be evolved and maintained
CODE 23	For generating and managing Health Care Waste, Health care establishments will register with the statutory authority after paying the requisite fee and completing the due procedures
CODE 24	The Health Care Personnel will be periodically updated with the legal provisions regarding Safe Management of Health Care Waste
CODE 25	All attempts will be made to incorporate aspects of Safe Management of Health Care Waste especially Principles of Universal Precautions into the Training curriculum of both Medical and paramedical courses

CODE 26	The patients, Patients attendant(s), Visitors to the institution and the general community will be involved in endeavours for maintenance of the system for Safe Management of Health Care Waste
CODE 27	All efforts will be made to provide appropriate support – technical, educational materials and such other things for undertaking endeavours towards Safe Management of Health Care Waste including Training, Orientation and Education
CODE 28	<b>All efforts will be made to participate in and develop a co-operative waste management facility fulfilling the norms/guidelines set by the statutory authorities</b>
CODE 29	All efforts will be made to recycle the recyclable waste like paper, plastic, metals and glass
CODE 30	All efforts will be made to proactively reach out, interact, co-operate, collaborate, undertake research and network with both governmental, Non-governmental and other agencies for Safe Management of Health Care Waste

“If we do not take steps to arrest the environmental degradation which is taking place in almost all the spheres ..... perhaps in another 50 years or so we will certainly have a disaster of a very large magnitude, which will destroy almost all the species in a very large number. .... that is how we cause damage to the environment but at the same time the human beings are the only species in the living world who have the capacity to arrest it and rebuild it. This is where we come to the mantra of a systemical development because the progress and the living has to go on, it cannot be really stopped nor it can be reverted back to a level 0, but at the same time, there is a requirement of striking a balance between the progress and the giving and that is why we come to the conclusion that systemical development is something which must be attempted and which must be practiced” Air Marshal L K Verma, in his inaugural address at ISHWMCOn 2001

## AUTOBIOGRAPHY OF DISPOSABLE PLASTIC SYRINGE WITH NEEDLE

I was born in USA and other European countries. My creation caused a revolution in Medical system. I am made up of PVC (Poly Vinyl Chloride), PE (Polyethylene), PP Polypropylene & PS (Polystyrene). I journeyed from 1st World countries to 3rd world countries as a Technology Transfer Concept. My use totally removed glass syringes from 3rd world countries. Later I realise that 3rd world countries are populous, they do not have proper disposal systems, I will be used, reused, once contaminated I will work as vector and help in spreading HIV, Hepatitis B & C and other resistant infections. The treatment and drugs required for such infections in these countries are virtually non-existent, thus I will create a major market for multinational pharmaceutical companies, (what a tremendous economic boom for developed countries. Multinational pharmaceutical companies will economically rule the 3rd world countries!!!).

In 3rd world countries, I am used for patients in medical establishments, self use in Home Care System for animals, by drug users and Immunization and vaccination programmes, since quantity of syringes, manufactured is not sufficient, my reuse and recycle will be tremendous.

In India alone it is estimated that 80 million syringes are produced annually where as eight hundred million injections are given annually, hence a chance to reuse and re-cycle. The rag pickers help my re-circulation in markets for their bread and butter. In this process they contract dreadful infections of HIV, Hepatitis B & C.

Every one knows, I am very susceptible to chemical treatment i.e. 5% Hypochlorite, but very few medical establishments, treat me and dispose scientifically. Large number of hospitals burn me in incinerator, perhaps I will have to pollute the air and throw dangerous emission of Dioxine & Furan and cause cancer, thus creating market for Doctors and Pharmaceuticals.

You will be surprised to note in India, quack doctors and other paramedics use me upto 100 times and if I am contaminated, I have the capacity to infect/re-infect a minimum of 100 human beings and capable of creating 100 new cases of HIV, Hepatitis B & C so I am worse than any bomb, hence I work as 'SILENT TIME BOMB'.

My dear countrymen, beware I am dangerous and creating a silent disaster. I am producing enormous clinical material for developed countries to conduct Research and get The Nobel prize. Masses in third world countries are being used as Guinea Pigs.

I warn you all that if this trend of indiscipline continues in handling me, the dangerous diseases in India will work as a neo-holocaust. Presently I am the biggest terrorist in this country, so fight the war against terrorism by destroying me scientifically. I request the medical fraternity to destroy me as per the norms of Bio-medical Waste (Handling and Management) Rules.

My countrymen a thought for New Year - we may revert back to glass syringes, a low cost and safe system.

As Told to GP CAPT HSR ARORA  
Senior Registrar, CHAF, Bangalore



Report of the proceedings of the first annual conference of the Indian Society of Hospital Waste Management, hosted and Organised by the Health care Waste Management Cell, Department of Community Medicine, M S Ramaiah Medical College, Bangalore - 54. Held on the 25th and 26th May 2001 at J R D Tata Auditorium, National Institute of Advanced Studies, Indian Institute of Science campus, Bangalore.

The first annual conference of the Indian Society of Hospital Waste Management was hosted by the Health care Waste Management Cell, Department of Community Medicine, M S Ramaiah Medical College. The members of the Cell accepted the challenge and decided to host the Inaugural National Conference of the Indian Society of Hospital Waste Management in the context of its ongoing endeavour towards Safe Management of Health Care Waste in Karnataka.

The two-day national Conference was held on the 25<sup>th</sup> and 26<sup>th</sup> May 2001 at the picturesque J R D Tata Auditorium of the National Institute of Advanced Studies, Indian Institute of Science campus, Bangalore. More than 300 delegates from amongst Environmentalists, Defence services, Government Hospitals, Private Hospitals and Nursing Homes, Social activists, NGO's, Manufacturers of hospital waste management equipment and technologies participated.

The objectives of the conference was set out to be:

1. To provide as a platform to share and exchange thoughts for endeavours towards Safe Management of Health Care Waste and facilitate for networking and information dissemination.
2. To identify issues and concerns (immediate, medium and long term) for development of systems and building capacity for Safe Management of Health Care Waste in the country.
3. To contextualise the systems for Safe Management of Health care Waste within endeavours of an Integrated Waste Management System.

The preparations took a period of 6 months from November 2000. The members of the organising committee met three times to finalise the agenda. Smaller groups were formed to plan the micro details. The composition of the organising committee is given elsewhere.

The themes initially identified based on the experience of the members of the cell during the training sessions, interaction with policy makers and other stakeholders was accepted. **The Theme was Systems Development for Safe Management of the Health care Waste – the need of the hour** with the following subthemes:

1. Capacity Building – the foundation of the system
2. Strengthening facilities – the building blocks
3. Information system – the critical link
4. Environment and Health – the duty and responsibility
5. Community Participation – a challenge
6. Economics of Waste management – dilemmas in pricing and costing

The rich experience gained in the process of implementing the Malleshwaram Health Care Waste Management Project demonstrated that the institutional commitment especially that of the Head of the Institution played a very critical role. In addition, systems built within in the institutions would come to nought if they were not linked to systems outside the institution. Building of systems outside the institutions had its own peculiar problems ranging from technical (availability of incinerator or any other waste management facility) to managerial (routing, transportation,

monitoring) to politicking (?self-explanatory). A major lacunae was absence of a clear-cut policy towards Waste Management.

The deliberations of ISHWMcon2001 were thus conceptualised to address these issues. The idea was two fold: provide a framework and enlist major components.

Inaugurating the deliberations the Honourable Health Minister of the government of Karnataka stressed the need for effective utilization of the existing resources and assured the commitment of the State government in this direction. Prof. M G K Menon, in his eloquent exposition in the key note address drew the attention of intelligentsia to address the increasing chemical contamination in the ecological systems and the human body in particular, therefore, there is an urgent need for development of systems for proper waste management. In his presidential address Air Marshall L K Verma traced the need for the formation of the Society as responding to the concern of environmental degradation. He called upon the delegates to undertake systematic development as attempted in Command Hospital, Air Force, Bangalore.

Dr. S Chandrashekar Shetty, Honourable Vice Chancellor, Rajiv Gandhi University of Health Science, Bangalore, inaugurated the website of the Health Care Waste Management Cell; the souvenir and the resource materials was released by Surg. Vice Admiral H P Mukherjee, AVSM, VSM, PHS, DGMS (Navy); Prof. Shivalingaiah, Chairman, Karnataka Pollution Control Board released the resource material - flow chart for safe management of health care waste. The exhibition of the technologies for waste management was jointly inaugurated by Dr. H Sudarshan, Chairman, Task Force on Health and Family Welfare, Government of Karnataka and Lt. Gen. R K Jetley, VSM, PHS, Director General Armed Forces Medical Services (DGAfMS). Dr. Seethalakshmi, Director Directorate of Medical Education, Government of Karnataka inaugurated the first piece of the needle destructor - JOGBUSTER

The first scientific session attempted to identify the elements of a policy. Sri Homi Mullan set the tone with his paper on Issues and concerns towards Safe Management of Health Care Waste – History and Future horizon.

In the policy towards Safe Management of Health Care Waste, three sub-areas of importance are:

1. Injection safety or its waste management counterpart – Waste Sharps Management
2. Occupational Hazards and Occupational Safety
3. (Disciplinary) Systems within the organisations – the ISO 9000 and ISO 14000

The attempt herein is to derive from existing ongoing endeavours and delineate the elements of a National Policy for Health Care Waste Management.

WHO has estimated 50% reuse of syringes and needles in the country. The Hospital Acquired Infection, HAI rate is estimated at 10%. A massive immunization programme – a public health strategy has to contend with these realities. The presentation by Mr. Bhuyan A L, Project Officer, Health Equipment traces the efforts of UNICEF in introducing the Autodestruct syringes as a “package” in the Measles elimination programme. This ensures that the syringes are not reused



but the problem of management of the used syringes still remains. This needs to be addressed as an integrated Waste Plastics Management programme.

This implies that we need to rethink and go beyond "the ban the use of plastic cover". Should we revert back to glass syringes? It also raises the unquestionable utility of Plastics in the health care services. In this sense, Plastics have revolutionized the Health Care services. We need to take a pragmatic stand. This is an important policy stand one has to consider.

Health Care Waste Management is primarily an issue of Occupational Safety, Use or Non Use of Personal Protective Measures during care giving; the extent permissible of the exposure to the hazardous environs (Handling HIV cases and use of disposable or the cost consideration as a result thereof) is a policy issue. Given the not so desirable track record of the even the hazardous industry towards systems in occupational safety, there is an urgent requirement to identify what is the most essential in the delivery of Health Care and arrive at a consensus. This very much has a bearing on the Waste generated and the method it is to be managed. Dr. D B Acharya dealt with this key component.

The third issue is of setting standards. The ISO 9000 sets standards as decided by the institution itself. "Say what you do; Do what you say; Document what you have done" – this in a nutshell describes what ISO 9000 system is about. It essentially brings about a larger sense of understanding and commitment what one are doing and their role in the context of the institution.

A critique of ISO 9000 is that it just documents the current practices even to the extent of justifying wrong / substandard / non-desirable practices. The ISO 14000 in-turn addresses the requirement of documenting the impact of systems including environment and mandating an improvement (the Delta).

Thus the ISO systems strive at disciplining the systems, which is another word for Waste Management. Efforts at the Cell have been in the direction towards bringing about greater accountability of the systems with a community health perspective. The moot question is who would monitor these systems. This was the context of the presentation by Sri Ramesha.

The Chairing of the Scientific Session I was by Air Marshall (Retd) K C Cariappa, who is actively working with the World Wild Life Fund. Enlightened citizens pave way for empowered citizens. Empowered citizens do take up the crudgels to institute systems within and outside the institutions. Thus when arriving at and identifying policy elements towards Safe Management of Health Care Waste, we look upto the enlightened citizens like Mr. Cariappa. In the not so long run in this millenium, we need to evolve an accreditation programme.

It is challenging for an advocacy work that attempts at establishing systems both at the City level and the institution level. This was the spirit behind the other scientific sessions. The session on free paper, session to document efforts on at macro scale and in community settings and the filed visits provided the opportunity to interact and share the ecstasies and agonies of systems development and capacity building.

Apart from this the manufacturers and technology people also presented their knowhow.

It had been a conscious endeavour of the Organising team to make the session a "deliberation" and also resourceful. The following paragraphs detail the individual sessions.

### **Scientific session 1**

"Elements of Policy for Health Care Waste Management"

1. Areas of Concerns in Health Care Waste Management – Sri Homi Mullan
2. Injection Safety in Measles Elimination Programme –Mr. Bhuyan A L, UNICEF
3. ISO 9000 and ISO 14000 - pathways for better systems – Sri M. Ramesha
4. Occupational Hazards and Safety in Waste Management systems – Dr. D B Acharya

**CHAIR PERSON:**

Air Marshall (Retd) K C Cariappa

**CO-CHAIR PERSON:**

Dr. Ramesh S Bilimagga, Past President, IMA-KSB

**RAPPORTEUR:**

Dr. S Pruthvish, Faculty in Community Medicine at MSRMC

### **FREE PAPERS PRESENTATION THEMATIC AND NON THEMATIC**

### **Scientific Session 2**

**CHAIR PERSON:**

Dr. A K Agarwal, Director, SOHS-IGNOU, New Delhi

**CO-CHAIR PERSON:**

Dr. Paramesh, Medical Director, Lake Side Medical and Research centre

**RAPPORTEUR:**

Dr. B J Mahendra, Faculty in KIMS, Bangalore

### **Summary of Scientific Session 2 by Chairperson**

The Chairperson complimented all the presenters and summarized their views. He remarked that Hospital Waste Management was receiving a great deal of attention of late. Several discussions, seminars and conferences had been devoted to this important issue and a good deal of printed material on the topic was available. He called for production of audio and video material to supplement the available printed material. He remarked that video films showing modern and systematic Hospital Waste management systems must be produced. This would help to generate awareness. The ISHWM had already made a beginning by arranging for production of such a videotape together with IGNOU.

### **Scientific Session 3**

#### **PRESENTATIONS BY ENTREPRENEURS AND MANUFACTURERS**

##### **CHAIRPERSON:**

Lt. Gen Raghunath, Principal Director, Sir Dorabji Tata Centre for Research in Tropical Diseases

##### **CO-CHAIRPERSON:**

Surg Cmmdre Sivadas, Director , Institute of Naval Mediation Mumbai

##### **RAPPORTEUR:**

Dr. Sathyanarayana, Consultant, KHSDP

Summing up the presentation, the Chairperson noted that alternative technologies to incinerators are important and that steam sterilization achieves total effect. But, in any case, a separate technology is required for treating pathological waste. Points about safety, ergonomics and economics of operation had been well explained. The modular construction and flexibility to meet individual needs are also significant. The complete electronic telemetry and management system, which controls odor and offers a reduction of 40% and saves time are all good features of this equipment.

### **Scientific Session 5**

##### **CHAIRPERSON:**

Sri Ravi Agarwal, SHRISTI, New Delhi

##### **CO- CHAIRPERSON:**

Dr. Geetha Bali, Co-ordinator, Dept of microbiology, Bangalore University

##### **RAPPORTEUR:**

Lt.Col. Gokale S, AFMC Pune,

#### **Remarks by Dr. Geetha Bali, Co-ordinator, Dept. of Microbiology, Bangalore University**

Dr. Bali wanted greater awareness about Health Care Waste Management to be created through training centers. She felt that the Andhra Pradesh scheme of centralized facilities was a good solution.

#### **Quantitative and Process Analysis of Biomedical Waste by Dr. Rajeev Kumar Agarwal**

Dr. Rajeev Kumar Agarwal presented his quantitative and process analysis of biomedical waste relating to a 600-bed, four-storeyed hospital specializing in cardiothoracic surgery, radiology, tuberculosis and dialysis, with 30 medical staff and paramedicals and 20 clinical wards and departments.

The study covered waste management from the point of generation to the stage of disposal and extended over three days and nights. Observations were recorded. The hospital management had been trying to minimize waste and the total weight of the waste that is being generated now is as low as 378 g per bed per day and of that 78% is general waste and about 21% is toxic or the health-risk waste generated by the ICUs, operation theatres and the catheterization



laboratory. They use an old incinerator and chemical methods of disinfection, sterilization and autoclaving. They do not have facilities for shredding or vermiculture which are certainly worth putting into practice. He referred to health safety concerns and mentioned certain grey areas in the government notification, which must be taken note of and acted upon.

### **On Hospital Waste Management: Quality Assurance by Wg. Cdr. R.K.Ranyal**

In today's technologically fast developing world, the health care providers must go for Quality Assurance in every field of health care to achieve the Primary Aim of 'Quality Patient Care.'

Health care providers have failed to assure safe and quality disposal of waste generated while imparting health care to the people. The concern by public, which was rightly highlighted in the media, led to laying down of Bio-Medical Waste (Management and Handling) Rules, 1998, by Ministry of Environment and Forests through Gazette notification. To assure strict compliance, the Honourable Supreme Court has also intervened. Pollution Control Boards have been appointed as the regulatory authority.

To assure the success of any 'Hospital Waste Management Programme', it must start with basics of Information, Education and Communication. Following are the suggested guidelines to achieve quality in waste disposal system.

### **Waste Management at St. John's Hospital by Wg. Cdr. Franklin.**

Wg. Cdr. Franklin of showed slides depicting the operation of some of the facilities at St. John's Hospital. The use of protective clothing, gumboots and aprons by the operators was highlighted. A twin-chamber incinerator was shown. The box for nontoxic waste burns without fuel using the natural draft of a 100-metre chimney and a grate at the bottom. Air is sucked in at the bottom and it is used only for paper, of which the teaching hospital produces a lot. It is connected at a high level to the incinerator exhaust. The incinerator handles 50 kg in each charge. The box for non-toxic waste is used in the morning and the incinerator for toxic waste, in the evening.

### **Presentation by Group Captain H S R Arora of Command Hospital, I.A.F. Bangalore**

The Command Hospital has a fully functional Hospital Waste Management faculty, which creates awareness and provides intensified training and on-the-job correction. Hospital acquired infection control, management and housekeeping system management are considered very important for a successful Hospital Waste Management system.

Colour coding is strictly followed in waste segregation. Slides showed the operation of the incinerator, the microwave system, the chemical treatment of plastics and sharps management. A hydroclave has been added recently. Vermiculture is practiced.

### **Presentation by Sri Sathyavir Chauhan**

Mr.Chauhan claimed that Andhra Pradesh is perhaps the only State to have put together two common waste facilities in the form of a complete cycle of waste management. These have been in operation for two years. Almost 97% of the hospitals in the State have applied for

authorization to the Pollution Control Board and about 86% of the hospitals have been granted such authorization. Every hospital is inspected once a quarter and prosecution is launched for non-compliance with the rules. His presentation covered four main aspects, namely, the initiative taken by the State Pollution Control Board, the initiative and policies of the government, the role of private hospitals and voluntary organizations and finally, how they are working in tandem to achieve the common goal.

Time was when all kinds of waste were dumped in a single well. This still happens in some parts of the country. The first slide showed a scene in one of the hospitals where segregation of the waste was initiated but since the site was not secured the waste from different coloured bags was mixed up to let the ragpickers have a go at what could be salvaged. The good done by the hospital is effectively undone. The ragpicker has taken out some of the segregated syringes for sale. Another slide showed all categories - plastic waste, infectious and general waste - mixed up and fed to an incinerator. This tragic state of waste handling needs to be remedied.

As far as the State policies are concerned they have to take into consideration the interests of all the stake-holders, the Pollution Control Board, the Health Care Establishment, Voluntary Agencies, Common Waste Treatment Facility, and the public at large. Biomedical Waste Management was taken up very rigorously in the year 1999 and the first meeting of the Pollution Control Board decided to form an Advisory Committee with members from the Government and the Association of Private Hospitals. The first decision was to levy an authorization charge of Rs. 100 per bed per year to be paid by the hospitals. The Advisory Committee decided to form a Technical Committee and to ban the operation of any individual incinerators in the different hospitals. All incineration was to be done at the Common Waste Treatment Facility only. All the 16 incinerators working in Hyderabad were put out of commission and the hospitals joined one or the other of two Common Treatment Facilities. These are equipped with incinerator, microwave, autoclave, a common waste treatment plan and a small, secured landfill also within the premises spread over 11 acres. A similar facility with an effluent treatment plant will start functioning in Vijayawada soon. Vishakapatnam has been short-listed for the next such facility. A task force set up by the Pollution Control Board with members from Private Hospitals and NGOs, inspects each health care establishment on a regular basis. A single inspection within three months is mandatory. Prosecution or any action is launched based on the report of the task force. About 820 establishments have been authorized. The task force has inspected about 220 hospitals and short-listed 20 of them for prosecution. The Government has formed four committees with a broad-based membership. Hospitals have been asked to form a Waste Management Committee. A uniform training programme has been drawn up for the whole State and Health Care workers are being trained. Refresher courses are conducted. Segregation practices have been standardized. Legal aspects have been worked out. Materials Management Policies have been evolved. Budgets have been released. But no seminars like the present one in Bangalore have been arranged.

About 85% of the hospitals have joined the common waste facility scheme. The charge for the use of the Common Waste Facility in Hyderabad is Rs.2 per bed and with the average occupancy of 55% in Hyderabad, it comes to about 75 paise in practical terms.

An important aspect of recycling is that anything that comes out of the hospital and can be recycled is paid for by the Common Waste Facility. This forms a steady income for the hospitals. The Osmania General Hospital, for instance, earned about Rs. 5.12 lakhs in this manner as against its recurring cost of Rs. 3.78 lakhs on consumables, leaving a surplus of Rs. 1.34 lakhs in one year. Smaller hospitals would earn correspondingly smaller amounts.

The presentation might have useful lessons for other States in the country.

#### **Presentation by Dilip Sunder on behalf of Haat Incinerators**

This Bangalore-based company has been manufacturing incinerators for the last five years and has almost 158 stations all over India and abroad. The unique feature of the Haat incinerator system is that it uses a single burner for both primary and secondary conduction, which leads to extremely high fuel savings. The saving in handling fibers could be as high as 30-40 lakhs. Slides of their installation in Kamal Hospital, St. John's, Manipal Hospital, Mallya and St. Philomena's were shown.

#### **Presentation on behalf of Jogbuster by Mr. Veeranna**

The Jogbuster consists of four main parts: body, canal, switch, and plug. Its operation is very simple. Plug in, press power on, and wait. When the unit is ready, a big sound is heard and the "READY" light comes ON. Insert the waste syringes into the upper tray, keep pushing gently till it stops. Now the needle is fully destroyed and cannot be reused. When the jogbuster is not in use for more than five minutes, it will automatically switch off. For destroying the next batch of syringes and needles, press "POWER ON" and follow the procedure as explained in the manual. When the tray is full with needles, the Jogbuster will automatically detect this and the "TRAY FULL" light comes ON. The beep continues till the tray is emptied. Switch off the Jogbuster, pull out the tray, empty it, clean it and put it back. A funny finger signal alerts the user not to insert his finger into the upper jar. Very little physical force is required for operation. This electronic device has a very long operating life. It is not a mechanical cutter. Since there are not many moving parts, there is no wear and tear. The only spare required is a fuse. The equipment carries a year's guarantee. The company provides good after-sales service.

#### **Presentation on behalf of San-i-pak Waste Treatment Systems by Mr. Arthur McCall**

The concept of San-i-pak – an exclusive pattern of combining a sterilizer and compactor or a sterilizer and shredder – was the result of a search by a group of doctors, physicians and engineers for an alternative to medical waste incinerators which pollute the environment with their discharge of dioxins while handling plastic waste. Besides sterilizers and compactors the company manufactures all sorts of support equipment for everything from waste collection equipment to automated waste handling systems and electronic waste management systems. The company has a great deal of consultancy experience.



**Presentation by Mr. Naresh Shukla**

Mr. Naresh Shukla pointed out that waste generated from medical activity can be hazardous, toxic, and even lethal. He then proceeded to describe equipment for hospital waste management with the aid of slides. His company, Pulse Pharma Ltd provides total solutions to the problem of biomedical waste management for all sizes of hospitals. They offer systems meeting the requirements laid down in the norms and rules of biomedical waste management. The total safety concept for infectious health care waste offered by them comprises training in segregation and hygiene, methods for collection of waste, methods for transportation of waste, microwave disinfection devices, biologic medical waste shredder and needle destroyers. Slides showing microwave disinfection devices of different capacities, a medical waste shredder of German make and a needle destroyer were projected. Installations of these devices in well-known hospitals in different parts of the country were shown.

**"Infectious Waste and Medical Waste: Medical Perspectives" by Dr. Krishna M. Jain**

Dr. Jain stated that people in the United States are very sensitive to the issue of medical waste. With the aid of slides he described the colour coding system for segregating waste into different categories and the disposal systems adopted. Much of the disposal is in the landfills. Incineration, autoclaving, microwave and chemical technology are the main methods of treating waste.

**Presentation by Mr. Partho Ray**

The speaker briefly explained the problems encountered in organizing Hospital Waste Management. These related mainly to funding, infrastructure, creating awareness and organizing training and refresher courses.

**Presentation by Mrs. Manjari Chuneekar representing Don Whitley Scientific equipment.**

The Indian company Diana Micro, in collaboration with the UK-based company Don Whitley Scientific has been marketing specialized equipment popular with microbiology laboratories. Their patented chambers for growing anaerobic bacteria at low cost have been installed in large numbers and have been in operation for a long time in India. Their bacteriological air samplers to monitor and control bacteria in sterile areas are in use in many operation theatres and in the food industry. They have also developed an incinerator to take care of laboratory-generated waste. They claim 99.9% combustion efficiency for their equipment.

**Presentation on behalf of the Maridi group of companies**

Running the biomedical waste treatment facility visited earlier in the day. Supplementing the presentation made by the visiting team, the speaker made special mention of their Cinthion range of portable microwave machines with steam injection and the expensive imported San-I-tek microwave machine expected to be in operation soon.

**Presentation by Mr. S.B.Patil, Divisional Manager of Ador Technology Ltd., Pune**

This is a combustion, thermal, and environmental engineering company established in 1989 with ISO 9000 certification for all its products including incinerators, burners and other combustion and thermal products, galvanized furniture. The speaker referred to an epidemic (of

unspecified date) and hinted that it might have been caused by infection from biomedical waste.

#### **Presentation on behalf of Jain Hydraulics (Private) Ltd.**

The company had supplied the first hydroclave to the Command Hospital, Indian Air Force, Bangalore. The company has a maintenance team itself of 14 people spread all over India and all spares are very easily available.

#### **Presentation by Mr. Srinivas Kulkarni of Ecologic**

This company makes eco-friendly corrugated paper products which can be recycled 20 times, such as stationery items, gift items, life-style products and other items generally used in various day-to-day activities. These are bio-degradable substitutes for the corresponding plastic products. As mankind becomes more and more aware of the damage caused by plastic products to the environment, lifestyle changes are bound to take place and these products offer innovative, lightweight and functional substitutes.

#### **Scientific session 4**

The facilitatory work of the Ceil has been successful in terms of more than 200 institutions in Bangalore alone attempting towards establishing systems at the institution level to safely manage the waste. It was considered worthwhile that the conference delegates from across the country visit these and other institutions of excellence in the city and interact with the key individuals who have been instrumental in establishing systems – to share the agonies and ecstasy. Thus, a major interaction that was planned during the deliberations was the field visits. The delegates were able to visit 12 of the 15 institutions identified.

The delegates after the briefing during the breakfast on the second day of the conference initially visited and observed the facilities at the Command Hospital and then broke into seven smaller groups and visited institutions. The list of institutions that the groups visited along with the persons in-charge in each of the institutions is given below.

*List of Institutions where field visits were undertaken. The person in-charge is given in paranthesis*

1. M S Ramaiah Medical Teaching Hospital (Mrs Meena Unnikrishnan)
2. Chhaya Nursing Home (Mr. Venugopala Rao)
3. Subbaiah Hospital (Dr. Anand)
4. Margosa Diagnostic Centre (Dr. Kumar)
5. SDS Sanitorium, Rajiv Gandhi Institute of Chest Disease (Dr. Shahshidhar Buggi)
6. Bowring and Lady Curzon Hospital (Dr. Vijaya)
7. Anand Institute of Laboratory Medicine (Dr. Jayaram)
8. St. Martha's Hospital (Sr. Mercy)
9. St. Johns Medical College (Wg Cdr Franklin)
10. Command Hospital (Gp Capt H S R Arora)
11. Lakshmi Nursing Home (Dr. Rajagopal)
12. Maridi Common Waste Management Facility (Mr. Ramesh Babu)
13. Rajashekar Hospital

The following persons facilitated for the field visits:

**Facilitators**

1. Dr. D Gopinath
2. Sri Lakshmikanth
3. Dr. Ramakrishna
4. Dr. Meera Meundi
5. Mr. Vittal Kumar A.
6. Sri Vishwanath
7. Dr. Rajamma
8. Dr. Pruthvish
9. Wg Cdr Srivastava

The checklist developed by the HCWMCCell to assess the institutions for their safe waste management practices was utilised as the basis. After the visit the groups came back and made presentations in the plenary with the following in the chair.

**CHAIRPERSON:**

Dr. D C Sharma, Zonal Officer – South Zone - CPCB

**CO-CHAIRPERSON:**

Sri A N Yellappa Reddy, Member, HCWMCCell

**RAPPORTEUR:**

Sri Vittal Kumar A, CEE- South, Bangalore

Summary of presentation by group leaders after the field visits

**Group A** visited One Nursing Home (25 bedded HCI), One diagnostic center and one major Hospital (750 beds)

**Observations**

1. In Nursing Home, housekeeping was good. The waste management system was quite satisfactory. The sharps were being destroyed using cutting pliers.
2. Not impressed with the waste management system at the Diagnostic Laboratory.
3. A poor opinion of the Nursing Home. There was no proper ventilation. The waste bin with soiled dressings was placed too close to the patient's head.
4. At the Hospital housekeeping was poor. The plunger is not removed from the syringes and was just disposed of as such into the bowl with the solution. The incinerator was not operative. There was no ventilation for the incinerator. The concerned person had not worn any personal protective devices. Waste collected from all areas was collected and dumped near the incinerator room itself.

**Group B** presentation visited two institutions - a 400-bed government hospital and a 50-bed private nursing home. The group rated them on a 5-point scale with 0-for unmentionable,



5-for excellent, 3-for average and 2- and 4- on either side of the average. They also agreed on the parameters for the evaluation.

### Observations

1. The government hospital scored well in respect of human resources also - medical, paramedical, and even the house-keeping staff - both in terms of the number of persons employed and their qualifications.
2. Training is imparted to them regularly, repeatedly. Awareness about waste disposal is quite high. The situation in the private hospital was really not very remarkable.
3. The material resources available to the two institutions were also quite different. In terms of the resources, equipment and the functional status of equipment they were rated as 3.3 and 1.5 respectively.
4. Neither institution could boast of modern equipment like a big incinerator, hydroclaves and so on. But whatever was available was more functional in the government hospital than in the private hospital, where they appeared to have been kept more for show than for regular use.
5. The group studied the specific area of sharps segregation. The institutions visited scored as high as 4 in the case of non-contaminated sharps. Contaminated sharps, like broken glass pieces, metal parts and so on were not being segregated properly. Since "plastics" has become a buzzword, everyone is aware about it and it is being segregated properly.
6. The government hospital did not generate much contaminated waste but the operation-theatre-generated waste was handled properly and all the lumps were sent in formalin to a histopathology laboratory or to museums. So, there was hardly any waste, which could be considered as organic waste going out. General waste was also managed quite well. They scored 3 points out of 5 while the situation in the other hospital was very poor indeed.
7. Movement and transportation of wastes was quite well organized. That was not so in the nursing home but considering that the space through which they had to move the garbage was much shorter, they could also be awarded 3 points.
8. Space being at premium in the private establishment, they have installed a "bhatti" on top, which looked more like a tandoor. The other one did have an old incinerator, perhaps 30 or 40 years old where things are dumped, kerosene is poured or sometimes wooden sticks are put in and allowed to burn with smoke spreading everywhere. Not really satisfactory in the opinion of anyone (including the Pollution Control Board) but such as it is, it is being put to use.
9. They have a "pyrolator" in the government institution was in working condition but its effectiveness could not be estimated and it had no markings on it. There was no way of checking what temperature is being attained, for what time it is held, and what the products are.

10. Sharps disposal is by deep burial, not really the ideal method but practicable. So overall, they were awarded 2 and 0.5 on these aspects.
11. Another important parameter was awareness. It was very high in the government institution but not so in the private nursing home. One of the problems was the high turnover in the private sector - trained workers always looking for greener pastures. No posters, ready reckoners or guidelines on what to do in the event of a spill, break or prick are displayed in either place, perhaps because this needs considerable inputs. Protective gear is available to some extent. Colour codes are followed only to some extent but several containers are available. There is no dearth of containers or of plastic bags, though all of them are black colored bags put into all types of buckets so perhaps once the bag is closed segregation becomes difficult. The staff did seem to be putting in a lot of effort.
12. The government hospital is doing good work and they need to be patted and encouraged but at the same time they need to be guided. The situation in the commercial establishment was dismal. The government institution stands at 2.8 which is above average but the group expected even better from the Government Hospital.

The Chairperson had a good word to say about how the group had set about its work. On the other hand he felt disappointed that waste management left much to be desired in both the establishments. Collection, segregation and disposal of waste affect both patients and outsiders.

**Group C** visited the 100-year-old institution with a bed-strength of more than 675 and a diagnostic laboratory.

#### **Observations**

1. A great deal of waste is being generated here, but it is being transported and disposed of in a commendable manner, the credit for which must go to the administrator. The supervisors are all concerned over the waste. The training imparted to them (by the HCWMCCell) has stood them in good stead.
2. In general, segregation is being done properly but disposal of waste needs to be improved with large inputs of money, space and time. At present the work has been entrusted to a senior contractor who takes the infected waste. The needles and syringes are sent out to the regional co-operative facility for disposal.
3. The incinerator is in operation but is in the wrong location. Space is a constraint. The workers do not have or do not wear any protective gear.
4. In contrast, the situation in the microbiology laboratory is very good both as regards waste disposal and collection. Autoclave facilities are available. Crushing of needles and shredding are entrusted to civil authorities.
5. Adequate training has been provided to the staff.
6. All the staff who were interviewed were aware of the importance of waste management from generation to disposal.

7. Protective gear is available in some areas but is not being used when it should be used. This is cause for concern to the administrator when HIV positive patients are being treated. But the staff have repeatedly been examined and found negative to infection. They have been immunized against hepatitis B, which is quite significant.
8. Not much attention is being paid to budgetary allocation, supervision of the contractor's work of maintenance, downtime of incinerator and so on. Practical and sustainable systems have to be adopted for these aspects of management.
9. One of the premier diagnostic laboratories in the city, with a good reputation. The staff include besides 4 doctors 17 laboratory technicians, 11 x-ray technicians and 6 group D workers. Unfortunately, needles and syringes are not being crushed or punctured at the sample collection stage itself.
10. Glassware in the biochemistry department is autoclaved and reused which is standard practice and a good one at that. An incinerator is available but it is under breakdown. Again, space is a constraint.
11. Plastic urine containers are being incinerated. Waste generation has been effectively reduced at source, which is a significant feature.
12. Small chlorine-free plastic ampoules are used and therefore, the ash left after incineration is dumped into the corporation dustbin, which may be considered safe enough.
13. Safety precautions being taken in the private sector have some features worth emulating in the public sector. Workers in the risk group in a private institution are covered by insurance. This practice should be extended to the public sector also.
14. All at-risk groups in both the sectors are at a disadvantage because of ignorance, lack of protective gear, delays and work constraints, and deserve to be suitably insured.

**Group D** This group visited oldest hospital in the city, functioning since 1886 with land and facilities donated by the Maharaja of Mysore in 1884. Coming from a State where nobody thinks of waste management in hospitals, the leader of the group was impressed with the waste management practices followed here.

#### Observations

1. This 562-bed multi-speciality hospital has round-the-clock APT facility and a core group engaged in waste management.
2. Education on waste management and health care is being imparted to the staff. Containment and segregation of waste are practiced properly.
3. Food waste is composted after decontamination, using 4 chambers for various stages of disposal.
4. A double-chamber 35 kg incinerator is used to burn up infected waste consisting of human tissues, placenta, etc. in two shifts. Much of the recyclable waste is taken away by ragpickers or sold to farms, shops and dealers, and the rest is disinfected and discharged into drains. Colour coding of containers is practiced.



5. The hospital management cooperated with the group in every way. The group was also impressed with the high quality and standards of work in the CCU.
6. The Chairperson remarked that the practice of placing an engineer rather than a doctor in charge of waste management as is being done here could be adopted in other hospitals also. Doctors would be more interested in health care than in waste management and it makes sense to use their talents more directly in health care. He also suggested that the quality of the ash from an incinerator and the quality of its flue gases should be considered an important parameter of its performance.

**Group E** 1000-bed Medical College hospital, where they were taken around by the person in charge of maintenance.

#### **Observations:**

1. The hospital has a staff strength of 1,600 including 300 doctors and it follows all the rules laid down in the Biomedical Waste Management Rules and is duly authorized by the Karnataka State Pollution Control Board to handle waste. The occupancy of the hospital is about 85%. Segregation, chemical treatment and incineration are the methods of waste management employed. The necessary equipment occupies 1000 sq. ft. of the total of 4000 sq. ft. available for all equipment.
2. The capacity of the twin-chamber incinerator is 50 kg per hour and it is operated for approximately 4 hours per day, giving a waste reduction of 95%. The temperature maintained is 750°C in one chamber and 900°C in the other. The chimney is 100 feet high and has no ladder. The authorities claim that it is not creating any pollution. The total cost of the incinerator is about Rs.12 lakhs and the running cost is claimed to be about Rs. 28,000 per day. This is questionable.
3. Plastics are chemically treated with 1% chemical solution, shredded in a machine and then sold in the market. The group considered biomedical waste management at this institution as highly commendable.
4. Following the presentation, a questioner pointed out that the stated temperatures of 750°C and 900°C were not good enough and that they should be 850°C and 1100°C according to the Pollution Control Board. Retention time at the specified temperatures is also important. The bi-annual notification from the Environment Ministry stipulates these higher temperatures and even the technology to be adopted. If these guidelines are not followed due to ignorance or any other reason, the hospital will face legal problems. Again, if the quality of emissions is checked and found to be unsatisfactory, legal problems will arise. Hospitals should be aware of these aspects while procuring incinerators. In answer, it was stated that the temperatures may be higher at the source of heat and there might be some loss of heat due to poor insulation and so on. Also, it is possible that the actual temperatures are higher, but the fault may be in the thermocouples, which may have lost their accuracy due to wear and tear, particularly, if they are not kept in thermowells intended for the purpose.

5. As a separate issue it was pointed out that the needle destructors are effective in destroying needles and syringes, prior to incineration.

**GROUP F** visited Nursing Home in addition to the major defence establishment and studied the waste management system backwards from the incinerator to the points of generation.

**Observations:**

1. The 30-metre high stack could not be built because of proximity to the airport. The group leader remarked that in Pune, a neem tree overlooking an incinerator with a 5-metre-high chimney retains its greenery. This is ample evidence of the emissions being free from toxic gases. The stipulation of 30 metres for the height of chimney is perhaps only a notional specification.
2. The operation of a hydraulic autoclave shown was a one-of-its-kind experience for the members of the visiting team.
3. The group suggested to the management that plastics could be treated separately. They could be segregated, shredded and then disposed of suitably. The group also suggested restricting access to one point and paving the skirting around the building with concrete for effective cleaning and decontamination in the event of any spilling of waste.
4. The group suggested locating the heavy-duty microwave oven outside the nephrology unit or using a portable unit. One of the members of the team had suggestions for improving the disinfection of dialysis sets.
5. The group wondered whether the personal protection gear was actually being used or was meant for demonstration only. These should be user-friendly if they are to gain general acceptance by the workers. Use of boric powder may overcome some of the prejudice against the use of gloves.
6. Segregation is the key to the success of a waste management system and education on this subject must be provided in every possible manner.
7. Although colour coding is in practice here, waste does get mixed up in certain bins. This may not be intentional and can be corrected by intensive training and frequent checks.
8. The group felt that the management in the private Nursing Home had not been briefed about the situation in the place. One of the members found out that the boy who usually looks after waste management was absent on the day of the visit. It was remarked that perhaps waste management in other hospitals (institutions) also follows the same pattern.

**Group G** visited the common biomedical waste treatment facility

1. The facility was located on Kanakapura Road, approximately 30 km from Bangalore. It has been set up on a 5-acre plot at a cost of Rs. 6.5 cores. The investor explained that this was a pilot facility for studying the dynamics and economics of Hospital Waste Management. This facility can handle 15 tons of biomedical waste per day.

2. There is an incinerator at present and provision is available for two more, if required. They also have a portable microwave oven, a shredder and six vehicles. With such a facility available, hospitals only have to segregate the waste and leave it to the facility to collect and handle.
3. The microwave unit was said to handle 60 litres of waste per hour or approximately 300 litres in an 8-hour shift. This equipment can handle metals also since it can also operate in the autoclave mode. If this option is not used, the capacity doubles to 120 litres per hour. Zero spillage, that is, total absence of danger of exposure to microwave radiation, is a distinct advantage of this equipment. Maintenance is minimal unlike as in the autoclave with its moving parts.
4. The shredder can handle about 150 kg of microwaved plastic waste per hour. The other types of wastes it can handle include sharps, tubing and IV bottles. Recycling improves the economics of the facility. Waste processed through the shredder is sold to waste recyclers at advantageous rates.
5. The incinerator of their own design can handle about 5 tons per day or 250 kg of pathological waste per hour. It has two chambers operating under vacuum with ash discharge from the bottom. Ash is manually removed. Wash water is chlorinated and reused. The chimney is designed for three such incinerators. The total cost of the incinerator installation was said to be Rs. 50 lakhs.
6. Waste from the city is brought in light commercial vehicles. They have four chambers painted white, red, blue, and yellow. At the suggestion of the group the facility plans to replace the grilled partitions with regular sheets to avoid spread of infection.
7. The group found it strange that payment for waste disposal is being made to the facility on the basis of the number of beds in the hospital and not actual quantities of waste handled. The facility bills for its services at Rs. 3.5 per bed irrespective of occupancy. This cuts both ways, because there may be a tendency to send away any waste, even waste that is not infectious, to the facility for treatment. Hospitals have to work with earnestness to make a success of the scheme by co-operating with them in terms of segregation as well as the pricing.
8. It appears that the facility will have to service 11,00 beds just to break even. It would have to contact veterinary hospitals as well as private practitioners to reach this target.
9. This facility is not on stream so the capability as well as capacity has to be established. Only theoretical projections are available at present.
10. The visit and the report would serve the interests of the facility and hospitals, which can benefit by offloading their waste and problems to the facility.



### **Remarks by Dr. Gopinath, Organizer of the programme of visits**

Dr. Gopinath was happy to note that the objective of the field visits had been accomplished. The delegates had given critical insights useful in evaluating the systems. Any criticism made about any administrative system should be taken in the right spirit without attributing motives to the delegates.

After all, good systems can only evolve over a period of time. Institutional initiatives have been taken and earnest efforts have been made. Success or failure should be looked upon as a learning experience. The exercise has proved that Bangalore has so many systems to demonstrate and has developed so much of human resource. Both these are useful assets to be built upon in the years to come for the good of the society we serve.

The readiness with which the various establishments agreed to receive such a large number of delegates is most gratifying. It shows the degree of transparency that exists in these matters. The prompt and very pertinent presentations by the seven groups have added enormous value to this conference. They have brought to light many social, technical and legal matters of interest to professionals as well as the public. Apart from all other achievements this conference has succeeded in showcasing Bangalore as a leading city as far Health Care Waste Management is concerned.

### **Scientific Session 6**

Overview of systems in Karnataka

**CHAIRPERSON:**

Smt. Kalpana Kar, Member Bangalore Agenda Task Force, Bangalore

**CO-CHAIRPERSON:**

Dr. Meundi, Joint Director, DME-GOK

**RAPPORTEUR:**

Smt. Anjana Iyer, member SWABHIMANA

### **Presentation by Mr. Sadiq Ahmed on behalf of Karnataka State Pollution Control Board**

The Karnataka State Pollution Control Board has identified more than 2000 health care establishments in the State. All establishments generating biomedical waste are duty bound to treat the waste and dispose of it safely without causing any damage to the environment. All health care establishments are required to apply for and obtain authorization for their functioning, furnish annual returns with details of waste generated every year and maintain records of the waste generated and handled in their premises. Although more than 2000 health care establishments have been identified, only 600 authorisations have been issued against 772 applications. Some 12 healthcare establishments have their own in-house incinerators.

The Board has encouraged the setting up of two common waste treatment facilities, one each in Bangalore and Mysore. The one in Bangalore has just been commissioned and was inspected earlier in the day by some of the delegates to the conference. The Board has conducted

training programmes for many health care establishments. The Government and academic institutions have been requested to include treatment of biomedical waste in the curriculum for medical and environmental education.

Asked about the basis for granting authorization, the speaker said some conditions of waste treatment and disposal have been evolved for granting provisional authorization and these will be reviewed in the light of assessments to be made in the next few years.

In reply to another question, he said there was no proposal to provide financial aid for setting up the centralised facilities.

#### **Presentation by Mr. Vittal Kumar, Center for Environment Education**

The Centre for Environment Education, with its Head Office in Ahmedabad is a national institution under the Ministry of Environment, working on various issues including biomedical waste management. In 1997 it had organized the National Council on Hospital Waste Management. The Centre in collaboration with the M. S. Ramiah Medical College conducted a survey on Hospital Waste Management practices in the hospitals of Bangalore.

The New Delhi office of the Centre provides funds for health care establishments, waste management and education programmes. The Centre proposes to implement a model programme in various places in India. Implementation of the American Waste Management rules is the subject of a study being conducted in New Delhi. Bilingual posters relevant to Hospital Waste Management are being prepared for educating specific target groups of *safai karmacharis*. Two other sets of posters are being prepared for the benefit of doctors and class IV employees.

The Centre is working on a plan to set up a common waste handling facility in Gulbarga under the Environmental Protection Programme.

The Centre solicits assistance from professionals in preparing education material in English and regional languages to create awareness and impart training.

#### **Valedictory**

The valedictory function was presided over by Dr C Shivaram, Chairperson, Health Care Waste Management Cell, Air Marshal L K Verma, President of the Indian Society of Hospital Waste management was the chief guest. The other dignitaries included Dr D.B. Acharya, Vice-president of Indian Society of Hospital Waste management, Dr Rajamma Deputy Director (MIS), Karnataka Health System Development Project and Dr D Gopinath, Director, Health Care Waste Management Cell, Department of Community Medicine, M S Ramaiah Medical College. Dr N Girish, Organizing Secretary, ISHWMCon2001 proposed vote of thanks.

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5. Prof. S. Chandrashekar Shetty, Vice-chancellor, Rajiv Gandhi University of Health Sciences, Bangalore.
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8. Sri. Ashok Dalwai, IAS, Commissioner, BMP

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**Co-Chairpersons:** Dr. Rajamma, KHSDP.  
Dr.Jayachandra Rao, BMP.

**Organising Secretary:** Dr.Girish. N, HCWMCell.

### **Joint Organising Secretaries:**

Dr. Ramakrishna Goud, HCWMCell.

Dr. Hemanth.T, HCWMCell.

Dr. Leonard Machado, HCWMCell.

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2. Wg Cdr. Franklin, Administrator, St. Johns Medical College, Bangalore.



3. Ms. Gracy D'Cunna, St. Martha's Hospital, Bangalore.
4. Dr. Mahendra. B.J., Assistant Professor, Dept of Community Medicine, KIMS, Bangalore.
5. Mrs. Meena Unnikrishnan, Nursing Superintendent, MSRMTH, Bangalore.
6. Dr. Meundi, Joint Director, Directorate of Medical Education, GOK.
7. Mr. Sadiq, Deputy Environmental Officer, Karnataka State Pollution Control Board.
8. Dr. Shashidhara Buggi, Rajiv Gandhi Chest and T.B Centre, Bangalore.
9. Dr. Shivaprasad, Administrator, Bangalore Hospital, Bangalore.
10. Dr. Vijaya, Dept of Microbiology, Bowring and Lady Curzon Hospital, Bangalore.

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2. Dr. Nagaraj. G.V, Directorate of Health and Family Services, GOK.
3. Dr. Seethalakshmi, Director, Directorate of Medical Education, GOK.
4. Dr. Shekar, President, Nursing Home Association and Private Hospitals, Bangalore Chapter.

**Convenor:** Dr. Jayachandra Rao, Project Co-ordinator, IPP8, BMP.

**Members:**

1. Dr. Jayanth Kumar, Head and Professor, Dept of Community Medicine, MSRMC, Bangalore.
2. Dr. Kumar S, Registrar Academics, MSRMC, Bangalore and Medical Director, Margosa Diagnostic Centre
3. Dr. Meera D Meundi, Principal, Bangalore Medical College, Bangalore.
4. Dr. Sandhya Belawadi, Principal, MSRMC, Bangalore.
5. Dr. Nadig, Chaya Nursing Home
6. Dr. Sunil Subbaiah, Subbaiah Hospital
7. Dr. Shahshidhar Buggi, Medical Superintendent, SDS Sanitorium, Rajiv Gandhi Institute of Chest Disease
8. Dr. L Chandramma, Medical Superintendent, Bowring and Lady Curzon Hospital
9. Dr. Ramaprasad, Anand Institute of Laboratory Medicine
10. Sr. Mercy Abraham, St. Martha's Hospital
11. Dr. Mary Olappally, St. Johns Medical College
12. Dr. S K Dham, Commandant, Command Hospital (Air Force), Bangalore
13. Dr. Rajagopal, Medical Director, Lakshmi Nursing Home

14. Mr. Ramesh Babu, Managing Director, Maridi Common Waste Management Facility

15. Rajashekar Hospital

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**Convenor:** Dr.S.Pruthvish, Member, HCWMC.

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**Members:**

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2. Dr. Geetha Bali, Chairperson, Dept. of Microbiology, Bangalore University, Bangalore.
3. Sri. Narasimha Murthy, Associate Professor, Dept. of Community Medicine, MSRMC, Bangalore.
4. Dr. Nirmala, Consultant Microbiologist, Mallya / Wockhardt Hospital, Bangalore.
5. Sri. Simha, Environmental Training Institute, Bangalore.

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2. Sri. Goverdhan, Swabhimana, Bangalore.
3. Dr. Maiya. M., Maiya Nursing Home, Bangalore.
4. Smt. Kalpana Kar, Member, BATF, Bangalore.
5. Dr. Sharma. D.C., Regional Director, South, CPCB, Bangalore.
6. Dr. Udayabhaskar, Regional Office, Ministry of Environment, Ecology and Forests, GOI.
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Sri Jothi Ramalingam, Medical Education Secretary, GOK.

Dr. Mant Ganekar, President, Indian Medical Association, Karnataka State Branch.

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Dr.Renuka, Lecturer, Dept of Community Medicine, MSRMC, Bangalore.

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Mrs Meera	Bangalore	Mallya hospital,	Partner
Dr. Bijoy Kumar Das	Cuttack	SCB Medical College & Hospital	Partner
Mr. Lakshmi Kantha	Bangalore	AEO, KSPCB	PCB
Mr. Sadiq Ahmed	Bangalore	DEO, KSPCB	PCB
Mr. S. Sankaran	Bangalore	Hast Incinerators	Trade
Mr. Dilip Sunder	Bangalore	Hast Incinerators	Trade
S.B. Patil	Mumbai	Adar Technologies	Trade
Mr. Krishna H. Jain	Bangalore	Advanced Vascular Surgery Progen Health Pvt.	Trade
Dr. Atul Bhatnagar	Bangalore	AIMIL Ltd., Badami Mansion, 44, Millers Road	Trade



Mr. S. Krishna	Bangalore	AIMIL Ltd., Badami Mansion, 44, Millers Road	Trade
Vinod Chhabra	Bangalore	AIMIL Ltd., Badami Mansion, 44, Millers Road	Trade
Mr. M.R. Venugopala Rao	Bangalore	Chhaya Nursing Home	Project partner
Mrs. Anjana Iyer	Bangalore	HCWM Cell + Swabimann	Project partner
Dr. B.J Mahendra	Bangalore	KIMS	Project partner
Mrs. K.S. Vijaya Lakshmi	Bangalore	N/S Sevakshetra Hospital BSK II Stage	Project partner
Dr. Jayaprakash	Bangalore	Primary Medical Centre Dr. Rajkumar Road, Rajajinagar	Project partner
Mr. Nareish Shukla		Pulse Pharma Pvt. Ltd.,	Project partner
Mr. T.K. Kumaresk Babu	Bangalore	Santesh Hospital, 6/1, Promenada Road Behind Cole's Park Near Good will School	Project partner
Mr. Madhas Rao	Bangalore	Shekar N.H. Malleshwaram	Project partner
Wg. Cdr. R. Franklin	Bangalore	St. John's Medical College Hospital Kormangala Sajapur Road,	Project partner
Dr. S. Buggi	Bangalore	Supdt. S.D.S TB & Chest	Project partner
Mr. Sandeep Sinha	Bangalore	BKF-Chanda Nephro Urology Centre Nu Trust, CA 6, 15 <sup>th</sup> Main, 11 <sup>th</sup> Cross Padmanabhanagar	Project partner
Dr. R.C. Bidri	Bijapur	Ashram Road	New Contact

*"The human body today contains about 500 different chemicals that were contained before 1920. (endorse the views of many experts in the field - underground water pollution, arsenic levels in West Bengal and Bangladesh is almost 500 times than what WHO permissible limits are there) All these are indicative of that unless we do something today, its going to be very, very difficult in the future, and we believe in past, present, and future"*

*- Air Marshal L K Verma in his address during ISHWMCon 2001*

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Maridi Eco Industries Pvt. Ltd, Rajashekar Hospital & Maternity Centre, J P Nagar, Bangalore, Chhaya Nursing Home, Malleshwaram, Bangalore, Shekar Nursing Home, Malleshwaram, Bangalore, Lakshmi Nursing Home, Seshadripuram, Bangalore, Ashwini Surgical Nursing Home, Jayanagar, Bangalore, Rajalakshmi Polyclinic and Nursing Home, Jayanagar, Bangalore, Subbaiah Hospital, Mathikere, Bangalore, Jupiter Hospital, Malleshwaram, Bangalore, Sani-I-pak, Haat Incinerators India Private Ltd., Don Whitley Scientific Equipment, Unique Inc., Jain Hydraulics, Pulse Pharma, Rajiv Gandhi University of Health Sciences

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### **SPECIAL THANKS TO OUR STUDENT VOLUNTEERS**

Kavya N, Manjunath G, Priyanka Nanjappa, Rohit Gokhale, Sri Vidya, Sunil Kumar B, Suvi Viruprakash, Swetha C, Vikaram K, Tejaswini K Y, Vipin V, Vivek N, Praveen L, Srihari M, Tejaswini J, Shivashanthi, Swathy Mogra

### **PARTNER ORGANIZATION**

Command Hospital - Air Force, Bangalore , MS Ramaiah Medical College, Dr. Kadam and Team, Training Centre, IPP8 -BMP, M.S. Ramaiah Institute of Nursing Education and Research, Bangalore Medical College, SDS Tuberculosis and Rajiv Gandhi Chest Diseases Hospital, Ashwini Surgical Nursing Home, Kumud Nursing Home, Rajajinagar Maternity Home, St. Martha's Hospital, Anand Institute of Laboratory Medicine, St. Johns Medical College, Ulsoor Maternity Home, Bowring and Lady Curzon Hospital, Bangalore Hospital, CGHS Polyclinic, Infantry Road, Bangalore

"Laying down a proper hospital waste management system is complex and cumbersome and calls for perseverance. The first activity is the inventory survey and compilation, and determining points of generation. This is not undertaken by the health care institutions for some reason or the other and that is why the health care institutions have not even now properly planned any effective waste management system" - L K Verma

**DETAILS OF FIELD VISIT ON SATURDAY 26<sup>th</sup> May 2001**

<i>Package</i>	<i>Institutions</i>	<i>Institution in charge</i>	<i>Facilitators</i>
1.	a) M S Ramaiah Medical Teaching Hospital b) Chaya Nursing Home c) Subbaiah Hospital d) Margosa Diagnostic Centre	Mrs Meena Unnikrishnan Mr. Venugopala Rao Dr. Anand Dr. Kumar	Dr. D Gopinath Mr. Sadiq /Mr Lakshmikanth
2.	a) SDS, TB and Rajiv Gandhi Chest Disease b) Ashwini Nursing Home c) Rajashaker Hospital	Dr. Shahshidhar Buggi Dr. Prakash Dr. Somayaji	Dr. Ramakrishna Dr. Meera Meundi
3.	a) Bowring and Lady Curzon b) Anand Institute of Laboratory Medicine	Dr. Vijaya Dr. Jayaram	Dr. Meundi Mr. Vittal Kumar A.
4.	a) St. Martha's Hospital b) Rajajinagar Maternity Home	St. Mercy Dr. Mangala	Dr. M Jayachandra Rao Sri Vishwanath
5.	a) St. Johns Medical College b) Kumud Nursing Home	Wg Cdr Franklin Dr. Ganguly	Dr. B J Mahendra Dr. Nirmala
6.	a) Command Hospital b) Lakshmi Nursing Home	Gp Capt H S R Arora Dr. Rajagopal	Dr. Rajamma
7.	a) Mandi Common Waste Management Facility	Mr. Ramesh Babu	Dr. Pruthvish Wg Cdr Srivastava

08:00 AM Assembly at No 2, Air Force Officers Mess, Trinity Circle, Bangalore

08:00 AM Break Fast

09:00 AM Onwards Briefing regarding the Field Visit by Group Facilitators and departure to the respective Institutions

09:30 AM Arrival at the First Institution

11:30 AM Completion of Interaction at the last Institution

12:15 PM Assembly at JRD Tata Auditorium, NIAS

12:30 PM Group Representatives to present the report of the Field Visit at the Plenary

**Attention Delegates :**

1. Each group to consist of NOT MORE THAN 30 DELEGATES. In case there has been a greater request for one institution, the decision of the Scientific deliberations Committee would be binding. The delegates are requested to co-operate and opportunity will be provided subsequently on specific request.
2. Each group to identify their Leader and the presenter before the beginning of the Visit.
3. Please use the given checklist as a guideline to evaluate the systems in each of the Health Care Institution. This could be either an individual activity or the group representative's endeavour.
4. The Facilitator in each team to guide endeavour 2 and 3
5. The checklist is of two variety – One for the Systems within the institution; the second for the Final Disposal Technology.





## INDIAN SOCIETY OF HOSPITAL WASTE MANAGEMENT

(Founded - 2000, Registration under the Societies Registration Act XXI of 1860, Reg No. 36939 of 2000)  
 Rome No. 126, AIR Hqs, West Block - VI, RK Puram, New Delhi - 110 066

The Government of India published a Gazette notification on 20 July 1998 making all persons who generate, collect, received, store, transport, treat, dispose or handle medical waste in any form responsible for handling the medical waste without any adverse effect to human health and the environment. Consequent to the publication of above Gazette Notification on Bio-medical Waste management, It is mandatory for all hospitals and health institutions to implement the rules.

Since Hospital Waste Management is a perpetual problem, it was felt that there should be an all India Organization/Society comprising of experts/specialists from various disciplines involved in Hospital Waste Management. This Society should provide conceptual guidance and oversee scientific research for further development

With this important aspect in mind, the Registrar of Society at Delhi was approached for registration of the 'Indian Society of Hospital Waste Management (ISHWM)' and the Society came into existence on 10th April 2000 and registered under Societies Registration Act XXI of 1860 with Registration Number 36939.

The aims and objectives of the Society are as follows :

- (a) To promote and advance the knowledge in Environmental Protection with special reference to Hospital Waste management. It also envisages promotion and improvement in public health, protection to the environment, hospital and individual through the practice and education in the subjects dealing with the said subject, in India.
- (b) The subject of Environmental Protection and Hospital Waste Management involves multidisciplinary approach and involves active participation by specialists of various disciplines such as pathology, Microbiology, Hospital Administration, Preventive & Social Medicine. Therefore, it will function to bring together specialists from various disciplines under a roof with a common goal of personal and environmental protection.
- (c) To propagate education and inculcate awareness in hospital environment as well as general population.
- (d) To advance research in various fields connected with Environmental Protection and Hospital Waste Management.
- (e) To function as an interface with Industries involved in designing/manufacture of bio-medical waste disposal equipment/appliances for R&D development India.

To fulfill the and further the above objectives, the Society shall

- (a) Hold periodical meetings, seminars, workshops, training courses and annual conferences of the members of the Society.
- (b) Conduct workshops, training courses etc. separately for the benefit of the beneficiaries such as general public, hospital waste handlers, patient & thier relatives.

- (c) Publish and circulate a journal on Hospital Waste Management and Environmental protection.
- (d) Maintain a Library at the location of the permanent office as and when established.
- (e) Generate funds from all possible sources. The funds so generated will be utilized for research for advancement in the knowledge of disposal of waste and environmental protection. Scholarships and Awards for outstanding contributions will be judged on merit by a special board of officers nominated from time to time.
- (f) Propose to the Government the laws and regulations in respect of disposal of waste from the hospitals and environmental protection.
- (g) Create and assist State-wise branches to propagate the objectives all over the country in a methodical and systematic manner.

#### EMBLEM & LOGO

The Emblem of the Society has been aptly designed to convey the message of environmental protection by confining hazardous hospital waste. The Concept of the Emblem is:-

Hospital Waste Management uses four colours – namely – **Green, Black, Yellow and Red** (coding colours used for bags to collect and dispose off hospital waste).

**Hands:** The two figures over the top and bottom denote the hands in light brown outlined with black to denote the hands, which stand for the control and management of waste.

**Syringe:** The syringe has been used as a symbol to represent hospital waste due to its extensive use in clinical practice.

**Biohazard:** Hospital waste is a serious biohazard; hence the universally accepted logo for biohazard appears in the backdrop.

**Tree & the Blue background:** denote the eco-friendliness, which is very important while disposing of hazardous waste.

**Summary:** The Logo depicts the hospital waste (syringe), which is a biohazard to the community being efficiently managed (by hands) in an environmental friendly (tree and blue background) manner.

**ISHWM:** Indian Society of Hospital Waste Management.

Please visit our website: [medwasteind.org](http://medwasteind.org) for details including membership forms

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## Journal of Indian Society of Hospital Waste Management

1. Journal of Indian Society of Hospital Waste Management publishes original articles, case reports, review articles, editorials, contemporary issues/ agendas book reviews and other related scientific information towards Safe Management of Health Care Waste.
2. Articles are accepted for publication with the understanding that their contents, (all or in part) have not been published and will not be published elsewhere, except in the abstract form or with the consent of the Editor. Journal of Indian Society of Hospital Waste Management does not accept any responsibility for the statements made by the authors. The Editorial Board has the right to introduce such changes in the writeup as may be considered necessary for effectiveness of communication.
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    - (iv) It is also certified that none of the material in this manuscript has been published previously or is currently under consideration for publication elsewhere

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5. PROCESSING : Material received for publication will be acknowledged. The article may be reviewed by referees. When required, one copy of the typescript, suitably modified, will be sent to the principal author for revision and resubmission in duplicate. Accepted articles will be published in their turn. Reprints (at least 10) of each article will be sent free cost to the FIRST author. Articles not accepted for publication will be returned by ORDINARY post.

6. AUTHORSHIP : Should be restricted to persons who have made sufficient contributions to (a) conception and design (b) drafting the article or revising critically (c) final approval of the article to be published. All conditions must be ideally met. The order of authorship should be joint decision of all the co-authors.

7. TYPESCRIPT : The typescript comprises (a) title page (b) abstract and key words (c) text (d) illustrations. All these must start on separate pages and in the above order. Pages should be numbered consecutively beginning with the title page.



- (a) Title page - gives the title of the article. a short title for page heading. type of article (original article, case report etc), name(s) of the author(s), affiliations of author(s), place of work, names and addresses of the authors (including PIN Code and FAX).

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- (b) Abstract and keywords - The abstract is a synopsis of the main article in about 200 words and gives an opportunity to the author to induce the reader to go through the article. It must give the purpose, methods results, and conclusions of the study, giving facts and not descriptions. Speculative surmises, and references to other works on the subject should not be included. Avoid abbreviations. No abstract is required for case reports. Below the abstract give not more than 5 key words using terms from Medical Subject Headings list of Index Medicus.
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- Photographs : Unmounted black and white, glossy (not matt) printers of excellent clarity and contrast should be selected. Their size ideally should be of post card. Do not write anything on the photograph, either on the back or on the front. Do not use pins, staples or even paper clips to put the photographs together. Enclose the photos in thin cards, so that they do not get mutilated. Avoid identifiable, photographs, unless you have obtained the patient's permission to reproduce them ( a copy of which must accompany the article). Coloured photographs are accepted only if inescapable
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#### 8. MISCELLANEOUS :

Use metric measurements -cm, m,g,kg,ml, L, No periods, no plural form (eg. '10 cm' not '10 cms'). 'Significant' should be reserved for use in the statistical sense Avoid names and initials of the patients and dates. Avoid unfamiliar abbreviations, medical jargon and passive voice. Avoid duplication and repetition of material in Results and discussion, in tables and Text and in text and legends.

*All Correspondence to the*

*Journal of Indian Society of Hospital Waste Management to be addressed to:*

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### Hospital Waste or Health Care Waste

A special category of Waste, which requires special precautions while handling. It affects not just the generators of the Waste but also the operators and the general public. A manifest impact of mismanagement of this waste is the alarming incidence of Hospital Acquired Infection (WHO estimates this as 10% in the South East Asia). Safe Management of the Health Care Waste needs a systematic approach. It is not a question of technology but of human behavior and attitude.

### Health Care Waste Management Cell

HCWMC is a group of the concerned citizens of Bangalore towards endeavours of Safe Management of Health Care Waste. Initiated the endeavours towards systems development with the Exploratory study on Waste Management in Bangalore and has prepared the document Information and Learning Units for Safe Management of Health Care Waste — a training package for the different categories of Health Care Personnel for the Department of Environment, Ecology and Forests, Government of Karnataka. The implementing agency for the Malleshwaram Health Care Waste Management Project — community based co-operative practical problem solving endeavour towards Safe Management of Health Care Waste in the defined geographic area of Malleshwaram ward 7 of Bangalore Mahanagara Palike. The learning and the systems are now being adopted at the City level. The process supported by the Urban Waste Expertise Programme of the Government of Netherlands. Technical support for development of Systems within more than 80 institutions in the State and also outside. A member of the Advisory board for the Appropriate Authority for Biomedical Waste in Karnataka.

### Indian Society Of Hospital Waste Management

A registered body of professionals to address the issues and concerns of Hospital waste at the National level. Facilitate / Advocate / Interface for endeavours and undertake research towards concerns of Hospital Waste.