JOURNAL OF THE

Indian Society of Hospital Waste Management

Combined Volume – 13 & 14 Issue – 1
September 2015

For Private Circulation only

JOURNAL OF THE
INDIAN SOCIETY OF HOSPITAL WASTE MANAGEMENT

Volume – 13 & 14 Issue – 01

September 2015

CONTENTS

PRESIDENT'S PAGE

Friends,

The Indian Society of Hospital Waste Management (ISHWM) has been making rapid strides in within and outside the country in the field of health care waste management. It actively partnered with IGNOU in planning and designing the famous Certificate Program in Health Care Waste Management (CHCWM). As you may be aware WHO, SEARO supported the CHCWM in establishing study centers in Bangladesh, Nepal, Mongolia (WPRO), Indonesia and of course India. The capacity building and training is ISHWM's strong forte. Research, consultancy and publications are its regular activities. Emerging new technologies in HCWM are drawing our active attention too. Recently (May 2015), ISHWM was invited by Swiss Green Technologies to Switzerland and Germany to visit a large scale functioning technology that converts tons of plastic waste to large volume of commercial use diesel oil. The Swiss Green Technology subsequently came down to Delhi in August 2015 to hold discussions in this regard. Together with them we may hold discussions with government of India to explore if our country too can benefit from such large volume technology. We regularly come out with ISHWM journal every year. The new journal is released in this ISHWMCON 2015. We have been approached by some reputed international consultancy firms to undertake HCWM activities for some state governments. Further, the WHO SEARO assigned a long term multicentric study "to understand the linkage between hospital associated infections and sound management of health care waste". This study started in September 2013 and will be completed in December 2015. The study is being undertaken in two government hospitals (Delhi and Bangalore).

I am thankful to HCWM Cell, Department of Community Medicine, MS Ramaiah Medical College Bangalore for making efforts to bring out this combined issue 13 and 14 of Journal of ISHWM and appreciate and thank Dr V. Narendranath, Chief Administrator, MS Ramaiah Medical Teaching Hospital, and Bangalore for sponsoring its Publication.

Ashok K Agarwal

Dean – IIHMR

President, ISHWM

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EDITORS PAGE

Dear readers,

Cordial greetings !

Inspite of efforts towards improving health care waste management in Governmental and private sectors, speed with which progress is happening appears to be slow in the country/region. Also, few critical areas remain critical. These include health care waste management at household level, pharmaceutical waste management at household level, need to look at management of mercury and lead in health care settings, health and safety of personnel working in common biomedical waste management facilities. Also, there is need to plan in a large way for management of sanitary pads. Concerted efforts are required to address these issues.

I was participating in 27th Annual Conference of Karnataka Association of Community Health at Yenepoya University at Mangalore recently. I have suggested for inclusion of Biomedical Waste Management in Swach Bharath Abhiyan. I feel this measure will help create awareness about Biomedical Waste Management and develop Citizen's involvement in the same.

Continuation of Journal work is always a challenge. This is combined issue Vol 13 and 14 September 2015. The Journal focuses on learnings from capacity building and training from two experiences: Karnataka and New Delhi. Also, learnings from GEF UNDP endeavor in India and review of HCWM efforts in Western Pacific Region of WHO are adding value to this publication. Short communication on policies on mercury and list of few references on HCWM make the Journal complete.

As always, we seek readers and all ISHWM members to participate actively in contributing to the Journal, serving as reviewers for the Journal and sponsoring its Publication.

I am grateful to all Editorial Advisory Board Members, Members of Editorial Board, my team members at HCWM Cell and Dept. of Community Medicine in MS Ramaiah Medical College for helping me in all facets of Journal activities; Dr V Narendranath, Chief Administrator –MS Ramaiah Medical Teaching Hospital , Bangalore for sponsoring its Publication.

Dr S Pruthvish,

MBBS MD DNB PGDHHM FISHWM FAMS

Honorary Chief Editor, Journal of ISHWM; Chairperson, HCWM Cell; Prof and HOD – Community Medicine,

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As always, I am overwhelmed with the support of our Honourable Chairman Dr. M R Jayaram, Chief Executive Dr. D V Guruprasad IPS (Retd) and Dr Ms. Medha Y Rao, Principal and Dean, M S Ramaiah Medical College and Gokula Education Foundation for the Visuals support.

ORIGINAL ARTICLE

DEMONSTRATING AND PROMOTING BEST TECHNIQUES AND PRACTICES FOR REDUCING HEALTH CARE WASTE TO AVOID ENVIRONMENTAL RELEASES OF DIOXINS AND MERCURY - THE GEF/UNDP PROJECT

Ashok K Agarwal

ABSTRACT

As principal investigator from IGNOU the above study was carried out after a MOU was signed between IGNOU and Ministry of Environment & Forest (MoEF) in December 2009. The goal was to undertake the capacity building and training of health care functionaries at King George Medical College/University (KGMU), Lucknow and Tamil Nadu Pollution Control Board (TNPCB) / 15 HCFs around Chennai. The detailed activity plan is presented and discussed in this paper.

First, activity under the Project was a joint visit to KGMU& TNPCB by the representatives from MoEF, UNDP, Dr. Jorge Emmanual from GEF and PI, IGNOU in July, 2010. Subsequently, the IGNOU component of activities were undertaken. These activities included establishing contacts at TN and KGMU, education and training in health care waste management of nodal officers and other categories, discussions with KGMU and TNPCB on strategic framework and evaluation of master trainers.

*Prof Dr. Ashok K Agarwal, Dean, IIHMR, New Delhi and President Indian Society of Hospital Waste Management (ISHWM)

INTRODUCTION

According to WHO, South East Asia produces over 1000 metric tons of infectious hazardous health care waste every day. Most of this waste is very poorly managed causing major health risks to public health. Only India and Thailand have a health care waste management (HCWM) legislation in place but implementation is poor. Further, the UN Basel Convention has identified health care waste as the second most hazardous waste after radioactive waste. This study was simultaneously carried out in eight countries across the globe. The other stake holders in India were MoEF, KGMU and TNPCB along with 15 health care facilities, GJ Multiclave Chennai and supported by UNDP/GEF.

The study started with a comprehensive baseline survey of the entire hospital under the KGMU, TNPCB and 15 HCFs in Tamil Nadu. It revealed that the existing scenario of health care waste management is rather poor, more particularly at KGMU. Some of the major deficiencies were in terms of poor segregation of HCW at the point of generation, shortage of color coded bins, liners, needle cutters, other consumables, lack of knowledge, awareness and skills among various categories of hospital staff and poor budgetary allocations to health care waste management. The baseline survey also included the GJ Multiclave a central treatment facility (CTF) at Chennai and the CTF under the UPPCB at Ayodhya. The CTF Ayodhya was however not part of the project.

This paper limits itself to the IGNOU component i.e. training, capacity building and related activities.

Findings

The activities under the IGNOU component spread over 2012-2012 are shown below.

I. IGNOU COMPONENT

Training Work

	2010						2011												2012		
Activity	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
➢ **6-month certification**																					
Establish contacts at TN and UP																					
Set up program study centers at TN and UP																					
One-day orientation program for academic counselors (TN & UP)																					
Registration of candidates for IGNOU certificate course (CHCWM)																					
Teleconferencing / Radio counseling																					
➢ **Waste handlers training and module**																					
Translation of waste																					

handlers module to Tamil (Hindi completed) and providing the modules to the master trainers and IGNOU-trained personnel	
Training of waste workers (award certificates of attendance) by master trainers at their respective facilities	
➢ **1-day training course for CTF personnel on waste management/use of different treatment approach**	
Discussions with GPT, UIC, and M. Rathi on content for training of CTF personnel	
Two 1-day trainings of GJ Multiclave operators during the TOT programs with the health care professionals	
➢ **Review of existing course material (addition of mercury, patient safety, etc.)**	
Review/ Updation/ enhancement of the IGNOU course material as well as sharing the same with GPT	
Final editing	
Printing of new modules (acknowledgement of UNDP GEF)	
➢ **Training of Trainers (TOT)**	
Discussion with TNPCB, UPPCB, KGMC on the strategic framework for the TOT (target audience, number of trainees, number of days, plan, sustainability, etc.)	
Identification of the master trainers	
Design of 2 to 3 day TOT program and development of PowerPoint presentations and handouts	
Conduct TOTs (2 in	

KGMC, 2 in TN)																					
Training workshops by the master trainers from the TOT and IGNOU program provided to their respective HCF staff																					
Evaluation of master trainers																					
Monitoring and evaluation of selected master trainings by UIC (Prof. Nickels)																					
Report of Prof. Nickels with recommendations																					
➢ **Promotion of training**																					
Advise TNPCB, UPPCB, and KGMC as needed on a strategic framework for institutionalizing training by TNPCB (integration of TOT, 6-month certification, training workshops, dissemination of information about training programs through various channels, etc.)																					
Request medical and nursing council to incorporate HCWM into their undergraduate and post-graduate curricula																					
Advice to MoEF, IMA, accreditation bodies and other relevant institutions on national standardization of HCWM training and certification																					

Activity wise brief findings are presented below. With the permission of the competent authority at IGNOU, a core group of experts was constituted. This core group had representations from Central Pollution Control Board (CPCB), MoEF, UNDP, Directorate of Health Services, Govt. of Delhi and the PI.

1. **Establish contacts at TN and UP**
   An initial familiarization visit to TNPCB along with select HCFs at Chennai and KGMU was undertaken in July 2010. This was a high level joint visit comprising of members from MoEF, UNDP, Mr Jorge Emmanual of GEF and IGNOU. Fruitful brainstorming exercise took place during these visits. At Chennai the meeting was chaired by the Chairman TNPCB. Immediate go ahead/approvals were given for further course of action including process for purchase of equipments for GJ Multiclave. The dates for the first two day training of trainers (TOT)for the nodal officers from 15 HCFs, GJ Multiclave and TNPCB officials was finalized. Similarly, the meeting at KGMU was chaired by the Vice Chancellor. The dates for the first TOT was fixed for the KGMU too. During these meetings the principal investigator IGNOU introduced the Certificate in Health Care Waste Management (CHCWM) programme of IGNOU. This is a six month duration programme through open and distance learning developed in collaboration with WHO SEARO for the South East Asian countries.
   After returning to Delhi a round table was held at the MoEF. The Ministry initiated actions to release the funds to different stake holders. The UNDP subsequently released the funds.
2. **Set up program study centers (PSC) at TNPCB and KGMU(UP)**
   As per IGNOU procedure the PSC was established both at TNPCB and KGMU. The program in charge (PIC) and academic counselors were identified and duly appointed by the respective regional directors of IGNOU.
3. **One-day orientation program for academic counselors(TN & UP)**
   The PICs and academic counselors of both the PSCs were given a one day orientation programme about the methodology of teaching and training of the prospective CHCWM learners. A 6 day contact program is an integral part of this course. The ICHCWM course material comprising of 8 Blocks, programme guide, academic counselors manual and project guide were provided to them in advance. This entire course material (SIM) has been vetted by WHO HQ and bears its logo along with IGNOU logo.
4. **Registration of candidates for IGNOU certificate course (CHCWM)**
   There was a very encouraging response from both the TNPCB/15 HCFs and KGMU for enrolment under the CHCWM. In the first cohort 23 nodal officers/staff from KGMU and 35 from TNPCB enrolled for the CHCWM course. All the enrolled/registered learners were provided the IGNOU course material of this course/program.
5. **Teleconferencing / Radio counseling**
   The PI facilitated periodic teleconference and Gyan Vani radio counseling to the enrolled learners from the EMPC studios of IGNOU. This provided virtual class room interaction to the learners simultaneously with the experts. The learners found it to be very useful.
6. **Translation of waste handlers module to Tamil and providing the modules to the master trainers and IGNOU-trained personnel**
   The Waste Handlers Manual is one of the eight Blocks of the course material, meant for the training of waste handlers. As these waste handlers are poorly literate, it was decided to translate it in Tamil language for the 15 HCFs at TN (the English and Hindi versions already available).
7. **Training of waste workers and award certificates of attendance by master trainers at their respective facilities**
   The master trainers who had undergone the TOTs provided the training to waste handlers at both the places. The certificate of training were also issued to the waste handlers. The waste handlers found the module and the training very useful and interesting. They ask many question during the course of the training.

8. **One day training course for CTF personnel on waste management/use of different treatment approach**A one day training of the CTF staff was carried out at the site. The GJ Multiclave (CTF) staff were also found to be keen learners. The training contents were finalized in consultation with Global Project Team (GPT), UIC, and Dr Megha Rathi.

9. **Review of existing course material (addition of mercury, patient safety, etc.)**It was decided by core group that the IGNOU course material should be supplemented with additional units on mercury hazards as well as the patient's safety issues. Accordingly additional units were written and edited by experts.

10. **Review/ Updating/ enhancement of the IGNOU course material as well as sharing the same with global project team (GPT)**The revised and updated course material was shared with GPT.

11. Training of Trainers (TOT)

Two TOT programs of two day duration each were organized for the Nodal Officers of KGMU and TN. In addition to these TOTs programs one day work shop on mercury hazards were also organized. All these training programs and mercury work shops were very well attended and appreciated.

These trainings were planned and organized after discussion with TNPCB, UPPCB, KGMC on the strategic framework for the TOT (target audience, number of trainees, number of days, plan and sustainability).

12. Evaluation of master trainers

After the TOT programs the master trainers were periodically training to others colleagues in there hospitals. A midterm evaluation of the master trainers was carried outs by administering a pre structured questionnaire. The knowledge and the skills of the master trainers were found to be very satisfactory. In addition to the master trainers the junior residents and post graduate medical students were also provided training at the KGMU.

13. Monitoring and evaluation of selected master trainings by UIC (Prof. Nickels)

Prof. Nickels from GEF also carried out his independent monitoring and evaluation of the master trainers.

14. **Advise TNPCB, UPPCB, and KGMU as needed on a strategic framework for institutionalizing training by TNPCB (integration of TOT, 6-month certification, training workshops, dissemination of information about training programs through various channels, etc.)**

Both the KGMU and TNPCB including the 15 HCFs agreed that the training and capacity building efforts should continue to improve the overall Health Care Waste Management activities as an ongoing strategy. The efforts will also be made to request the MCI and the Indian Nursing Council (INC) to include HCWM in their respective curricula. In fact the INC has already done so.

15. Advice to MoEF, IMA, accreditation bodies and other relevant institutions on national standardization of HCWM training and certification

The MoEF being a key stake holder in this study, was convinced on the need for standardization of HCWM training and certification. The IGNOU's CHCWM program is

one important step in this direction. The Indian accrediting bodies like NABH have included HCWM in its Standards and Objective Elements.

Before the closing of the project in October 2012 following major activities were completed.

- Development of Course material on Patient Safety & Infection Control
- Printing of two Blocks (CTF, Mercury, Dental Waste, Patient Safety and Infection Control)
- Printing of Waste Handlers Manual in Tamil
- Training programme for the staff of Common Treatment Facility, GJ Multi Clave (TNPCB), Chennai.
- Four Core Group Meetings of the Core Group Member
- Two day training programme for Masters Trainers/ Nodal Officers at Lucknow and Chennai
- Registration/Payment of the Programme fee of learners for the IGNOU's CHCWM programme at TNPCB, Chennai and KGMU/CSSMU, Lucknow
- Evaluation of Master Trainers/ Nodal Officers at CSMMU Lucknow and TNPCB.

CONCLUSIONS

The baseline survey showed large gaps in overall management of health care waste, more so, at KGMU. There were large gaps in knowledge and skills too. The IGNOU component focused mainly on capacity building. A concerted effort in this direction in terms of TOTs, enrolment in IGNOU's six month CHCWM certification program at Tami Nadu and KGMU, mercury hazards Workshops at Chennai and KGMU Lucknow, discussions and orientation of the staff of GJ Multiclave (CTF) Chennai proved to be very successful in raising not only the knowledge and skills of the nodal officers, nurses, faculty and other staff but also considerably improved the overall management of HCW. The midterm evaluation by the PI and an external USA university professor were undertaken to asses these skills. The evaluation revealed major improvement in the knowledge and skills vis a vis the baseline survey. The evaluation also highlighted certain weaknesses and gave a way forward for the future sustainability.

ORIGINAL ARTICLE

"IMPACT OF TRAINING ON AWARENESS AND PRACTICES RELATED TO BIO-MEDICAL WASTE MANAGEMENT AMONGST HOSPITAL STAFF AN A TERTIARY CARE TEACHING HOSPITAL, DELHI"

Dr Sumi Nandwani[1], Dr Sanjay Singhal[1], Dr Nidhi Malik[1], Mrs Sushila Devi[2]

ABSTRACT

PURPOSE: To assess the impact of training on awareness and practices related to Bio-Medical Waste Management amongst hospital staff. **METHOD:** A cross -sectional study over a period of one year i.e. 2013 to 2014 was done in a tertiary care 600 bedded teaching hospital in Delhi, India. The study group included a total of 160 Health Care Workers: 40 Nursing Staff, 40 Doctors, 40 Technicians and 40 Paramedical Staff. A questionnaire survey was conducted in the study group and the correct responses were graded as satisfactory (more than 80%), intermediate (50–80%) and unsatisfactory (less than 50%).Various trainings, including Audiovisual presentations and Hands on Training for Bio-Medical Waste Management were conducted in batches over a period of one year. The pre and post training responses were compared and analysed. The results were stastically evaluated using a paired t test with p value < .05 as significant.

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Results: A total of 160 Questionnaires were distributed to all Health Care Workers of which 110 were received back and evaluated. Pre training Questionnaire Evaluation revealed a marked lack of knowledge amongst all levels of Staff especially those with experience less than five years .Major lacunae were noted in areas of Waste Categorisation, Disposal, Segregation, and associated risks. Training had a significant impact (p values .000 to .045) with improvement in knowledge in these areas. **Conclusion**: Training all levels of Health Care Staff is urgently needed and can significantly impact the level of awareness related to Bio -Medical Waste Management.

Key words: Impact, Training, BioMedical Waste Management, Awareness, Practices, HealthCare Workers.

INTRODUCTION

"Bio-medical waste" (BMW) means any waste, which is generated during the diagnosis, treatment or immunisation of human beings or animals or in research activities pertaining thereto or in the production or testing of biologicals, and including categories mentioned in Schedule I of Biomedical Waste (management and handling) Rules, 1998.[(1)]Healthcare waste is defined as the total waste stream from a healthcare facility (HCF).About 75% to 90% of this is non-hazardous "general waste", the remaining 15 to 20% is considered as hazardous, that may be infectious, toxic or radioactive.[(2)]High-income countries generate on average up to 0.5 kg of hazardous waste per bed per day; while low-income countries generate on average 0.2 kg of hazardous waste per hospital bed per day.[(3)]In India there are approximately 1,68,869 no. of HCFs and generating about 484 tons/day of BMW and Delhi is having 3,999 no. of HCFs, generating approximately 13,351 kg/day of BMW as reported in the year 2013.[(4)]At the global level, 18 to 64 per cent HCFs are reported to have unsatisfactory Bio-Medical Waste Management (BMWM) facilities; predictors include lack of awareness, insufficient resources and poor disposal mechanisms[(5)]

Keeping this in view, the Ministry of Environment and Forests, India notified the "Biomedical Waste (management and handling) Rules, 1998" in July 1998.[(6)]The management of the BMW is an ongoing process and cannot be completed by mere instruction rather need training of the stake holder. Training of the staff is the hospital occupier's responsibility.[(7)]

With this background, the above study was carried out as a part of ongoing training programme intended for increasing the awareness about BMWM among hospital staff in a tertiary care, post-graduate teaching and research hospital in Delhi, India. The study was carried out with the following Objectives:

1. To determine the level of awareness regarding BMWM among health care workers in a hospital and identify the areas of deficit.

2. To study the impact of training on knowledge related to BMWM.

MATERIALS AND METHODS

A cross -sectional study over a period of one year i.e. 2013 to 2014was done in a tertiary care 600 bedded multi-disciplinary post graduate teaching and research hospital in Delhi, India. The study group included a total of 160 Health Care Workers (HCW) : 40 Doctors 40 Nursing Staff, 40 Technicians and 40 Other Paramedical staff (O). Doctors(D) comprised of Interns, Post-Graduate Students, Senior and Junior Residents, Medical Officers, Specialists, Consultants and Faculty members. Nurses(N), comprised of Nursing Supervisors and Staff

Nurses. Technicians(T),comprised of Laboratory, O.T. and ECG technicians. The Other paramedical staff comprised of Nursing Orderlies, Radiographers and House keeping Staff.

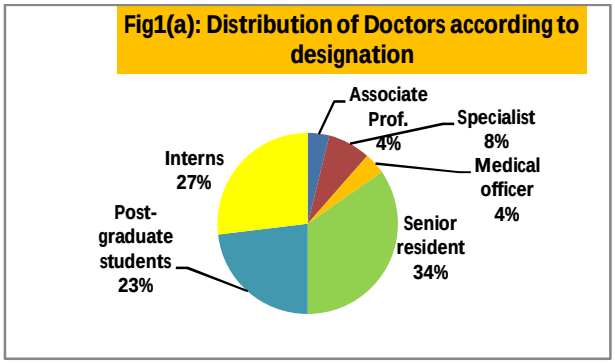
Indirect interview type of study was conducted through self-distributed pre-tested semi-structured questionnaires. Each questionnaire was composed of two sections. Section A related demographic profile which included department, designation and total period of work experience and Section B on awareness and practices related to BMWM among the HCWs. Each correct answer scored one mark. A self made grading system was prepared to categorize the overall response of the participants as satisfactory (more than 80%), intermediate (50–80%) and unsatisfactory (less than 50%) depending on percentage of correct responses .

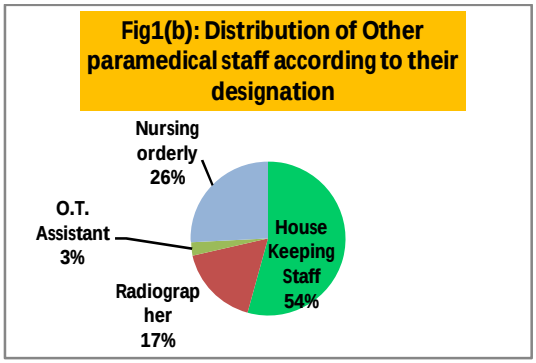
Various trainings, including Audiovisual presentations and Hands on Training for BMWM of two hours each were conducted for all levels of HCWs in batches over a study period of one year.

The pre and post training (after one week) responses in questionnaires were compared and analysed. A null hypothesis assuming that there is no impact of training on awareness about BMWM was statistically tested .The results were stastically evaluated by comparing the pre and post test percentages using a two tailed paired t test taking p value $< .05$ as significant using a Stats Calculator.

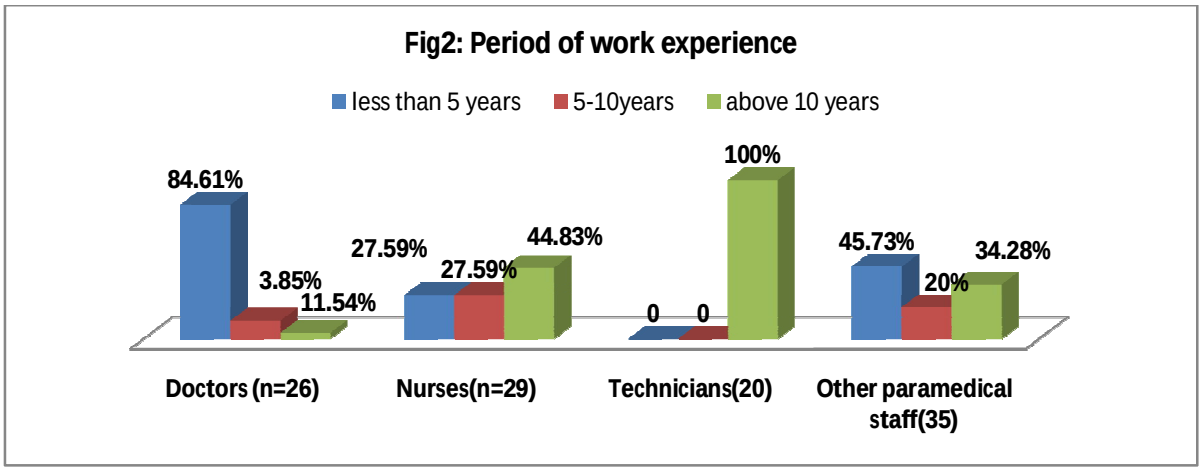
RESULTS

A total 160 pre-tested questionnaires were distributed, out of which 110 (68.75%) were received back and evaluated. The 110 respondents comprised of: doctors 26 (23.64%), nurses 29 (26.36%), technicians 20 (18.18%) and other paramedical staff 35 (31.82%) as shown in Figures 1(a) and (b).

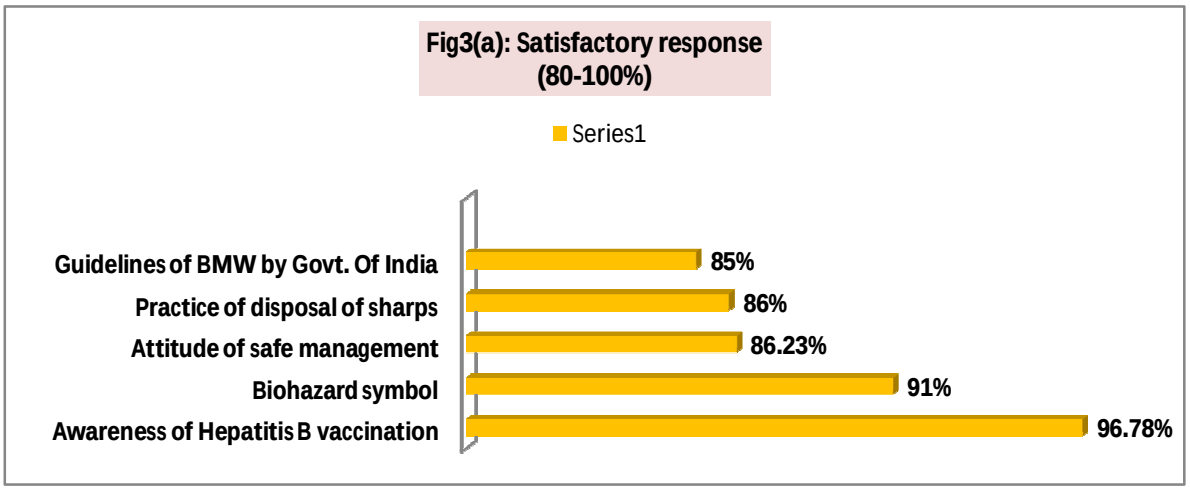


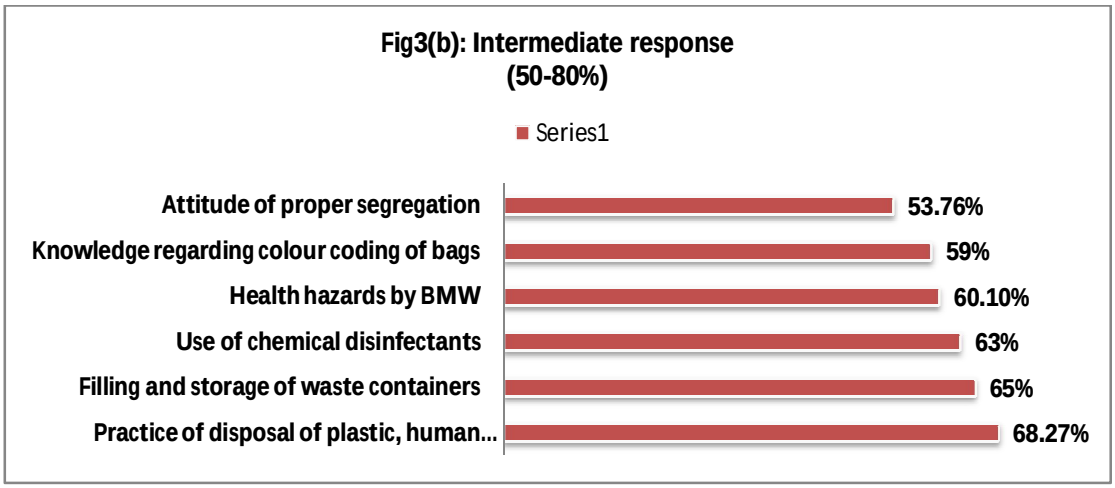


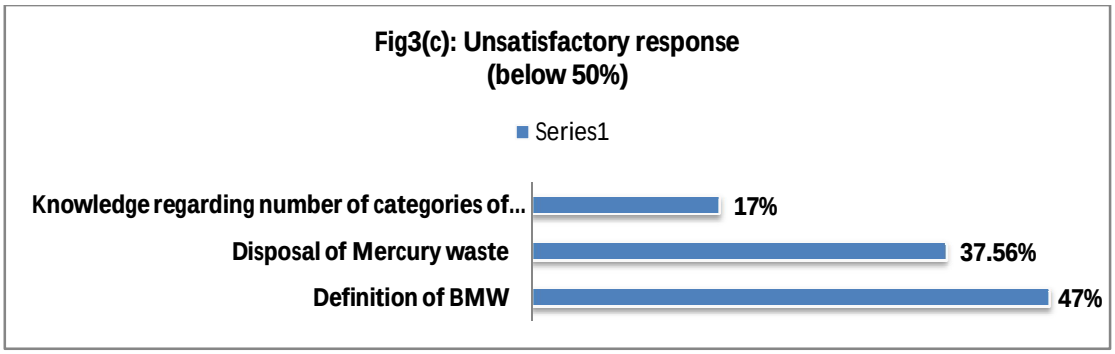
Distribution of period of work experience among the health care workers is given in Figure 2.



Overall response was graded as satisfactory (above 80%), intermediate (in between 50-80%) and unsatisfactory (below 50%) as shown in Fig 3 (a), (b) and (c).







The Pre Test and Post Test Responses (percentages of Correct responses) for all groups of health care workers in various areas of BMWM were compared and the p value calculated as shown in Table 1(a) (b) and (c)

Table No. 1(a): Evaluation of Knowledge related to BMW(% of Correct Responses)

	BWM policy				Definition of BMW				%of BMW				Number of categories of BMW				Health hazards due to improper waste disposal			
	Pre T	Post T	T stats	P value	Pre T	Post T	T stats	P value	Pre T	Post T	T stats	P value	Pre T	Post T	T stats	P value	Pre T	Post T	T stats	P value
D (26)	73	88.4	0.623	0.539	55.76	88.4	1.440	0.162	**26.92**	92.3	3.812	**.0008**	**50**	96.15	2.106	**.045**	63.46	88.4	1.054	.302
N (29)	96.55	100	.132	.895	55.17	89.6	1.608	0.119	**24.14**	96.6	4.724	**.0001**	**0**	86.2	13.29	**0.00**	57	82.7	1.20	0.240
T (20)	90	95	.165	.871	**37.50**	90	2.349	**.029**	**15**	85	4.384	**.0003**	**0**	95	18.90	**.000**	60	85	.949	.354
O (35)	88.57	91.4	0.125	.901	40	77.1	2.159	.380	**17.14**	85.7	5.428	**0.000**	**17.14**	82.8	5.153	**0.000**	60	94.3	1.700	0.983

Table No. 1(b) : Evaluation of Knowledge related to BMW(% of Correct Responses)

	Risk of HIV infection by needle prick				Biohazard symbol				Hepatitis B vaccine				Segregation				Safe management			
	Pre T	Post T	T stats	P value	Pre T	Post T	T stats	P value	Pre T	Post T	T stats	P value	Pre T	Post T	T stats	P value	Pre T	Post T	T stats	P value
D (26)	**34.62**	92.3	3.039	**.0055**	80.77	100	0.736	.468	100	100	0.0	1.0	57.70	88.4	1.339	.1926	88.46	96.15	0.289	.774
N (29)	**37.93**	89.6	2.771	**.009**	86.20	93.1	0.278	.783	90	96.6	0.260	.796	**34.48**	93.1	3.270	**.0029**	79.31	89.6	.428	.671
T (20)	**25**	80	2.845	**.0104**	100	100	0.0	1.0	100	100	0.0	1.0	80	95	.510	.615	80	90	.344	.734
O (35)	**37.14**	82.8	2.714	**.0104**	97.14	97.14	0.00	1.0	97.14	100	0.00	1.00	42.86	97.2	3.058	0.004	97.14	100	0.00	1.00

Table No. 1(c) Evaluation of Knowledge related to Practices of BMW

(% of Correct Responses)

	Disposal of various categories of wastes				Disposal of sharps				Disposal of colour coding of the bags				Filling and storage of waste containers				Chemical disinfectant				Disposal of mercury waste			
	Pre T	Post T	T stats	P value	Pre T	Post T	T stats	P value	Pre T	Post T	T stats	P value	Pre T	Post T	T stats	P value	Pre T	Post T	T stats	P value	Pre T	Post T	T stats	P value
D (26)	79.80	88.4	0.339	.737	96.15	100	0.137	.892	57.70	96.15	1.663	.108	65.38	88.4	0.963	0.345	**44.23**	92.3	2.301	**.03**	**46.15**	88.4	1.994	**.057**
N (29)	71.55	93.1	.920	.365	89.65	96.6	.277	.784	62.10	93.1	1.384	.177	72.41	89.6	.734	.469	79.31	89.6	.428	.672	51.72	86.2	1.654	.109
T (20)	60	90	1.130	.273	80	100	.674	.508	52.50	90	1.48	.155	65	100	1.266	.220	62.50	90	1.022	.319	**25**	85	3.199	**.0056**
O (35)	61.72	94.3	1.6	.119	77.14	97.2	0.911	.369	65.72	91.4	1.24	.224	57.14	88.5	1.59	.121	67.14	85.7	.898	.375	**28.57**	85.7	3.741	**.0007**

DISCUSSION

In this study, during pre-training evaluation major lacunae were observed in awareness amongst HCWs in certain areas of BMWM especially regarding Definition(47%) and Categorization(17%) of BMW, disposal of Mercury waste(37.56%) ,about risks like HIV infections associated with improper Sharp disposal (25% - 37.14%) and attitude towards segregation of waste (53.76%).These are similar to that in other studies by Narang RS et al, Mathew SS et al and Madhukumar S et al .[8,9,10]

Although overall response regarding the guidelines laid down by Government of India for BMWM was satisfactory (85%), the response of nurses (96.55%), technicians (90%) and other paramedical staff (88.57%) was better than that of doctors(73%). This is in contrast with other studies where auxiliary staff was less aware (12.5%, 71.4%) compared to doctors (100%,85.4%)about the waste management guidelines. [8,9] This may be because in our study majority of the doctors enrolled (86.61%) had work experience less than 5 years and 27% were interns who had graduated outside India and may not have been aware of Govt. of India guidelines. [Fig2; Fig1(a)]

Awareness regarding vaccination of Hepatitis B(96.78%) and biohazard symbol (91%) was satisfactory, which is similar to another study from Bangalore (86.2%).[10] In our study, knowledge about Bio Hazard Symbol was least amongst doctors (80.77%)which is similar to the finding of another study in Ludhiana(79.2%).[9]

Awareness regarding number of categories of biomedical waste was highly unsatisfactory, (only 17%)which is similar (3.13 %) to that of a study done in a tertiary care hospital, Bangalore.[10]The possible reason was that most of the HCWs were aware of only those categories of wastes that are generated in the hospital. However, in our study the awareness about this was least amongst Technicians and nurses (0%) which is dissimilar to the findings

of certain other studies in which it was maximum among paramedical staff (62.5% ,100%) .[9,10]

Awareness regarding health hazards related to improper disposal of bio-medical waste was intermediate, 60.10%(63.46% amongst doctors)in our study which is in contrast to findings of another study in a Dental Care facility(100% amongst dentists).[8]

In this study, overall awareness about proper disposal of BMW was intermediate(68.27%) and that of sharps was satisfactory, (86%). It was the highest amongst doctors(79.8% and 96.15%)followed by nurses (71.55% and 89.65%).This is similar to another study, where it was more amongst dentists (85%) than among stauxiliaries(55%).[8]However, other studies by Mathew Ss et al and Saini S et al have found this awareness to be more among the nurses(100%)than doctors which is in contrast to ours.[9,11]

Awareness regarding segregation at the site of generation of waste was intermediate (53.76%). Very few doctors had a positive attitude(only 57.7%) towards segregation of waste in contrast to studies done in a private hospitals by Nandwani S and Selvaraj K et al where there was an overwhelming response (82%,98%).[12,13]In our study nurses also had a poor attitude(34.48%), which is dissimilar to a study by Shafee M et al where nurses had a positive attitude(99.5%)towards segregation of waste.[14]

In this study, **Training** had a marked and significant impact leading to improvement in areas of Knowledge deficit like awareness about Categorization of Waste(p value 0.000 to .045), Percentage of BMW as of Total Hospital Waste(p value 0.000 to 0.0008), risk of HIV infection by improper sharp disposal(p value 0.009 to 0.0104), segregation(p value.0029:N), Chemical disinfection (p value.03:D) and Disposal of Mercury Waste(p value 0.0007 to 0.057).Similar effectiveness of Training has also been reported in similar studies by Ramamohan et al, Basarkar .S, Srivastava DK et al and Devamani TSD et al. [15, 16, 17,18]

CONCLUSION

This study reveals that there were lacunae in awareness about major areas of Bio Medical waste Management amongst all levels of Health Care Workers in the Hospital. Training in Biomedical waste management has a significant role to improvise the same and should done as a continual and regular process followed by periodic evaluation to be effective. The Hospital administration should support and encourage such training programmes to tackle the problem of Improper Hospital waste Management actively.

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ORIGINAL ARTICLE

REVIEW ON THE STATUS OF HEALTHCARE WASTE MANAGEMENT IN SELECTED COUNTRIES OF THE WESTERN PACIFIC REGION

Guilberto Borongan[1], Debbie Siru[2], Mohd Nasir Hassan[3]

ABSTRACT

Introduction: Health Care Waste (HCW) generated by healthcare facilities includes both non-hazardous (75% - 90%) and hazardous (10%–25%) waste. Although non-hazardous waste HCW may not pose significant risk, hazardous HCW may pose health risks. Poor management of HCW exposes health care workers, waste handlers and the community to infections, toxic effects and injuries. Sound management of HCW is crucial for environmental health protection including establishment of national policies, guidelines and action plans. This paper describes the status of healthcare waste management in several countries in the Western Pacific Region. **Materials and methods:** A survey was carried out in 24 of the 37 countries and areas in the Region. **Results:** The results from the survey were supplemented by other sources including review of literatures and internet searches, telephone interviews and email correspondence. Some of the best practices on HCW in these countries are also described. **Recommendations:** Recommendations from the study include strategic directions, possible actions and tools that can promote HCW management in countries of the Western Pacific Region. Governments, international organizations and other stakeholders can synergize their respective knowledge and expertise in the implementation of these strategies and actions.

Keywords: Healthcare waste, policy, Western Pacific Region

INTRODUCTION

Provisions of health-care services lead to the generation of waste. Health Care Waste (HCW) is defined as the total waste stream from a health-care facility, which includes non-hazardous or general waste (waste that does not pose any particular biological, chemical, radioactive or physical hazard) and hazardous HCW, such as sharps, non-sharps, blood, body parts, chemicals, pharmaceuticals, medical devices and radioactive materials. Different types of healthcare facilities can be viewed as major or minor sources waste, according to the quantities produced. Examples of major sources are hospitals and other healthcare facilities, related laboratories and research centres, blood banks and blood collection services and nursing homes. Minor sources include small healthcare establishments (such as dental clinics, first-aid posts and sick bays), specialized health-care establishments and institutions with low waste generation (disabled persons' institutions) and home treatment.

Figure 1 shows that usually 75% to 90% of the waste produced by health-care providers constitutes domestic or non-hazardous or general health-care waste. It comes mostly from the

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administrative, kitchen and housekeeping functions at health-care facilities, also including packaging waste and waste generated during maintenance of health-care facilities.

The remaining 10% to 25% of HCW is regarded as "hazardous" and may pose a variety of environmental and health risks[4].Poor management of HCW exposes health-care workers, waste handlers and the community to infections, toxic effects and injuries. Thus, sound management of HCW is crucial for environmental health protection.

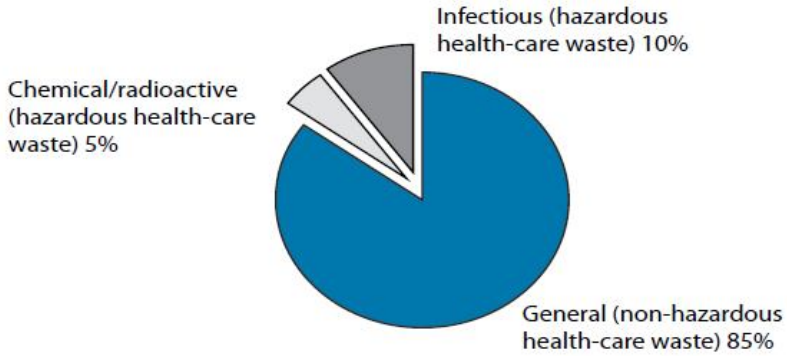

Figure 1. Typical waste compositions in health-care facilities[5]

On 25 September 2012, WHO carried out a survey to identify the current status of HCWM in 24 of the 37 countries and areas in the Western Pacific Region. The countries covered in the survey includeAustralia, Brunei Darussalam, Cambodia, China, Fiji, Japan, Kiribati, the Republic of Korea, the Lao People's Democratic Republic, Malaysia, the Marshall Islands, the Federated States of Micronesia, Mongolia, Nauru, New Zealand, Palau, Papua New Guinea, the Philippines, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu and Viet Nam. The survey involved an invitation for all countries to respond to an internet-based questionnaire and the response was 118 people from 20 countries participated in survey. The results from the survey was supplemented by other sources including review of literatures and internet searches, telephone interviews and email correspondence

METHODOLOGY

The survey was carried using two approaches in parallel, namely, a literature search and review and a survey questionnaire[6]. The literature search and review was carried out via multiple means, including but not limited to internet searches, telephone interviews and email correspondence. The survey questionnaire was conducted through a commercially available online survey tool (surveymonkey.com). Selected countries were informed about the survey and were requested to provide a list of potential participants who have the essential knowledge of the status of HCWM in their respective countries. Once the contact details of

[4]*Safe management of wastes from health-care activities – Second edition, WHO Blue Book (2013)*

[5]*Safe management of wastes from health-care activities- Second edition. WHO*

[6]*The survey questionnaire was developed by WHO to analyse the implementation status of HCW in different regions of the world. It is planned that country information will be published on the website, http://www.healthcare-waste.org/ to provide a global overview of the status of HCWM*

the nominated participants were received, they were contacted individually and a country-specific network was provided. As the IP addresses of the participants were registered, it was ensured that each participant would only fill the questionnaire out once. Three reminders were sent to participants who did not respond to the survey. Language problems in some countries were resolved with the support of local WHO staff members who assisted in translating the questionnaire. The lack of internet access in several countries was resolved by sending a scanned copy of the questionnaire to the countries, who then entered the answers into the online survey tool.

Using results of the online survey, the assessment of the status of HCW management in each country was carried out and classified into five areas, namely: Management; Training; Policy and regulatory framework; Technologies implemented; and Financial resources. For each of these assessment areas, a score of 1 (insufficient) to 5 (excellent) was assigned, based on criteria as shown in Table 1.

Table 1. Criteria for scoring of HCWM status in countries

Management		Training	
Score	**Criteria**	**Score**	**Criteria**
1	No specific waste management system exists.	1	No training is provided.
2	Some aspects of a waste management system exist with some segregation of the waste.	2	Basic HCWM training is provided but mainly by development organizations.
3	A waste management system has been introduced, waste is segregated in different waste streams and is safely collected.	3	Training is provided by the government or appointed contractors/consultants from time to time.
4	A comprehensive waste management system has been introduced that includes waste reduction and recycling aspects. Responsibilities are clear and the system is regularly monitored and supervised by the concerned authorities.	4	Health-care waste training is regularly offered and different training levels from basic to advanced and comprehensive training exists.
5	The waste management system is fully integrated in the management system of the health-care facility and the concerned authorities, efforts to avoid waste generation are taken, and specific waste management plans and advanced monitoring and certification systems exist.	5	A mandatory training system on HCW exists for waste generators and handlers. The system supports lifelong learning.

Policy & regulatory framework		Technologies implemented	
Score	**Criteria**	**Score**	**Criteria**
1	A policy and regulatory framework does not exist.	1	No or only simple treatment and limited logistic equipment is available and used.
2	HCW is partly covered by other regulations and policies.	2	Basic treatment equipment is available but not always operational and does not fulfil international standards.
3	HCW is covered by other regulations and some legal documents specifically addressing HCW.	3	More advanced treatment equipment is available but does not fulfil international standards in all aspects.
4	A regulatory framework for HCW exists, but policies, strategies, or action plans are not available.	4	Advanced treatment equipment is available which follows international standards but does not fulfil all best available techniques (BAT) aspects.
5	Full policy and regulatory framework for HCW exists, including policy, law, guidelines, strategies and implementation plans.	5	BAT for logistic and treatment equipment is available, well maintained and regularly tested by independent institutions.

Financial resources	
Score	**Criteria**
1	Nearly no financial resources exist.
2	Some financial resources exist for consumables, but mainly depending on donor organizations.
3	A budget for HCW exists, but mainly at central level.
4	Regular budget is available based on the “polluter-pays” principle.
5	Regular budget for HCW exists at facility level, based on a full cost analysis.

For the assessment of the legal and administrative framework, the following definitions are used in this study:

a. Health-care Waste Law: A law or set of laws at national level that addresses HCWM issues.
b. Health-care Waste Policy: An official document that states the goals to be achieved.
c. Health-care Waste Strategy: An official document that lists the steps that must be taken to achieve the objectives contained in the policy document.
d. National Action Plan (NAP) on Health-care Waste: Document that can be seen as a time-driven scheme defining who does what, when, how and at what cost.
e. Health-care Waste Guide: Practical oriented document(s) that lists responsibilities and duties of staff; segregation, handling, storage and transport procedures; colour coding, etc.
f. Health-care Waste National Steering Committee (NSC): A group of people that coordinate the implementation of the NAP according to the policy and strategy adopted.

LIMITATION OF THE STUDY:

As not all countries responded to the online survey, there are several gaps in information limiting the scope of the study. In addition, information on HCWM for many countries was not readily available either via the Internet or in print, while in some cases the information was out of date. The results presented in this paper may have some gaps of information. Hence, where information is not available, we left it blank. Hence, we also hope that the results of this study would trigger interest from countries to update data and information for a more comprehensive and updated version in the future.

RESULTS

Terms Used by countries for healthcare waste

Most countries covered by the survey normally refer HCW as hospital waste or medical waste. Although medical waste is usually confined to infectious waste, pathological waste and sharps waste; in several countries it also included other hazardous waste categories, such as pharmaceutical waste, chemical waste and radioactive waste.

HCW GENERATION

Identifying the types and quantities of waste produced in a health-care facility is a crucial initial step in safe management of HCW. Waste-generation data may beused to estimate the required capacities for containers, storage areas, and transportation and treatment technologies, as well as to establish baseline data on rates of production in different medical areas and for procurement, specifications, planning, budgeting, and calculating revenues from recycling, optimization of waste-management systems and environmental impact assessments.

In **Cambodia**, the capital city, Phnom Penh, generates large volumes of medical waste compared to the other cities and provinces. A survey in 2003 reported that Phnom Penh generated 342.54 kg/day of HCW from hospitals, polyclinics, clinics, and health care centers[7]. In **China**, a clear definition and categories of HCW have been established; however,

[7] *According to a 2003 Cambodia Environment Association survey supported by the Japan International Cooperation Agency*

its main composition varies in different regions. Fig. 2 shows the composition of HCW of Dongguan City, China.In **Japan**, infectious wastes generated from facilities such as hospitals (20 or more beds), clinics (19 or fewer beds), clinic laboratories, nursing homes, midwifery homes, veterinarians and laboratories (medical, dental, pharmacology, and veterinary medicine)are regulated by the law. HCW generation amounted to 285 000 tons for infectious waste and 945 000 tons for non-infectious waste as of November 2003.

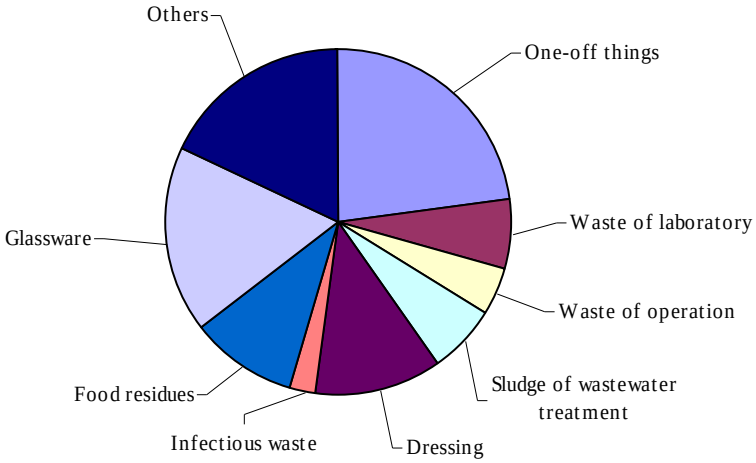

Figure 2. Composition of HCW in Dongguan City, China[8]

The **Republic of Korea** has generated 82,633 tons of HCW in 2007, and since then the amount per year has been increasing. The Waste Management Act specifies 16 HCW generators, with the main sources of HCW being hospitals and clinics. As of December 2007, there were 316 general hospitals and 50 123 clinics. Other generators of HCW include public health-care centres [2962], veterinary clinics [2757], research institutes for medicine and pharmacy and similar institutions [1679]. HCW generators in the Republic of Korea has a total of 57 837.In **Mongolia**a total of 2324 facilities provided health-care services in 2005, of which 24.5% were primary health-care facilities, 1.5% secondary-level health-care facilities, 0.9% tertiary-level health-care facilities, and 29.4% were out-patient and in-patient private hospitals. In the health-care facilities in Ulaanbaatar, the percentage of medical waste in the total waste stream was comparatively high (ranging between 12.5% and 69.3%) depending on the type of health-care facility, which indicated poor waste segregation and minimization practices. Projections of treatment per year, the health-care facilities in Ulaanbaatar produced about 781 kg of medical wastes and 1874 kg of general wastes, for a total generation rate of 2655 kg per day.

Figure 2: Community Hospital in outskirt of Ulaanbaatar

RISKS ASSOCIATED WITH HCW

[8] *Report to Waste TWG -The Status and trend of development of HCW in China, Research Institute of Solid Waste Management, Chinese Research Academy of Environmental Sciences, 2008*

The largest component of non-hazardous HCW is similar to municipal waste and does not usually pose higher risks than the waste produced in households. It is the hazardous HCW component that needs to be properly managed in order that the health risks from exposure to known hazards be minimized. Protection of the health of staff, patients and the general public is the fundamental reason for implementing a system of HCWM. The hazardous nature of HCW is due to one or more of the following characteristics: presence of infectious agents, a genotoxic or cytotoxic chemical composition, presence of toxic or hazardous chemicals or biologically aggressive pharmaceuticals, presence of radioactivity, and presence of used sharps. All individuals in close proximity with hazardous HCW are potentially at risk from exposure to a hazard, including those working within health-care facilities (e.g., medical doctors, nurses, hospital maintenance personnel, patients, among others) that generate hazardous waste, and those individuals who either handle such waste or are exposed to it as a consequence of careless actions.

POLICIES & REGULATORY FRAMEWORKS IN SELECTED COUNTRIES OF THE WESTERN PACIFIC REGION

Most of the countries of the Western Pacific Region have enforced national laws or regulations, policies, strategies, national action plans and technical guidelines to improve HCWM. Although policies and regulatory frameworks exist in most of the countries, not all countries have a specified law or regulations on HCWM. The policies and regulatory frameworks, explicit or implicit at the national level, along with strategies and action plans as well as guidelines on HCWM are summarized in Table 2.

Table 2:Policies & regulatory frameworks in selected countries of the Western Pacific Region

Country	Law, Policy, Strategy, National Action Plan, HCW Guide, National Steering Committee
1. Australia	**Law:** National Environment Protection Measure (NEPM) for Movement of Controlled Waste 1998 **Policy:** National Waste Policy: Less Waste, More Resources e.g., Specific to health-care waste, the Clinical and Related Waste Management Policy in Western Australia **Strategy:** Partly(included in national policy on waste) **Action Plan:** National Waste Policy Implementation Plan **HCW Guide:** National Guidelines for Waste Management in the Health-care Industry **National Steering Committee:** Industry Code of Practice for the Management of Clinical and Related Wastes
2. Brunei Darussala	**Law:** Infectious Disease Order; Environment Pollution Control Order, Environmental Impact Assessment Order and Hazardous Waste (Control of

	m	Export, Import and Transit) Order) **Policy:** Partly(included in the infection control policy) **HCW Guide:** Guidelines for Health and Safety of Health-care Workers ; Partly (only for selected facilities)
3.	Cambodia	**Law:** Prakas on Health-care Waste Management in Cambodia **Policy:** National Policy on Health-care Waste Management 2009 **Action Plan:** National Plan for the Management of Health-care Wastes in Cambodia 2011–2015 (developed 2008) **HCW Guide:** Technical Guideline on Health-care Waste Management; Infection Prevention and Control Guideline for Health-care Facilities
4.	China	**Law:** Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste 2005; Regulations on Management of Health-care Waste issued by State Council on 2003 (Order No. 380) **Action Plan:** National Plan for Construction of Hazardous and Health-care Waste Treatment Facilities **HCW Guide:** Pollution Control Standard for Hazardous Wastes Incineration (GB18484-2001); Technical Standard for Medical Waste Transport Vehicle (GB 19217-2003); Technical Standard for Medical Care Incinerator (GB 19218-2003; Technical Specification for Centralized Disposal of Medical Waste (Trail)
5.	Fiji	**Law:** Environment Management (Waste Disposal and Recycling) Regulations **Policy:** Policy for Health-care Waste Management 2002 **Strategy:** National Solid Waste Management Strategy: 2011–2014
6.	Japan	**Law:** Waste Management Law (Wastes Management and Public Cleansing Law); Waste Disposal Law of 1970 **Strategy:** Different strategies for different kinds of health-care waste **HCW Guide:** Manual on Sound Management of Infectious Wastes, May 2012; Home based health-care waste (2008) and for the manual handling of health-care waste (2012)
7.	Kiribati	**Law:** Environment Act 1999
8.	Republic of Korea	**Law:** Waste Management Act **Action Plan:** Second National Comprehensive Plan for Waste Management (2002–2011)

	HCW Guide: Guideline for Health-care Waste Management (2004)
9. Lao People's Democratic Republic	**Law:**1997 Ministerial decree on solid waste management in the health-care service Areas; Regulation on Waste Management in the Health-care Service Institute (2004) **Policy:** National Health-care Waste Policy (2011)
10. Malaysia	**Law:** Environmental Quality (Scheduled Wastes) Regulations 2005; Environmental Quality Act 1974; Private Health-care Facilities and Services Act 1998 **Policy:** Policies and Procedures on Infection Control of the Ministry of Health; Environment Policy of the Department of Environment; Policy on the Protection of Public Health and Environment (1996) **Strategy:** National Health-care Waste Strategy and Action Plan **Action Plan:** National Health-care Waste Strategy and Action Plan **HCW Guide:** Technical Guidelines for Environmentally Sound Management under Basel Convention, Guidelines on Handling and Management of Clinical Wastes in Malaysia
11. Marshall Islands	**Law:** National Environmental Protection Act, 1984 and the Solid Waste Regulations 1989
12. Federated States of Micronesia	**Law:** Federated States of Micronesia (FSM) Public Law 15-09; Presidential Order No 1 **Policy:** Strategic Development Plan 2004–2023 **Strategy:** Federated States of Micronesia Infrastructure Development Plan **Action Plan:** Federated States of Micronesia Infrastructure Development Plan
13. Mongolia	**Law:** HCWM -Ministerial order No: 93 (2011); Ministerial order No: 158 (2011/05/03) **Policy:** National Strategy on the Improvement of Health Care Waste Management and Action Plan for 2009-2013 **Action Plan:** National Action Plan on Improvement of Solid Waste Management ; Regulation for Improvement of Health-care Waste Management (HCWM) ; Health Sector Master Plan (HSMP) 2006–2015; Health Sector Strategic Master Plan Implementation Framework
14. Nauru	**Law:** Litter Prohibition Act 1983

15. New Zealand	**Policy:** Policy Framework to Reduce and Safely Manage Hazardous Wastes in New Zealand; New Zealand Standards on Management of Health-care Waste (NZS 4304:2002) **HCW Guide:** Guidelines for the Safe Handling of Cytotoxic Drugs and Related Waste
16. Palau	**Law:** Environmental Quality Protection Act 1981 **Action Plan:** National Master Development Plan (NMDP)
17. Papua New Guinea	**Law:** Environment Act (2000); Public Health Act 1973;Public Health (Sanitation and General) Regulation 1973 **Policy:** National Health Service Standards for Papua New Guinea 2011–2020 **HCW Guide:** Chapter 13 Infection Prevention Policy Guidelines for Health Facilities (2nd Edition, 2009)
18. Philippines	**Law:** Republic Act No. 4226 Hospital Licensure Act (1965); Republic Act No. 8749 or the Philippine Clean Air Act of 1999; Republic Act No. 9003 or the Ecological Solid Waste Management Act of the Philippines; Republic Act No. 6969 or An Act to Control Toxic Substances and Hazardous and Nuclear Waste Control Act 1990; DOH Administrative Order No. 2008-0021 dated 30 July 2008 on Gradual Phase- out of Mercury in all Philippine Health-care Facilities and Institutions **HCW Guide:** Health-care Waste Management Manual **National Steering Committee:** Presidential Degree 856 The Code on Sanitation of the Philippines
19. Samoa	**Law:** Lands, Surveys and Environment Act 1989 **Policy:** Health-care Waste Management Plan (National Strategy) **HCW Guide:** Health-care Waste Management Plan (2011)
20. Solomon Islands	**Law:** Environment Act 1998; Environment Regulation 2008 **Policy:** National Health-care Waste Management policy 2009
21. Tonga	**Law:** Waste Management Act, 2005; Public Health Act, 1992; 2010 the Hazardous Wastes and Chemicals Act
22. Tuvalu	**Law:** Waste Operations and Services Act, 2009; Environment Protection Act, 2007
23. Vanuatu	**Law:** Public Health Act No.22 of 1994; Environment Management and Conservation Act No.12 of 2002

24. Viet Nam	**Law:** Decision No. 43/2007/QD-BYT dated 30 November 2007 of the Ministry of Health promulgating Regulation on Health-care Waste Management **Action Plan:** Prime Minister Decision No: 798/QD-TTg on the approval of the solid waste treatment investment program for the period 2011 to 2020 **HCW Guide:** Circular No.: 18 /2009/TT-BYT dated 14 October 2009 on the Guideline on the Implementation of Infection Control in Health-care Facilities

Training, education and public awareness

In this section, past, ongoing and planned activities for training, education and public awareness on HCWM is described for six countries including Cambodia, Fiji, Japan, the Republic of Korea, Mongolia and the Philippines. Other countries are not described due to unavailability of data and information.

In **Cambodia**, HCWM activities include awareness campaigns where the design of pictograms and a specific sample of containers in the national language for medical waste and been disseminated to hospitals. Capacity-building activities include workshops, training, and the distribution of posters, stickers, sample bins and sharp containers to promote HCWM. In **Fiji,** several health-care workers have received training on HCW and were provided with personal protection equipment. In the **Republic of Korea,** the Resource Recirculation Center of National Institute of Environmental Research is supporting the Ministry of Environment by conducting the required research on HCW. In the private sector, three HCW-related associations keep their members updated on regulation and policy developments. In **Mongolia,** although HCWM has received only little attention in the past, this has changed during the last few years. Awareness-raising activities among stakeholders on the risks of HCW resulted in a willingness to start changing processes. The importance of these activities was underlined by a study by the WHO in 2011 that showed very high prevalence of hepatitis B and C among health workers in Mongolia – above 50% in some surgical departments – pointing to a breach in HCWM.

FINANCIAL RESOURCES AND OTHER PROJECT ACTIVITIES

Financial resources for HCWM are needed for the development of infrastructure, capacity-building and development of policies, regulatory frameworks, national strategies and action plans, and technical guidelines and manuals on HCWM.Australia, Brunei Darussalam, Cambodia and the Lao People's Democratic Republic were not included due to the unavailability of data and information.

In Cambodia, a specific budget for the financing of HCWM activities does not exist, either at the central level or within the health-care facilities. In **China,** the Global Environment Facility (GEF) is funding a project on Environmentally Sustainable Management of Medical Wastes. The 11th and 12th Five-Year Plan activities include the construction of hazardous and medical waste treatment facilities. In **Japan,** afinancing system is in place to cover the cost of HCWM and is based on the polluter-pays principle. In the **Republic of Korea,** afinancing system is in place to cover the cost of HCWM and is based on the polluter-pays principle. In **Malaysia,** the financing system includes privatization by the Ministry of Health

to a private consortium to collect and dispose of HCW also based on the polluter-pays principle. **Mongolia**is being supported by WHO and the Millennium Challenge Corporation (MCC) on the improvement of its HCW system. The Asian Development Bank is also funding a project on the improvement of the HCW system as part of the fifth health sector improvement project.**Pacific island** countries and areas including Fiji, Kiribati, the Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu areengaged in the development of a Regional Strategy and Action Plan 2013–2015 through South Pacific Regional Environment Programme(SPREP) and an EU-funded Pacific Hazardous Waste Management (PacWaste) project, which includes a HCW component. Through PacWaste, countries such as Fiji, Kiribati, the Marshall Islands, the Federated States of Micronesia, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu will receive assistance and equipment to set up improved HCWM. However, the financing system for the management and treatment of the HCW in most Pacific island countries is not fully developed. **The Philippines,** has a HCWM project supported by GEF and the United Nations Development Programme (UNDP) and various projects on HCW training exist, e.g. a training project for the Calabarzon Region (2012) financed by Japan. In **Viet Nam**, HCW is one of the priorities of the Government, and a major project with a budget of US$ 150 million has commenced. However, the financing for the recurrent cost of HCWM still remains a challenge as the sector is underfunded. A UNDP-GEF global HCW project will demonstrate and promote best techniques and practices for reducing HCW to avoid environmental release of dioxin and mercury. Various projects financed by bilateral donors such as Belgium and Germany include a HCW component.

DISCUSSION

Status of HCWM in selected Western Pacific Countries

The potential risks created by the unsafe management and disposal of HCW have long been recognized in the Western Pacific Region, and efforts have been undertaken to raise awareness of the problem. Some countries in the Region have had the financial resources to take counter measures and have introduced more advanced HCWM systems to address the risks. But other countries faced financial constraints that limited their response. Hence, only limited measures have been undertaken, which often were dependent on donor support. In the last decade, several countries in the Western Pacific Region have begun to improve HCWM. For example, the Lao People's Democratic Republic, Mongolia and Viet Nam have already invested in the improvement of HCW infrastructure. Cambodia and the Philippines, have improved HCW legislation. New strategies, such as the centralization and privatization of HCW disposal services, were implemented in Malaysia. Pacific island countries and areas are working towards the development of HCWM plans. To describe the status and issues of HCWM in selected countries in the Western Pacific Region, a summary assessment is shown in Table 3.

HEALTH-CARE WASTE MANAGEMENT

Micronesia and Nauru have no specific HCWM system. Some aspects of a waste management system exist in Cambodia, Fiji, Kiribati, the Lao People's Democratic Republic, the Marshall Islands, Solomon Islands and Tuvalu. Waste management systems have been

introduced in China, Malaysia, Mongolia, the Philippines and Viet Nam. The Republic of Korea also has a comprehensive HCWM system.

HEALTH-CARE WASTE MANAGEMENT TRAINING

Micronesia and Nauru provide no training on HCWM. While Cambodia, Fiji, Kiribati, the Marshall Islands, Solomon Islands and Tuvalu provide basic HCWM training but mainly through the support of development organizations. In China, the Lao People's Democratic Republic, Malaysia, the Philippines and Viet Nam training is provided by the government or appointed contractors or consultants. The Republic of Korea and Mongolia are the most advanced in terms of HCW training, as it is regularly offered and includes basic to advanced levels.

Table 3. Summary assessment on HCWM in selected countries in the Western Pacific Region

Country	Information Base	Management	Training	Regulation	Technology	Financing
1. Australia	Good	-	-	-	-	-
2. Brunei Darussalam	Poor	-	-	-	-	-
3. Cambodia	Good	2	2	4	2	2
4. China	Fair	3	3	4	3	3
5. Fiji	Poor	2	2	2	2	1
6. Japan	Good	-	-	-	-	-
7. Kiribati	Poor	2	2	1	2	1
8. Korea (Republic of)	Good	4	4	4	5	4
9. Lao PDR	Fair	2	3	3	3	2
10. Malaysia	Good	3	3	4	4	4
11. Marshall Islands	Poor	2	2	1	1	2
12. Micronesia	Poor	1	1	2	1	1
13. Mongolia	Good	3	4	4	3	4
14. Nauru	Poor	1	1	2	1	1
15. New Zealand	Fair	-	-	-	-	-
16. Palau	Fair	-	-	-	-	-
17. Papua New Guinea	Poor	-	-	-	-	-
18. Philippines	Good	3	3	4	3	2
19. Samoa	Fair	-	-	-	-	-
20. Solomon Islands	Fair	2	2	2	1	1
21. Tonga	Fair	-	-	-	-	-
22. Tuvalu	Poor	2	2	1	2	1
23. Vanuatu	Poor	-	-	-	-	-
24. Viet Nam	Fair	3	3	3	2	2

Note: The five HCW aspects listed: HCWM (management); HCW training (training); HCW policies and regulatory frameworks (regulation); HCW technologies (technology); and HCW financial resources (financing). A scoring of the implementation level was carried out. Rating scheme ranges from 1 = insufficient to 5 = excellent

POLICIES AND REGULATORY FRAMEWORK

A regulatory framework on waste management does not exist in Kiribati, the Marshall Islands and Tuvalu. HCW is partly covered by other regulations in countries such as Fiji, the Federated States of Micronesia, Nauru and Solomon Islands. In the Lao People's Democratic Republic and Viet Nam HCW is covered by other regulations, and some legal documents specifically address HCW. In Cambodia, China, Japan, the Republic of Korea, Malaysia, Mongolia and the Philippines, a regulatory framework for HCW exist.

TECHNOLOGIES

Pacific island countries, such as the Marshall Islands, the Federated States of Micronesia, Nauru and Solomon Islands, have little or no treatment equipment and limited logistics available for HCW use. Basic treatment equipment for general waste is available, but it is not always operational and does not fulfil international standards for HCW. In China, the Lao People's Democratic Republic, Mongolia and the Philippines, more advanced treatment equipment is available but does not fulfil all international standards. In Malaysia, sophisticated treatment equipment that meets international standards is available; however it does not fulfil all best available techniques (BAT) standards. BAT for logistics and treatment equipment is available, well maintained and regularly tested by independent institutions in Japan and the Republic of Korea.

FINANCIAL RESOURCES

Pacific island countries including the Federated States of Micronesia, Fiji, Kiribati, Nauru, Solomon Islands and Tuvalu have almost no financial resources for HCWM. Several countries have resources to handle consumables, but mainly depend on donor organizations. In China, a budget for HCW exists, but mainly at central level. In Japan, the Republic of Korea, Malaysia and Mongolia a regular budget based on the polluter-pays principle has been established.

Despite the improvements in many countries, HCWM is still far from ideal. Further support for the development of HCWM systems in countries is required to ensure that within the next decade safe HCWM systems are implemented.

CONCLUSIONS AND RECOMMENDATIONS

There are 37 countries and areas in the Western Pacific Region, of which 24 were covered by this research. It is recommended that the remaining 13 countries not covered in this report should be included in the future to ensure a clear and full picture of the HCW situation in the Western Pacific Region is obtained.

STRATEGIC DIRECTIONS IN COUNTRIES

The following recommendations provide strategic direction, possible actions and tools that can promote HCWM in countries of the Western Pacific Region. Governments, international

organizations and other stakeholders can synergize their respective knowledge and expertise in the implementation of these strategies and actions.

- **Policy and regulatory frameworks**: Develop HCW policies and regulatory frameworks taking into account international conventions and agreements, as well as the practices of other countries, tailored to local needs with clear roles and responsibilities, thereby creating dedicated units for monitoring implementation and enforcement of HCWM.
- **HCWM (separation, transportation, treatment and disposal) and technologies:** Encourage integrated treatment facilities under build-operate-and-transfer or build-own-operate-and-transfer schemes. Select a low-cost HCWM plan with adaptability for developing countries and implement it.
- **Training, education and awareness raising:** Synergize capacity-building and technical support activities to enhance partnerships among HCW sector and other stakeholders. Establish a network for capacity-building through periodic training and workshops that explicitly address HCWM and waste minimization. Conduct HCWM research and development covering best practices, lessons learnt, indicators, etc.Carry out information, education and communication campaigns on HCWM to raise awareness of decision-makers and health-care facility staff in handling, safety and exposure to HCW.Develop training tools, modules and packages focusing on best practices on HCWM.
    - **Financial resources:** Establish a waste minimization system and use the revenue by applying the fund to the overall HCWM system.

WESTERN PACIFIC REGION STRATEGIC DIRECTIONS

Possible strategies for the improvement of HCWM in the Western Pacific Region could include:

- **Improvement of a regional dialogue**

  In the Western Pacific Region, various states of development of national HCWM systems have been identified. For the purpose of the recommendation in this section, three proposed regional development clusters have been set up including North-South cluster (Australia, China, Hong Kong (China), Japan, the Republic of Korea, Macao (China), Mongolia and New Zealand); South-East cluster(Brunei Darussalam, Cambodia, the Lao People's Democratic Republic, Malaysia, the Philippines and Viet Nam); South Pacific cluster (countries in the South Pacific, excluding Australia and New Zealand). For each of the three regions, a HCW working group should be established to share experiences on the practical management of HCW and to update each other on lessons learnt. Additionally, a vertical experience exchange among these clusters should take place regularly. The exchange of lessons learnt between systems in transition and advanced systems, and/or systems in transition and underdeveloped systems, could benefit less-developed countries and could help ensure better utilization of funds planned for the improvement of the systems.

- **Regional improvements in the South Pacific cluster**

  It is recommended that WHO in cooperation with SPREP consider an application for a HCW project to be funded by GEF to reduce the production of unintentionally generated POPs.

- **Improved database on regional HCW documents and tools**

  The analysis of available documents showed that a wide variety of potentially useful action plans, guidelines, policies, regulations, etc. are available but often difficult to find. It is recommended that these documents be made available on the WHO website or another platform for HCWM in the Region.

- **Standardization of the legal and administrative framework**

  The study shows that a regulatory framework for the HCWM does not exist in the South Pacific region. Responsibilities for monitoring and supervision of HCW activities are not clearly defined and the monitoring capacities of enforcement authorities can be regarded as low. As an immediate intervention, HCW policies and guidelines should be introduced to support subsequent implementation of national HCW strategies and plans. To ease implementation, templates for the development of policies, strategies and guidelines should be made available.

- **Regionalization of the training system**

  In an effort to standardize and harmonize training systems, it is recommended regional curriculums or training materials for HCW training be issued, as they are by WHO Regional Office for Europe, so they can be easily adapted and used by countries. This will also enable the training of participants from several countries to be conducted at the same time or in parallel and will avoid the unnecessary duplication of activities. Additionally, standardized training for treatment facility operators and inspectors should be developed.

- **Coverage of all hazardous HCW categories during strategy and action plan development**

  HCW is defined as the total waste stream from a health-care facility, including all hazardous and non-hazardous waste streams. Within the Western Pacific Region, management of hazardous HCW tends to focus on so-called “medical waste”, which in most countries is defined as a waste stream that includes infectious waste, sharps and pathological waste but does not normally include chemical waste, pharmaceutical waste or radioactive waste. It is strongly recommended that countries include these other categories of waste when developing HCW strategies, policies and actions plans. Considering that governments have adopted a global, legally binding treaty to realize mercury-free health care by 2020, it will be important that countries be ready to address the disposal of mercury when they begin substituting mercury-based medical devices with alternatives.

Acknowledgment: The authors profoundly acknowledged WHO WPRO for supporting this study on Healthcare Waste Management in Western Pacific Region (WPR). The authors are thankful to **countries in WPR** for providing data and information for the Status of Healthcare Waste Management Report in the region. The authors are also thankful with other colleagues in WPRO country offices for assisting in data collection from various sources in the region.

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ORIGINAL ARTICLE

TRAINING OF TRAINERS (TOT) AND DISTRICT LEVEL TRAINING PROGRAMME (DLTP) ON BIOMEDICAL WASTE MANAGEMENT UNDERTAKEN BY ENVIRONMENT MANAGEMENT AND POLICY RESEARCH INSTITUTE (EMPRI), DEPARTMENT OF FORESTS, ECOLOGY AND ENVIRONMENT, GOVERNMENT OF KARNATAKA – AN OVERVIEW

Dr. B Ramakrishna Goud MD, MBA, DIH

BACKGROUND

The Training of Trainers (ToT) and the District Level Training Programme (DLTP) is a unique initiative undertaken by Government of Karnataka in joint collaboration with two of its stakeholder departments, namely Environment, Ecology & Forests and Health and Family Welfare. The programme was coordinated by Environment Management and Policy Research Institute (EMPRI).

EMPRI is a autonomous Institute established by Government of Karnataka in the Year 2002, under Department of Forests, Ecology and Environment, Government of Karnataka with a mandate to take-up training programmes addressing compendium of issues concerning environment protection and conservation of forests.

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Following decisions were taken and implemented prior to training programme

1. Bio Medical Waste Committees were constituted in all the districts vide a Government Order. No. FEE.22EPD2009, Bangalore, Dated 16-08-2011.
2. The District Nodal Environmental Officers (DNEO) was designated as coordinators of these committees. The committee constituted would constitute six members. Where ever feasible Faculty members of Microbiology and Community Medicine were included in these committees.
3. A training of trainer's workshop (ToT) was conducted at Bangalore for all these committees.
4. The ToT was a three day residential programme. The trainers were from MS Ramaiah Medical College, St. John's Medical College, Bangalore Medical College and Mandya Institute of Medical Sciences along with Officers and Consultants from Karnataka Health Systems Developments Reforms Project (KHSDRP), Karnataka State Pollution Control Board (KSPCB) and Senior Veterinary Doctors from Animal Husbandry department, for duration of three days.
5. The ToT included problem solving exercises along with field visits to Hospitals, Common Bio Medical Waste Treatment Facilities and Hazardous Waste Management facility at Dobbaspet.
6. The District BMW Management Committee members trained at TOT would undertake training at District level along with the District Environmental Officer of KSPCB.

The Training of Trainers Programme (ToT)

1. The ToT was designed to be a three day residential training programme. About 5 to 8 persons from each district were trained. In all, Five ToTs were conducted in Bangalore (the details of which are published in Journal of ISHWM, Vol 11, Issue 1, Sep 2012.
2. The ToTs started in Sep 2011 and concluded in Aug 2012. The initial three ToT were held at Mahatma Gandhi Rural Institute for Energy Development (MGRID), Hebbal and the remaining two ToTs were held at The National Institute of Advanced Studies (***NIAS***), Indian Institute of Science campus, ***Bangalore. In all 181 persons belonging to the 30 districts were trained.***
3. Each team of the district was facilitated with formulating an action plan for undertaking training programmes at district level, in a dedicated session at ToT.
4. The ToTs served the purpose of resolving some aspects of colour coding and treatment of waste categories of syringes, sharps, salvaging and recycling of plastics and glass wastes and utility of equipment like needle destructors/hub cutters.
5. ToT also served as platform for discussing other concerns like need for common waste treatment facilities and limitations of pit(s) system of disposal of wastes, the need for continuous training programmes at sub districts level also.
6. The district teams also did a SWOT analysis of respective district's existing biomedical waste management systems.
7. A tentative training content was also discussed at ToT for training programmes at district level.
8. The budgetary support for district level training programme was channelized through EMPRI which also was to steer and pilot the DLTPs.

The District Level Training Programme(s) (DLTP)

1. The DLTP was designed to be one day training programme for three batches on three consecutive days.
2. The trainees were from Animal Husbandry and Health departments and also from private sector (medical doctors, nurses and laboratory technicians)
3. The DLTPs started in Nov 2011 with Mandya and concluded in Aug 2013 with Yadgir.
4. In all about 6000 persons from departments of Health and Animal Husbandry and Private Health Care institutions of 30 districts of the State were trained.
5. On each day of the three day programme about 60 personnel were to be trained. That is at the end of three days, at least 180 personnel were targeted for training.
6. The DLTP was designed to be an eight hours (one day) programme. The training included didactic lecture cum interactive sessions. Where ever possible a field visit was undertaken (e.g. in Belgaum). The trainees were encouraged to clarify doubts as few faculty of DLTP were from agencies implementing BMW Management Rules and related issues, namely KSPCB and nodal officers of Karnataka Private Medical Establishment Act (District Health Office).
7. All the DLTPs had a Master Trainer (ToT faculty) from EMPRI deputed to function as an Observer. This was to ensure that the training content and process was uniform for all the districts.
8. Both, the ToT Workshop(s) at Bangalore and DLTP(s) at District headquarters had components of pre-test and post-test evaluations and written feedback from trainees about the training programme.
9. The training tool kit for ToT and DLTP was the same. The kit included the KHSDRP Manuel, a CD containing the presentations of the ToT faculty, BMW Management Rules booklet.

WAY FORWARD

An evaluation of DLTP is being planned by EMPRI. A Data collection tool and a Checklist are being devised to undertake the same. The State Core team is keen to involve the local medical colleges to undertake this activity. This would serve the dual purpose of a “third party evaluation” and possibly address the concern of *trainer’s bias.*

An exclusive training programme for personnel of Common Treatment Facilities would further serve the cause of safe management of health care waste. EMPRI could explore the possibility of reaching out to these unaddressed stakeholders.

Further, it was suggested to EMPRI to consider assessing and evaluating the functioning of Common Treatment Facilities operating in the state.

ACKNOWLEDGEMENTS

1. Mrs. Ritu Khakkar IFS, Director General, Environment Management and Policy Research Institute (EMPRI), Hasiru Bhavana, Doresanipalya Forest Campus, Vinayakanagara circle, 5th Phase, J P Nagar, Bangalore-560 078,
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3. Mr.Basavarajappa, Training Head and Team and Dr. Vikas PhD, Project Development Officer, Environment Management and Policy Research Institute (EMPRI) Hasiru Bhavana, Doresanipalya Forest Campus, Vinayakanagara circle, 5th Phase, J P Nagar, Bangalore-560 078.
4. Prof. Dr. Pruthvish, Prof. Dr. Hemanth T, Dr. Suman G and Dr. Lalitha K of Health Care Waste Management Cell, Department of Community Medicine, MS Ramaiah Medical College, MSRIT Post, Gokula Ext., Bangalore.
5. Mrs. Vanshree Vipin Singh IFS, Formerly Director, EMPRI, Bangalore.
6. Dr. Asha Abhikar, KHSDRP; Mr. Ravishankar and Mr. Hemanth, Consultants, KHSDRP and Officials from KSPCB.

ORIGINAL ARTICLE

SHORT COMMUNICATION

MERCURY POLICIES: NATIONAL AND INTERNATIONAL EFFORTS

Aparna Sharma[1], HemanthThapsey[2], ArjunanIsaac[3],

"States shall cooperate in a spirit of global partnership to conserve, protect and restore the health and integrity of the Earth's ecosystem. In view of the different contributions to global environmental degradation, States have common but differentiated responsibilities. The developed countries acknowledge the responsibility that they bear in the international pursuit of sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command."

- *Principle 7 (Rio declaration on environment and development,1992)*

Mercury pollution is a global problem that requires global action because it moves with air and water, transcends political borders, and can be transported thousands of miles in the atmosphere. [1]

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INTERNATIONAL EFFORTS

- Mercury has been regulated domestically in industrialized countries since at least the 1950s and internationally since the 1970s [2,3].
- The United Nations Conference on the Human Environment in Stockholm in 1972 initiated action on high-priority pollutants in the marine environment, including mercury [4].
- To understand better the problem of mercury in health-care sector, it was recommended by W.H.O in its policy paper (2005) that countries conduct assessments of current mercury usage and waste management programs.WHO proposed to work in collaboration with countries through the following strategic steps:

a) **Short-term:** Develop mercury clean up and waste handling and storage procedures. Instituting safe handling procedures which minimize and eliminate patient, occupational, and community exposures. Access to affordable alternatives should be developed and plans should be implemented to reduce the use of mercury equipment and replace them with mercury-free alternatives.

b) **Medium-term:** Increase efforts to reduce the number of unnecessary use of mercury equipment. Hospitals should inventory their use of mercury, categorizing into immediately replaceable and gradually replaceable. Progressively discouraging the import and sale of mercury containing health-care devices and mercury use in health-care settings. Provide support to countries to make sure that the recovered mercury equipment is not pushed back in the supply chain.

c) **Long-term:** Support a ban for use of mercury containing devices and effectively promote the use of mercury free alternatives. Support countries in developing a national guidance manual for sound management of health-care mercury waste. Promote the principles of environmentally sound management of health-care waste

containing mercury, as set out in the UN Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal.[5]

- The European Union (EU) has banned mercury thermometers for home and health care use beginning in 2008. Other countries phasing out mercury from Health Care- Argentina, Philippines, Uruguay, USA, Sweden, Cuba.[6]
- In February 2009, the UNEP Governing Council established a mandate to begin negotiations on a global, legally binding mercury treaty. This decision follows several years of voluntary activities under a mercury program, in which interested countries and other parties established partnerships on topics such as artisanal gold mining, transport and fate research, coal combustion, and waste management.[3]
- The Minamata Convention on Mercury (2013) is a gallant effort towards a global and legally binding instrument to protect human health and the environment from mercury emissions. It recognizes that the provisions identified cannot happen overnight, and these will need to be realized at different paces depending on the resources and capacities of individual countries. [7,8]
- The Ministry of Health and Family Welfare has issued two volumes on "Infection Mangement and Environment Plan, in 2007 under National Rural Health Mission. They include a policy framework document and a set of operational guidelines for institutions. Both the volumes have integrated mercury spill management, besides advising the healthcare establishments to start a phase-out plan for mercury containing equipment.[9]
- All government hospitals in Delhi have stopped purchase of mercury equipment and are in the process of phasing it out since 2010. Some of the private hospitals in Delhi had started mercury phase-out as early as 2003.[10]Punjab, Manipur and Hubli (Karnataka) have followed.

- The Director General of Health Services, Government of India has issued guidelines (2012) for the proper management of mercury spills and gradual phasing out of mercury containing items and introduction of safe alternatives.[11]
- The Central Pollution Control Board (CPCB), India has drafted guidelines on 'Environmentally sound management of mercury waste generated from the health care facilities' in 2012.
- India became a signatory to the Minamata convention in 2014, pledging its support to phase out mercury containing products, mercury import etc. by 2020.

THE WAY FORWARD[1]

India has become a signatory to Minamata Convention, hence, the following steps can be taken in accordance to the guidelines of the Convention-

- Progressive phase- out, resulting from banning the manufacture, import or export by 2020 [of mercury thermometers and sphygmomanometers, of mercury-containing cosmetics, including skin-lightening soaps and creams, and mercury-containing topical antiseptics]
- Measures to be taken to phase down mercury-added dental amalgam.
- Development of public health strategies on the exposure to mercury of artisanal and small-scale gold miners and their communities.
- Promote the development and implementation of science-based educational and preventive programmes on occupational exposure to mercury and mercury compounds.
- Safe handling, use and disposal of remaining mercury-containing products should be encouraged.

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RESOURCES AND INFORMATION

IGNOU CERTIFICATE COURSE

INDIRA GANDHI NATIONAL OPEN UNIVERSITY

Indira Gandhi National Open University (IGNOU), the largest open university in the democratic world, was established by an act of Indian Parliament in 1985, and started offering academic programmes in 1987 (Diploma in Management and Diploma in Distance Education with 4528 students). Today, it serves the educational aspirations of about 1.3 million students in 30 countries, including India, through eleven schools of studies and a network of 57 regional centres; five sub regional centres, 1296 study centres/tele-learning centres, 35 partner institutions overseas. The University offers 101 certificate, diploma, degree and doctoral programmes comprising 900 courses, through a strength of 300 faculty members and academic staff at the headquarters and regional centres and about 33,000 counselors drawn from conventional institutions of higher learning, professionals from various organizations and bodies, among others.

The University has been in existence for only two decades. In such a short time, the University has contributed significantly to higher education and continuing professional development in the country catering to the· education of about 12 per cent of total students enrolled in higher education (and more than 50 per cent of total students in distance education) in the country. As a world leader in distance education, it was conferred the Centre of Excellence Award in Distance Education in 1993.

SCHOOL OF HEALTH SCIENCES

The School of Health Sciences was established in the year 1991 as one of the eleven schools of the University. Its prime objective is the development and delivery of programmes in the field of medicine, nursing, paramedics through distance education mode and the maintenance of their academic standards. The Certificate Programme in Health Care Waste Management is one of the latest programmes developed in the School for the South-East Asia Countries.

CERTIFICATE IN HEALTH CARE WASTE MANAGEMENT

The concern for bio-medical waste management has been felt globally with the rise in deadly infections such as AIDS,

Hepatitis and indiscriminate disposal of health care waste. The United Nations through UN Basel Convention on the control of transboundary movements of hazardous wastes and their disposal has classified health care waste as most hazardous waste, after radioactive waste.

According to WHO, the eleven South-East Asia countries together produce some 3,50,000 tons of health care waste per year, close to 1000 tons a day. As it is not segregated at source, all of it is to be considered hazardous despite the fact that only 10-20 per cent is infectious in nature (Health Situation in the South-East Asia Region, 1998· 2000, WHO, 1999).

The main bottleneck to sound health care waste management programme is lack of training and appropriate skills, insufficient resource allocation and lack of adequate equipment. The need to educate different health care professionals/ workers, NGOs and other stake holders was thus identified as a priority. To cater the needs of these health care professionals, IGNOU and WHO, SEARO decided to develop and launch Certificate Programme in Health Care Waste Management in the South-East Asia Region Countries. This programme is a 14 credit 6-month certificate programme, through open and distance learning.

This certificate programme has been developed to create essential knowledge and skills in health care waste and equip the leaders to manage it effectively and safely and also safeguard the community against adverse health impact of health care waste.

OBJECTIVES

- Sensitize the learner about health care waste and its impact on our health and environment
- Acquaint the learner about the existing legis1ation, knowledge and practices regarding infection control and heath care waste management practices in South· East Asia Region Countries.
- Equip the learner with skills to manage health care waste effectively and safely.

BENEFICIARIES

Doctors, Nurses, Paramedics, Health Managers and other professiona1 workers with a minimum of 10 + 2 Qualification.

PROGRAMME PACKAGE

It is a multimedia package consisting of print material in the form of booklets called blocks, audio-visual materials, teleconferencing and providing counseling by contact sessions where the learners are invited to the Programme Study Centres in

India and Partner Institutions in other countries for hands on training. The package will have eight theory blocks, a project and programme guide.

BHM-001 Fundamentals: Environment and Health,

Health Care Waste Management Regulations

Block 1: Understanding Our Environment 1

Unit 1 Introduction to Environment

Unit 2 Environmental Pollutants

Unit 3 Interrelationship of Environment and Health

Unit 4 Waste Management

Block 2: Health Care Waste: Definitions 1

Unit 1 Definitions, Types and Categories of Waste

Unit 2 Principles of Health Care Waste Management

Unit 3 Handling Health Care Waste

Block 3: Need for a Sound Health Care Waste Management 1

Unit 1 Impact of Health Care Waste on Our Environment

Unit 2 Impact of Health Care Waste on Human Health

Unit 3 Safety Methodology, worker Safety and Precautions

Block 4: Current Status of Health Care Waste 1 Management legislation in SEAR Countries

Unit 1 Rules and legislations

Unit 2 Regulatory Mechanisms

Unit 3 Current Status in India. Thailand. Indonesia. Sri Lanka. Bangladesh

Unit 4 Current Status in Bhutan, DPR Korea, Timor Leste, Maldives, Myanmar, Nepal

BHM·002 Health Cart Waste Management Concepts, Technologies and Training

Block 1 Practical Aspects of Health Care Waste Management 2

Unit 1 Managerial and Administrative aspects

Unit 2 Integrated Infection Control Management

Unit 3 Disinfection and Transportation

Unit 4 Capacity Building. Training and Monitoring

Block 2: Systems and Technologies in Health Care Waste Management 2

Unit 1 Systems Options

Unit 2 Treatment and Disposal of Health Care Waste: Burn Technologies

Unit 3 Treatment and Disposal 01 Health Care Waste: Non burn technology

Unit 4 Innovative Concepts and Possibilities

Block 3: Health Care Waste Management and Emerging Issues 1

Unit 1 Managing Waste Water from Health Care Facilities

Unit 2 Management of Wastes from Immunizations

Unit 3 Occupation and Patient Safety

Unit 4 Success Stories

Block 4: Training Manual for Waste Handlers 1

BHMP-001 Project 4

CREDIT SYSTEM

In IGNOU parlance, the study hours are measured in credit system. One credit is equivalent to 30 learning hours. For example, 14 credits of Certificate in Health Care Waste Management programme means an average student will be required to give 420 hours (14 X 30) of input for this programme which includes theory reading, undertaking a project, hands on training, video viewing, counseling etc.

IMPLEMENTATION PLAN 2006

The programme will be implemented through a network of Programme Study Centres (PSCs) in India and Partner Institutions (Pls) located in other South-East Asia (SEA) and other countries. These Programme Study Centres and Partner Institutions will be located in health care institutions like medical colleges, hospitals, district and private hospitals, rural health centres, etc. A team of trained teachers called counselors will be identified and trained for providing academic counseling and supervising the Programme Study Centres/Partner Institutions. The administrative control will be through the Regional Centres (RCs) of IGNOU located usually at state capitals nationally, by the Partner Institutions, and Indian Consulate in other countries and the School of Health Sciences (SOHS) located at the IGNOU Headquarters, Delhi. India.

EVALUATION

Evaluation will be through theory and project evaluation. 70 per cent weightage will be kept for theory term-end examination and 30 per cent for project

evaluation. 50 per cent minimum pass mark in each component separately is required for successful completion of the programme.

Term-end examination of theory will be held twice in a year i.e. June and December. There will be no practical examination.

ADMISSION INFORMATION

Admission Fee : Rs. 2000/- in India

US$ 150 for other SEA countries

Eligibility : Doctors, Nurses, Paramedics, Health Managers and other professional workers with a minimum of 10 + 2 Qualification

Duration : Minimum 6 months
: Maximum 2 years
Launched : January 2006
Session : January to June
July to December

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INDIAN SOCIETY OF HOSPITAL WASTE MANAGEMENT

(Founded – 2000, registration under the Societies Registration Act XXI of 1860, Reg No. 36939 of 2000)

The Government of India published a Gazette notification on 20 July 1998 making all personas who generate, collect received, store, transport, treat, dispose or handle medical waste in any form responsible for handling the medical; waste without and 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 registration 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 subject's dealings with the said subject.

(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 a personal and environmental protection.

(c) To propagate education and inculcate awareness in hospital as well as general population.

(d) To advance research in various field, connected with Environmental Protection and Hospital Waste Management.

(e) To function as an interface with Industries involved in designation/manufacture of bio-medical waste disposal equipment/appliance for R&D development India.

To fulfill and further the above objectives the Society shall

(a) Hold periodically meetings, seminars, workshops, training courses and annual conference 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 & their relatives.

(c) Publish and circulate a journal on Hospital Waste Management and Environmental protection.

(d) Maintain a Library at the location of the permanent officer as a when established.

(e) Generate funds from all possible sources. The funds so generated will be utilized for advance 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 for details including memberships forms.

USEFUL RESEARCH PAPERS ON HEALTH CARE WASTE MANAGEMENT

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LETTER TO EDITOR

Sir,

The biomedical waste which is produced directly or indirectly by the process of diagnosis, treatment or immunization of human beings or animals, or in research activities pertaining thereto contains various hazardous material causing infection, injury even death and also damages the environment.

I appreciate the efforts that have been made to bring out such a commendable journal which helps the readers in various medical and paramedical fields to understand the basis of biomedical waste management and its importance.

Even though WHO has been constantly updating on the issues on biomedical waste management, in the article 'A Study on Hospital Waste Management at a Rural Hospital in Maharashtra' by Athvale AV et al, it was found that in the Pravara rural hospital in Maharashtra, there was no segregation of wastes from the generation to disposal. It spotlights the situation that health care waste management is still of serious concern in many parts of India.

Article on 'Ecofriendly Treatment of Biomedical Wastes Using Epigeic Earthworms' by Dinesh MS et al focussed on vermin-composting and its advantages over normal composting. It's indeed an innovation that would further help in the soil conservation and it is proving highly successful. But its feasibility in applying for a larger sector and its durability are matters of concern.

The journal has not only focussed on solid waste management but also the liquid biomedical waste management which is to be highly appreciated.

There have been currently many emerging and re-emerging diseases and the organisms pose a severe threat to the biomedical waste management. Hence I request you to kindly add more articles focussing on current health problems that are challenging the biomedical waste management.

Hoping for more issues of the journal and wishing an all the best for the great work ahead.

Thank you,

Dr. Vaishnavi C
District: Coimbatore,
State: Tamil Nadu

GUIDELINES FOR AUTHORS

JOURNAL OF THE INDIAN SOCIETY OF HOSPITAL WASTE MANAGEMENT

1. Journal of Indian Society of Hospital Waste Management publishes orginal 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 publications 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.

3. Following CERTIFICATES (Orginal Single copy) must accompany the articles.

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(i) Certified that I we have not used any information or material from official documents graded 'restricted' and above or any 'classified' information obtained in any my our official capacity in the preparation of the article of the article title .

(ii) Certified that this manuscript contains no matter that is libelous or otherwise unlawful, or invades individual privacy or infringes on any proprietary rights.

(iii) All authors certify that they have made substantive and intellectual contributions to the article and assume public responsibility for its content.

(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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4. **MANUSCRIPT** must be typed in double space throughout, on one side of good quality white bond paper of size 22x28 cm or A4 size with margin on both sides. Words should be hyphenated at the end of a line. Three copies, sets or hard should be submitted along with 3 sets of illustration and the entire text in MS Word format on a 1.44 MB floppy. Authors must retain a copy of all the above material, as the Journal cannot be held responsible for its loss due to any reason. The material should be enclosed in a large envelope, superscribed 'Article for publication Not to be Folded', and sent under registered cover to Honorary Chief Editor, Journal of Indian Society of Hospital Waste Management, Health Care Management Cell, Department of Community Medicine, M. S. Ramaiah Medical College, Bangalore - 560 054. (Karnataka).

5. **PROCESSING**: Material received for publication will be acknowledged. The article may be reviewed by referrers. 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 publications will be returned by ORDINARY post.

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(a) Title page: gives the title of the articles 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 address of the authors (including PIN Code and FAX). Ideally, the title should be of about 60 characters. It should have no abbreviations. Names of all the authors with highest academic degree must be typed one below the other with proper footnote marks after the name. Affiliations (with corresponding footnote marks at the beginning) and addresses of authors should be typed as footnotes only.

(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 be included. Avoid abbreviations. No abstract is required for case reports. Below the abstract give not more that 5 key words using terms from Medical Subject Headings list of Index Medicus.

(c) Text - The text should be divided into sections, e.g. Introductions, Materials and Methods, Results and Discussion. Each should have it individually and must not be mixed with other. Ensure that all references, tables and figures are cited in the text.

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(e) Legend - to illustrations should be brief (ravely exceeding 40 words), but must explain the salient features of the illustrations.

(f) Illustrations - should be presented only of they depict. something new or unusual. They should be serially numbered in the order of their mention in the text, irrespective of their nature. Viz. Photograph, drawing or chart, using only the word 'figure' and not diagram, graph etc. Type a label indicating the top ( ), the short title of the article and the figure number on a piece of paper and past in on the back of the illustrations.

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Diagrams and Charts: These should be drawn on thin, white, smooth or glazed care in black ink, and not in any other colour.

8. **MISCELLENEOUS:** Use metric measurements -<:m, m.g.kg.nl.L., No periods, no plural (eg. 'IDem' not '10 cms'). 'Significant' should be reserved for use in the statistical sense Avoid naml'd and initials of the patients and dates. Avoid unfamiliar abbreviation, medical Jargon and passive VOl:'C. Avoid duplication and repetition of material in results and discussion. in tables and Text and in text al~d legends.

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