

**Medical Waste Management at
Rajshahi City Corporation -
Public-private Partnership Model
Development: A Collaborative
Effort on Medical Waste
Management in Bangladesh
(Baseline and Status Report)**

Nasima Akter, Mizanur Rahman, and Lammia Sharmin

and

Institution of Policy Support Unit-Ministry of
Environment and Forest Team

December 2005

BRAC Research Report



BRAC Research and Evaluation Division

BRAC Centre, 75 Mohakhali, Dhaka 1212, Bangladesh

E-mail: research@brac.net, Fax: (88-02) 8823542, 8823614

Telephone: 9881265, 8824051, 8824180-87

**Medical Waste Management at Rajshahi City Corporation
Public-private Partnership Model Development: A
Collaborative Effort on Medical Waste Management in
Bangladesh
(Baseline and Status Report)**

**Nasima Akter, Mizanur Rahman, and Lamia Sharmin
and
Institution of Policy Support Unit-Ministry of Environment and Forest Team**

December 2005

Research and Evaluation Division, BRAC
BRAC Centre, 75 Mohakhali, Dhaka 1212, Bangladesh
E-mail: research@brac.net, Fax: (88-02) 8823542, 8823614
Telephone: 9881265, 8824051, 8824180-87

For more details about the report please contact: nasima.a@brac.net

ABSTRACT

This study aims to i) conduct a feasibility study to establish the viability of medical waste management (MWM) rules implementation, ii) identify the appropriate technology and management model, iii) establish viable final disposal technological options in which the both parties and other actors can participate as partners, and iv) establish a coordination and partnership model in MWM in Bangladesh. In this pilot research BRAC aims to: i) introduce an appropriate waste management system in hospitals, clinics and diagnostic centers within the Rajshahi City Corporation (RCC) area using a standard manual and training module, ii) develop a core trainer group at BRAC and relevant organizations on MWM. The methods of action were: i) baseline survey to ascertain the training need, ii) sensitization/awareness, iii) training on in-house management, iv) implementation of in-house management, and v) evaluation. The pilot period was from July 2005 to February 2006. A baseline survey was done to assess the existing hospital waste management practices in RCC area, as well as to ascertain the training needs for relevant institutes establishment. The findings show that the lack of awareness, training and management planning is the basic constraints of hospital waste management at RCC area. Based on training need assessment BRAC prepared a training of trainer (TOT) module (according to the draft MWM manual) and provided ToT for a 15-member core trainer group. BRAC also provided training for healthcare workers e.g. doctors, nurses, cleaners, technicians, administration officers, and City Corporation's staff. A total 850 healthcare personnel and healthcare workers have been provided with in-house MWM training covering almost all hospitals, clinics and diagnostic centers in Rajshahi city and 257 healthcare workers at Joypurhat hospital. Several orientation seminars and workshops were organized for RCC officials, clinic owners and hospital management personnel. After implementation, an evaluation will be done to assess the impact of training and management practices. The outcome of this pilot are a) medical waste management manual; b) booklet and 2D animation c) core trainer group; d) ToT and training module; e) a model of working partnership; f) pilot implementation of MWM practices at RCC area; and g) initiation of mainstreaming of this pilot model. The draft MWM rule is now under the process of approval by the government.

INTRODUCTION

Definitions of medical waste vary in different countries and institutes as well, based on different categories of wastes. In general, medical wastes are wastes arising from diagnosis, monitoring and preventive, curative or palliative activities in field of the veterinary and human medicine (Akter 2000). According to the U.S. Environmental Protection Agency (EPA) and World Health Organization (WHO), definitions of medical waste have a view to aid in regulating it. Given the fact that the medical waste stream is an extremely complex one including chemicals, which could be hazardous, as also normal kitchen or office waste akin to municipal solid waste. Usually, medical wastes produced by hospitals, clinics, pathological laboratories, diagnostic centers, doctors' offices, and other medical and research facilities. These wastes include infectious, pathological, sharps, pharmaceuticals, hazardous, genotoxic, chemicals, heavy metals, radioactive and other general wastes.

Medical waste is a serious threat to public health that need immediate attention. Several research and activity reports published in Bangladesh on medical waste (Akter, *et al* 2000, Akter and Tränkler 2003, BCAS 1997, Dana 1999a & b, Kazi 2000, and Rahman 2000). Considering huge amount of municipal waste, hospital waste is very small part and infectious waste is even very small amount that would not be a problem to manage if we do proper in-house management (Akter 2000). From different studies and our experiences it is understood that hospital waste management is possible, but what is lacking is final treatment and disposal of hazardous and infectious waste. There are debates on different technologies and options of management. In Bangladesh, policies and regulations are not much addressing the issue (Farooque and Hasan 1996). However, Bangladesh government is giving much emphasis on this issue, and realized that a policy should be made for medical waste management (MWM) in Bangladesh based on our practical situation and technical and economic ability.

To conceptualize the appropriate options and basic needs of MWM in Bangladesh BRAC conducted a pilot research on in-house MWM in few selected children hospitals in 2004 (Akter and Ali 2004). A manual on in-house MWM for Bangladesh has been drafted based on that pilot study. After dissemination of this pilot findings and the manual to relevant stakeholders and government institutes the necessity for developing rules and implementation of in-house MWM practices in hospitals got immediate attention. According to the discussion and need assessment, this public-private partnership model piloting has been designed. Rajshahi City Corporation (RCC) has been selected for pilot implementation of MWM system.

Aim of this project is to build a coordination and partnership with all relevant stakeholders (e.g. City Corporation, Institution of Policy Support Unit under Ministry of Environment and Forest (IPSU-MoEF), Directorate General of Health (DGH) under Ministry of Health and Family Planning (MoHFW), hospital and clinic owners, and BRAC) and assist the government to formulate and implement environmental guidelines for healthcare facilities (hospitals, clinics, diagnostic centers). This project is designed to pilot a model of partnership among all stakeholders in MWM. After successful completion of this project this model would be replicated all over the country by the government and BRAC.

OBJECTIVES OF THE COLLABORATIVE EFFORT

1. To conduct a feasibility study to establish the viability of MWM rules implementation,
2. To identify appropriate technology and management model for MWM,

3. To establish viable final disposal options in which both the parties and other actors can participate as partners, and
4. To establish a coordination and partnership model in MWM in Bangladesh.

SPECIFIC OBJECTIVE FOR BRAC

- Introduce an appropriate waste management system in hospitals, clinics and diagnostic centers in RCC area using a standard manual, and
- Develop a core trainer group at BRAC and relevant organizations on MWM.

METHODS OF ACTION

1. Baseline survey on hospitals for waste management, quality and quantity of wastes produced at different types of hospitals and healthcare facilities in RCC area, as well as to ascertain their training need,
2. Sensitization/awareness,
3. Training on in-house management,
4. Implementation of in-house management practice in RCC area, and
5. Evaluation of pilot implementation of MWM and partnership model.

Pilot period was from June 2005 to February 2006. However, due to logistical and regulatory problem of the MoHFW the implementation phase was delayed. Therefore, the monitoring and evaluation phase of this pilot is not yet completed.

OVERVIEW OF THE RAJSHAHI CITY CORPORATION (RCC): CONSERVANCY DIVISION

Around 0.7 million people live in the RCC area of 92.93 square km. They produce 300 metric ton waste/day. The duty of the conservancy division of RCC is to dispose of and manage these wastes including the medical waste. The RCC is considered as 'Dustbin free city'. There are 30 wards in RCC. Fifteen wards are covered by 'door to door waste collection' facilities. RCC is trying to provide this service to all the wards in the near future. There are one dumping site (3.5 feet deep in 15.98 acre area) and 35 secondary collection points. At present four pilot projects are running by RCC. Two of these are in ward 14, one in ward 6 (Laxmipur) and another one in ward 20, 21 and 23.

Recently RCC has been involved in medical waste collection. There are 8 hospitals, 47 clinics and 22 diagnostic centers in RCC area (source: RCC register). Among these, 3 hospitals, all clinics and diagnostic centers are covered by RCC collection system. The amount of medical waste collected by the RCC is 2-2.5 ton/day. Two covered rickshaw vans and three rickshaw van pullers are involved for collecting and disposing all the medical waste generated from all the clinics/hospitals/diagnostic centers. Usually the medical waste collected daily is disposed off in the Rajshahi Medical College Hospital incinerator. Medical wastes are burnt out once a week. But, the burnt date is not fixed, it depends according to the collection of waste. All the hospitals/clinics/diagnostic centers collectively contribute 1,500 taka/month.

REPORT ON RCC BASELINE SURVEY

A baseline survey was conducted among all of the hospitals, clinics and diagnostic centers situated within the RCC area to develop a public-private partnership in MWM. The organizations involved in this collaborative effort are:

1. Rajshahi City Corporation (RCC)
2. Hospital and clinic owners association
3. Institution of Policy Support Unit –Ministry of Environment and Forest (IPSU-MoEF)
4. Directorate General of Health -Ministry of Health and Family Welfare (DGH-MoHFW),
and
5. BRAC

OBJECTIVES OF THE BASELINE SURVEY

The broad objective of the baseline survey was to assess the existing hospital waste management practices in RCC area, as well as to ascertain their training needs for relevant institutes/establishments. Specific objectives were to:

1. Know the actual amount of waste generated in hospitals and clinics in RCC area,
2. Characterization of waste at different category with amount (if any system existed), and
3. Know the health and management aspects (medical personnel, RCC worker, in-house management and final disposal).

METHODOLOGY

SAMPLING

According to RCC report there are 8 hospitals, 47 clinics, and 22 diagnostic centers at RCC (based on RCC report). A total of 44 hospitals, clinics and diagnostic centers were surveyed (list of hospitals/clinics/diagnostic centers are appended in appendix 1). Almost all large hospitals in RCC area were included in this study including Rajshahi Medical Collage Hospital (RMCH). Except three comparatively larger hospitals all other clinics even do not have bed or doctor more than one. Respondents were the hospital management authority, owners, doctors, nurses, laboratory technicians, and health workers.

DATA COLLECTION

Data were collected through semi-structured questionnaire. Basic information on hospitals/clinics and diagnostic centers *e.g.* type and services of hospitals, staff categories and patient type, management practices; knowledge on medical waste, reuse/recycle of waste; quantity of waste generated; health and environmental consequences; training needs, etc. were included. Open ended responses like opinions of different hospital authority on constrains related to MWM, willingness to introduce proper management system and improving the management of hospital waste, and precautions taken by the hospitals/clinics to minimize the health hazards were also tabbed.

Field observations were done through a checklist. The checklist included the inside and outside environment of the hospitals/clinics, the type of disposal bins used in the hospitals/clinics, transportation, collection, and disposal, etc.

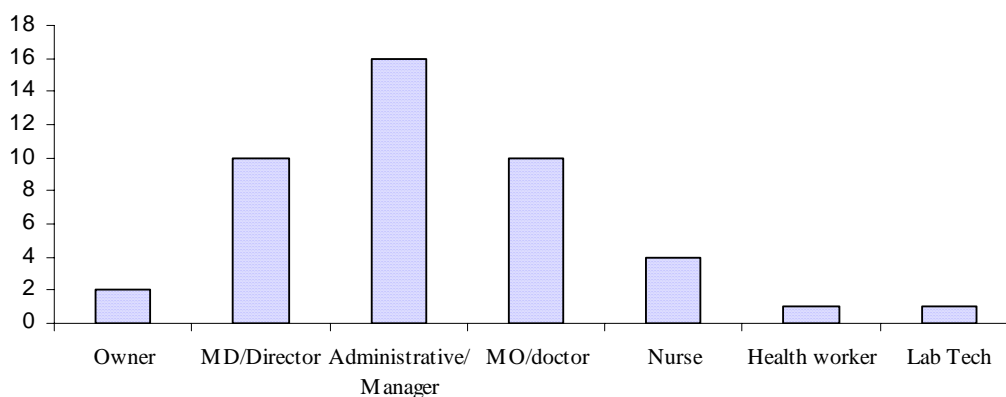
Two discussion meetings, several orientation workshops with hospital staff, and in-depth interview with the hospital authority, owners association, and City Corporation officials were also conducted during the baseline survey. The baseline survey was conducted in July 2005.

FINDINGS

RESPONDENTS' CATEGORIES

Forty-four respondents from 44 hospitals, clinics, and diagnostic centers were interviewed. Half of them were hospital authority and management related (22 out of 44). Other respondents interviewed were doctors, nurses, laboratory technicians, and health workers (Aya) (Fig. 1).

Figure 1. Respondents category of sampled hospitals in RCC area



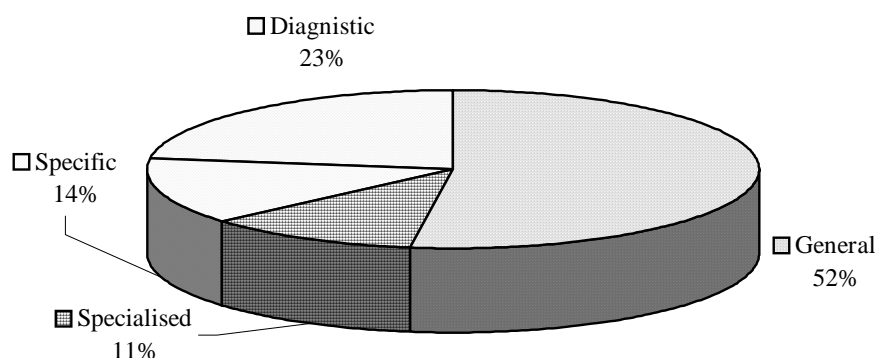
GENERAL INFORMATION

Type of hospitals and services offered

Of these 44 hospitals/clinics/diagnostic centers 23 (52%) are general hospitals. Five (11%) are specialized hospitals i.e. chest hospital, infectious disease hospital, leprosy hospital and another is a blood bank. Another 14% (6) hospitals are treating specific diseases like heart, old-age problems/hospital for old-aged people, surgery, ENT, orthopedic, etc. Remaining 23% (10) are diagnostic centers (Fig. 2). Different types of services are provided by these hospitals/clinics such as primary healthcare, examining patients, surgery, pathological examinations, x-ray, ultra-sonography, treatment of chest-related diseases, etc. Few hospitals also provide nursing training.

The pathological examinations performed are histology, cytology, microbiology, neurology, diabetic, albumin, haemoglobin/different tests of blood, x-ray, ultra-sonography, urine, sputum, pus, endoscopy, pregnancy test, echo-cardiogram (ECG), angiogram and CT scan, etc.

Figure 2. Type of hospitals in RCC area (N=44)



Different staff categories

Among all the hospitals/clinics in RCC area RMCH is the largest hospital with 42 doctors, 551 nurses, 348 administrative staff, and 160 cleaners/*ayas*. The Islami Bank hospital is the second largest hospital in Rajshahi municipal area. Most of the other hospitals/clinics have 1-6 doctors, 3-10 nurses, 1-5 administrative staff, and 1-3 cleaners/*ayas*. Other staff include security guard, office bearer/ward boy, attendant, receptionist and MLSS (Table 1). Mostly there is 1 to 3 cleaner/ward and they clean waste 2-3 times/day.

Table 1. Number of staff in different hospitals/clinics in the RCC area

Hospital/Clinic	Administration	Doctor	Nurse	Cleaner/ <i>Aya</i>
RMCH	348	42	551	160
Islami Bank	35	25	35	46
Chest			65	
Mukti Clinic	10			
Rajshahi Bishwa Biddalay Medical Center		23		
All other clinics and hospitals	1-5	1-6	3-10	1-3

Patient type

Most of the hospitals/clinics are 10 bedded while RMCH has 530 beds. In most of the hospitals/clinics 1-3 patients got admission per day during the survey. In the case of RMCH 209 patients got admission during the survey, and another four hospitals had 8-18 in-patient on the day of survey. The outpatients were huge (1,700 at the day of survey) in RMCH. But in other hospital/clinics it varied from 1-400/day. Diagnostic centers do not have any inpatient system.

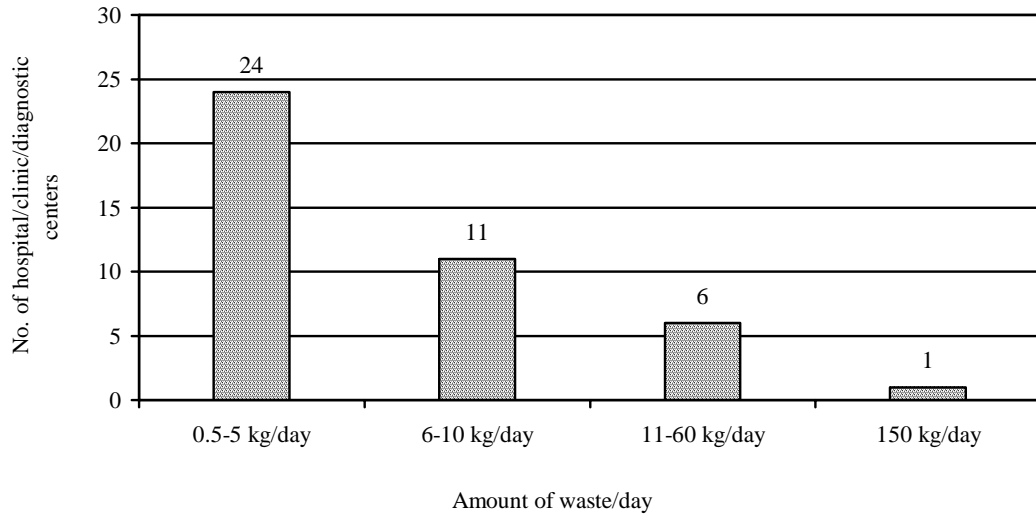
MEDICAL WASTE DISPOSAL

Types and quantity of waste

Different types of waste were generated from all the 44 hospitals/clinics/diagnostic centers. These were gauge/bandage, syringe, saline bag, papers, medicine packet and rapping, food waste, urine, placenta, ampoule, sanitary pad, cotton, etc. According to RCC data all hospitals/clinics/diagnostic centers together generate 22 kg pathological waste, 30 kg plastic waste, 20 kg soft waste, 7 kg sharp waste and 320 kg general waste per day. However, this baseline survey measured 349 kg of medical waste per day from 44 hospitals/clinics/diagnostic centers per day (Fig. 3). It was found that most of the clinics/diagnostic centers generated 0.5 to 5 kg waste per day. Few small hospitals and clinics generated 6-10 kg waste, and six hospitals

generated 11-60 kg waste per day. Only RMCH generated the largest amount of waste compared to other hospitals and clinics (Fig.3). Therefore, it can be suggested that the priority should be given to large and government hospitals to introduce proper in-house management system.

Figure 3. Quantity of medical waste generated during baseline survey (N=44)



Medical waste composition and quality showed similar trend for all divisions of Bangladesh in the year 2001 (WHO 2001). Figure 4 and 5 illustrated the findings. Nevertheless, data collected during the baseline survey (source: RCC) in the year 2004 showed different trend (Fig. 6). It was found that the amount of general waste increased to 87% (including 8% plastic waste) that was much higher than 2001 data (71%). Whereas, infectious waste decreased from 26% in 2001 to 11% (6% pathological and 5% soft waste) in 2004. Variation in waste composition might be due to the service and diseases pattern and also due to the increasing number of patients in all healthcare facilities.

Figure 4. Medical waste generation in 6 divisions of Bangladesh (WHO, 2001)

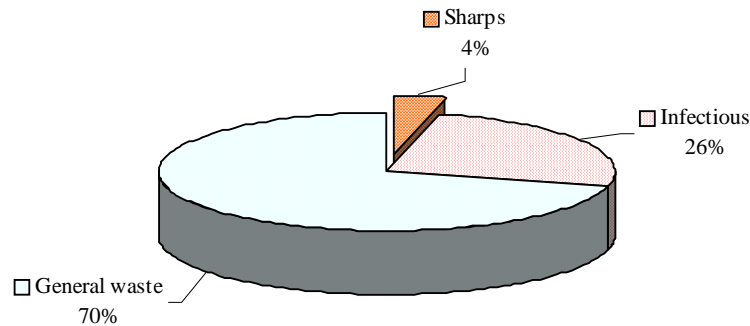


Figure 5. Medical waste generation in RCC area in 2001

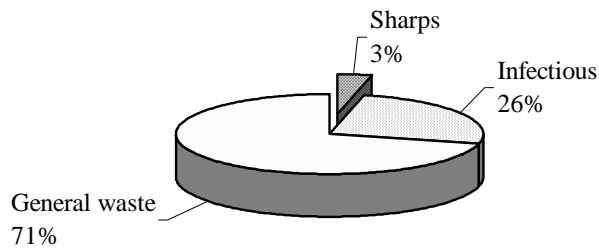
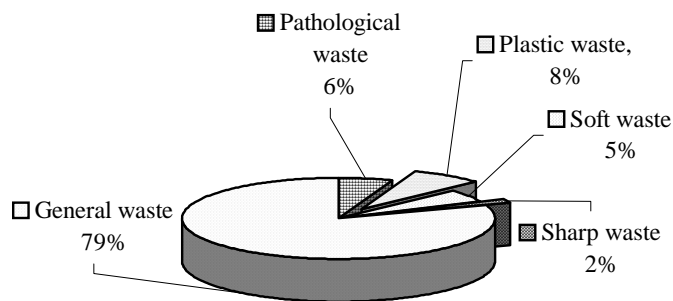


Figure 6. Medical waste generation in RCC area in 2004



Disposal of waste

It was found that most of the hospitals/clinics/diagnostic centers did not follow proper segregation of the waste before disposal. Few institutes, who found to segregate the waste, used two types of containers (bins, cartoons, and covered buckets). Few used yellow container for general waste and red container for hazardous waste. Those who did not segregate the waste usually dispose their waste in City Corporation's dustbin, open field or buried in an open place. In few cases, the hospital/clinics burn their waste by their own initiatives in open places. In some cases, RCC collected the un-segregated medical waste in a separate van.

The laboratory waste like syringe, needle, bandage and discarded samples are disposed off indiscriminately. In all cases, liquid waste and discarded samples from pathological laboratory were poured in basin or drain. In most cases, the cleaners/aya collected used syringes and saline bags to sell outside.

According to the respondents, the radioactive wastes were disposed off in the dustbin, drain, and buried under soil. They also said that the outdated medicines were thrown into the dustbin, destroyed, buried under soil and/or burnt. Some said that RCC or the company took those back. Only RMCH used to send those to the central store and managed centrally.

Transportation and final dumping site of the waste

Usually RCC sweepers take the waste by truck or RCC's special small rickshaw van collect medical wastes from few hospitals/clinics. All medical wastes collected by RCC are sent to an

incinerator for burning. It was noted that RCC did not operate the incinerator everyday to burn medical wastes. However, in some cases hospitals/clinics managed medical waste by themselves, such as buried, burning, dumping in open space or field, and so on.

WASTE RECYCLING AND RELATED RISK

Respondents were asked about the kind of wastes were being reused or recycled from hospital/clinics. These were water bottle, paper/carton/box, ampoule/vial, polybag/plastics, saline bag/set, blood bag/set, canola/catheter, syringes, and x-ray water. It was noticed that the *aya*/cleaners also collected and sold few items informally without informing the hospital authority. The respondents expressed different perceptions about the hazard and/or risk associated with re-use of hospital waste. According to them, it could effect the environment as well as could cause health hazards. It could spread different diseases like diarrhoea, TB, HIV, cancer, convulsion, and hepatitis or even could cause death. There are also possibilities of infection from the re-use of hospital waste. Some said they knew about different hazards of re-using hospital waste but could not mention in detail.

GUIDELINE AND TRAINING NEED

Only 36.4% of hospital authority said that they had a guideline regarding medical waste disposal. Others (63.4%) said that they did not have any guideline for the medical waste disposal. All the hospital/clinic authorities agreed that there should be rules/regulations for disposing of the medical waste generated from the hospitals/clinics to minimize the health hazards.

Among the respondents, 31.8 % received training or got suggestion for being careful while handling the medical wastes. Other respondents (68.2%) mentioned that they did not receive any kind of training regarding that or nobody told them anything about how to handle the medical wastes.

Only 22.7% respondents mentioned that they had heard about MWM rules or regulations. Most of them (77.4%) never heard about any rules or regulations related to hospital waste management. All the respondents mentioned that there is a need of MWM rules/regulation.

LIMITATIONS IN PROPER MWM

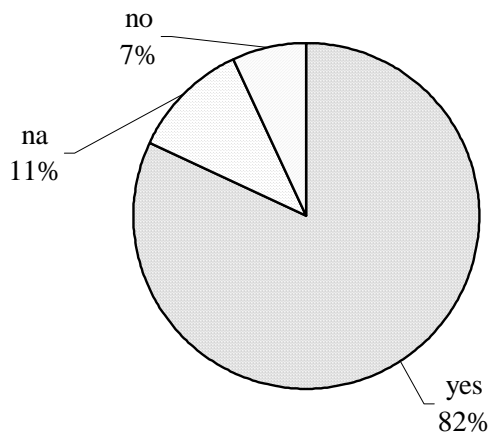
Major constraints related to MWM mentioned by the respondents are lack of awareness, improper management planning, and lack of training. Few respondents also mentioned that, RCC did not have proper waste collection system for hospitals/clinics. Though RCC has a separate medical wastes collection system but the collection coverage and frequency were not adequate. This is might be due to lack of van for waste collection and lack of dustbin, lack of manpower, and improper collection and disposal system of RCC.

Improvement of MWM system should be the responsibility of RCC as most of the respondents mentioned. They also emphasized on training for waste handlers and cleaners on medical wastes handing and disposal. Many also suggested that, there should be enough van/container and incinerator for disposing and burning of medical wastes. Some said that the government should take the responsibility of disposing the medical waste in a safer way. Few also mentioned that everyone has to be responsible for safe disposal of medical waste and obey the rules of MWM. The other opined the government and non-government sectors should work together for proper management of medical waste. In RMCH, the respondents said that the authority could plan something for proper MWM.

WILLINGNESS TO PAY

It was asked to the hospitals/clinic authority, if they were interested to pay for proper MWM. Eighty percent said that they were willing to pay for MWM services (Fig. 7). Most of them are private hospitals/clinics and diagnostic centers. Only seven percent said that it was not possible for them to buy the services. These were government hospitals/clinics. The authority of government hospital/clinics responded that, they do not have any budget for the MWM. So, it is almost impossible for them to pay for that. And other 11% did not respond to that question.

Figure 7. Willingness to pay for waste management services



SAFETY MEASURES

The precautions taken by different hospitals/clinics authorities in RCC area to protect their employees from health hazards related the medical wastes are negligible. Few respondents mentioned that they provided health check-up for their employees free of cost e.g. vaccination and general check-up. Most of the hospitals provide apron for radioactive protection. Keeping fire extinguishers in appropriate place; and providing gloves and masks were some of the precautionary measures mentioned by respondents.

DISCUSSION AND CONCLUSION

Among 44 surveyed healthcare facilities, only RMCH (530 beds) is the largest one in RCC area. Others are moderate to small (10 to 150 beds) hospitals/clinics and diagnostic centers. RCC collect all kinds of medical wastes together from healthcare facilities. In the case of disposing the waste, nobody followed any standard methods or guideline. Most of the respondents did not have knowledge on hazardous waste and not aware about the safe disposal of medical wastes. The small hospitals/clinics who are not under RCC collection coverage usually threw their medical wastes in common dustbin or roadside. It was observed that the medical wastes of the Rajshahi city are managed in two different ways- (1) the RCC vans collect medical wastes from different hospital/clinics and charge monthly fees; (2) some clinic owners arranged vans to collect medical wastes from their clinics and van drivers threw those to the roadside or RCC dustbin.

Concerned persons did not have a clear idea about how to manage medical wastes and what are the hazards from medical waste. Many of them threw the human body parts directly to the RCC dustbin or do not bother to buried the human body parts or the hazardous waste. The RMCH has an incinerator, but it is not in an appropriate position. So, it creates a lot of problems to the patients. Even there is doubt about the regular use of the incinerator.

Authority and the professionals seemed not much aware about the safety and protective measures needed for the healthcare professionals and waste handlers. Lack of skilled manpower, transport, and proper place of disposing off the medical wastes are the main problems for MWM. Respondents also mentioned that lack of awareness, training and improper management planning were the basic constraints of MWM. Everybody agreed that there should be a system for appropriate MWM. In the case of payment for waste management services, 82% agreed to pay for the services. Those who did not agree to pay are basically the government hospitals.

Most of respondents showed their urge for getting separate bins for separate waste and training on MWM. Many also said about rule or law to protect re-use of syringe and saline bag. It is evident from the survey that there is a need for implementation of regulations and guidelines for proper waste management in RCC area. There is an urgent need of in-house waste management training for hospital staff and healthcare service providers. There are many challenges ahead to develop a proper management system for RCC but one of the main challenges will be the final disposal site.

To implement this pilot project the following recommendations are made based on the baseline survey:

- The first step for managing medical waste properly is to build awareness through training, workshop, and consultative meeting with healthcare workers, service providers, waste handlers, and authorities;
- Development and/or improvement of existing MWM manual and develop a core trainers group in MWM;
- Implementation of draft rules of MWM to assess its effectiveness and applicability;
- Selection of appropriate place and technology for final disposal of medical waste;
- Mechanism and/or provision of incentives for healthcare workers to build their professionalism and prevent them to sell or re-use the syringe and saline bag; and
- Committee formulation for monitoring and evaluation of MWM system.

STEP FORWARD AFTER BASELINE SURVEY

Based on the baseline findings an awareness and training programme have been developed. Discussion meetings, seminars, and orientation for RCC authority and hospital and clinic owners were organized to sensitize them and create awareness. Training on in-house MWM were provided for healthcare professionals in RCC area. Details of the pilot project activities are given below:

Orientation seminar and discussion meeting

Three orientation seminars and three discussion meetings were organized with RCC, healthcare service providers, doctors, and hospital authority and owners association in RCC area. IPSU-MoEF, DGH-MoHFW, and BRAC were involved in this process.

MWM training manual and module developed based on MWM manual

A training manual and module have been finalized to conduct training in RCC area based on previous draft MWM manual prepared by BRAC in 2004. Manual has been drafted following WHO, EPA guideline, DGH manual (EPA 1986, 1990 & 1991; Rahman 2001; Prüss et al. 1999 and WHO 2000a & b). Feedback from experts, civil society, professionals, and practitioners have also been incorporated to enrich the content and make the manual handy and appropriate.

Training and orientation training for healthcare professionals in RCC area

In total, 850 participants were provided with full-day MWM training and orientation training from 44 hospitals/clinics/diagnostic centers. Out of them, 485 participants were provided with full-day training and the rest were provided with orientation training. RMCH had maximum number of participants in this training, which indicates their interest, the necessity of this training and the cooperation from government hospitals. Different professionals who were involved with healthcare services e.g. doctors, nurses, cleaners, technicians, administrative officers joined the MWM training. Among 485 participants 10 were doctors, 206 were nurses, 190 were cleaners, 24 were technicians, 30 were the people from administration and others/MLSS were 25 (Table 2). The participants were from 4 larger hospitals and 4 bigger clinics and another group (29 persons) of participants came from different small clinics and diagnostic centers.

A small number of doctors participated in the training. This is because most of the doctors attended the orientation seminar and discussion meetings. It is assumed that all healthcare establishments at RCC have been covered under training and/or orientation seminars.

The MWM training has contributed a lot in creating awareness among healthcare professionals those are directly or indirectly related to hospital waste management.

Table 2. Participants attended day long training course in RCC area

Name of the hospital	No. of participants		
	Male	Female	Total
Islami Bank Medical College Hospital	33	37	70
RMCH	63	142	205
Mahanagar Clinic	13	21	34
Dolphin Clinic	6	11	17
Jamjam Islami Hospital	13	11	24
Padma Clinic	12	21	33
<i>Sramajibi</i> Hospital	3	21	24
Mukti Clinic	20	29	49
Different Clinics	22	7	29
Total	185	300	485

Training of trainers (ToT) and extended training to Joypurhat

A core trainers group was developed. Fifteen trainers were selected from BRAC, MoEF, IPSU-MoEF, MoHFW, DCC, RCC, Prism and Waste Concern to form a core trainer group. This group was provided with three days ToT on MWM training. It is expected that this group will provide training in all healthcare facilities and related organizations during and/or before implementation of MWM rules.

Immediate completion of the ToT, the DGH organized training for Joypurhat Adhunik Government Hospital, where few trainers from this core group provided the training (Photographs below). During this training BRAC coordinated and evaluated the trainers and training provided by them. A total of 257 participants from that hospital received this training (32 doctors, 9 officers, 125 nurses, 57 supporting staff). Demand of MWM training for Joypurhat Adhunik Government Hospital indicates the importance and quality of training programme designed during the pilot in RCC area.

Implementation of MWM system in RCC area

After successful completion of training and awareness programme all healthcare facilities in RCC area were asked to implement the MWM system prescribed in MWM manual. Directorate General of Hospitals under MoHFW agreed to supply different colored bins (prescribed in the manual) for RMCH and other government hospitals. Private facilities were asked to arrange their own bin according to the manual. RCC is collecting and disposing medical wastes with their existing capacity.

Evaluation phase

Upon implementation of MWM system following activities were conducted to evaluate the pilot project:

- A survey on waste generation by category
- Pre and post training assessment
- Finalization and publication of MWM manual
- Finalization of training manual and module

Few more activities are under way to complete the evaluation phase. These are:

- Post survey
- Monitoring using a structured format
- Finalization of final disposal option
- Evaluation of partnership model by discussion, meeting, and consultation with all stakeholders

Due to logistical and regulatory problem of the MoHFW, implementation phase was delayed. Therefore, the monitoring and evaluation phase of this pilot is not completed yet. A final report on this pilot will be completed after completion of above-mentioned activities.

OUTCOME OF THE PILOT

1. Medical waste management manual (published by IPSU-MoEF & BRAC) (photograph added below),
2. Booklet on “*Shusthu medical borjo bebosthaponna: nirapod jibon* (Appropriate medical waste management: safe life)” in Bangla and a 2D video animation on MWM,
3. Training provided for 485 healthcare workers in RCC area and 257 healthcare workers at Joypurhat Government Hospital,
4. Core trainer group of 15 trainers from BRAC, MoEF, MoHFW, DCC, RCC, Prism and Waste Concern,
5. ToT and training module,
6. A model of public-private working partnership,
7. Pilot implementation of MWM practices in RCC area,
8. Replication of these model at Jaoypurhat Government Hospital,
9. Initiation of mainstreaming of this pilot model in collaboration with the MoEF and MoHFW, and
10. Experiences from this pilot have been incorporated in the drafted MWM rules. That is now under process of approval by the government.

References

- Akter N and Ali MR. Improving in-house medical waste management in Bangladesh: a pilot research. BRAC, 2004. (Unpublished research report)
- Akter N and Tränkler J. An analysis of possible scenarios of medical waste management in Bangladesh. *Management Environ Quality: An Int J* 2003;14(2):242-55.
- Akter N. Appropriate management options for developing countries (the case of Bangladesh and Thailand). Bangkok: Asian Institute of Technology, 2003. (Doctoral Dissertation).
- Akter N, Hussain Z, Tränkler J, Parkpian P. Hospital waste management and its probable health effect: a lesson learned from Bangladesh. *Indian J Environ Health* 2002; 44(2):124-37.
- BCAS. Hospital environment management project. Dhaka: Bangladesh Center for Advanced Studies, 1997.
- Dana T. Hospitals waste disposal in Dhaka: an exploration in search of policy, guidelines and rules. Dhaka: Bangladesh Legal Aid and Services Trust, 1999.
- Dana, T. Alternatives: health and hospitals: an exploration in search of policy, guidelines and rules. *The Daily Star* 29 October, 1999.
- Environmental Protection Agency (EPA). EPA guidelines for infectious waste management. Washington D.C: U.S. EPA. Office of Solid Waste, 1986.
- EPA. Operation and maintenance of hospital medical waste incinerators. Handbook. Technology transfer. 1990. EPA/625/6-89/024. 1990
- EPA. Medical and institutional waste incineration: regulations, management, technology, emissions, and operations. Washington, DC: Office of Research and Development, 1991. EPA/625/4-91/030. 1991. Seminar publication. Technology transfer.
- Farooque M and Hasan R. Unofficial English version of the Bangladesh Environment Conservation Act, 1995. *In: Laws regulating environment in Bangladesh*. Dhaka: Bangladesh Environmental Lawyers Association, 1996.
- Kazi NM. Healthcare waste management in Khulna city: an integrated approach for sustainability. In: An international workshop on planning for sustainable and integrated solid waste management. Manila, Philippines, September 18-21, 2000.
- Rahman AKMS (Editor). Situation assessment and analysis of hospital waste management (a pilot study). Directorate General of Health Services, Ministry of Health and Family Welfare. Mohakhali, Bangladesh. 2000.
- Rahman AKMS (Editor). Manual for hospital waste management. Directorate General of Health Services, Ministry of Health and Family Welfare. Mohakhali, Bangladesh, 2001.
- Prüss A, Giroult E and Rushbrook P. World Health Organization. Safe management of wastes from health-care activities. edited by. E Giroult and P Rushbrook. 1999. XIV, 230p.
- WHO. Wastes from healthcare activities. WHO information, Fact Sheet No 253, October 2000. <http://www.who.int/inf-fs/en/fact253.html> 2000_a [Accessed in March 2002].
- WHO. Policy analysis management of health-care wastes. (*Intended to provide a quick overview of the topic at policy-maker level, in particular at national level*). . <http://www.who.int/> 2000_b (Accessed in April 2002).

Appendix

Appendix 1

List of Hospitals surveyed in RCC area during baseline survey

1. Railway Hospital
2. Pathology Center
3. FWVTIMCH Unit
4. Dolphin Clinic
5. Green Diagnostic Center
6. Micro Path Clinic and Diagnostic Center
7. Fatema Diagnostic Center
8. The Pathology
9. Care Diagnostic Center
10. Uttar Bango Islamia Center
11. Chowdhury Nursing Home
12. Jibon Clinic
13. Mukti Clinic Pvt. Ltd.
14. Ma O Sishu Kalyan Kendra
15. Care Lab
16. Semata Nursing Home
17. Sankramak Bedhi (ID) Hospital
18. TB Hospital
19. Christian Mission Hospital
20. Divisional Police Hospital
21. Kushto (Leprosy) Niyatron Center
22. Jam Jam Islamic Hospital
23. Jamuna Clinic
24. City Hospital
25. Islamic Bank Medical College Hospital
26. Rajshahi University Medical Center
27. Rajshahi Medical College Hospital
28. Life Care Blood Bank
29. City Diagnostic Center
30. Motherland Hospital
31. Al-Ara Clinic
32. Islamic Blood Bank and Pathology
33. Janata Clinic
34. Padma Clinic
35. Jara Sasthya Clinic
36. New Ibn-E-Sina Hospital
37. Cure Nursing Home
38. Maa Pathology and Diagnostic Center
39. Ekata Clinic (Diagnostic Center)
40. Bagmara Clinic
41. Care Nursing Home
42. Islamia Diagnostic Center
43. Dinna Nursing Home
44. Mahanagar Clinic