

# Impact Assessment of the Training Conducted in the Past on Health Care Waste Management



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# Impact Assessment of the Training Conducted in the Past on Health Care Waste Management

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Submitted To  
Nepal Health Research Council

Submitted By  
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NHRC  
December 2005



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Vikram Basyal  
Principal Investigator  
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September 2005

## Abbreviation & Acronyms

NHRC	Nepal Health Research Council
WHO	World Health Organization
HCI	Health Care Institution
HCWM	Health Care Waste Management
KAP	Knowledge, Attitude & Practice
HMGN	His Majesty's Government of Nepal
HCW	Health Care Waste
BPKIHS	Bisheshwor Prasad Koirala Institute of Health Science
TU	Tribhuvan University
GOVT	Government

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## Executive Summary

Nepal Health Research Council (NHRC) has conducted various activities like workshop, seminar, research, training etc related to medical waste management. In the past it had organized two training regarding HCWM. The first training was on "Dissemination and Training Workshop on National Health Care Waste Management Guidelines" in 2002. Similarly on 11<sup>th</sup> and 12<sup>th</sup> of November, 2003, NHRC had conducted two days training on "Possible exposure and risk from health care waste and its management" for related staff of various hospitals at Dhulikhel.

As a follow up of these trainings, a training impact study was conducted on the title "Impact assessment of the training conducted in the past on health care waste management". The main objective of the study was to evaluate the impact of the past trainings.

For this study, two sectors were chosen i.e. health care waste management staff and health care institution. To find the impact on the staff, a KAP study was conducted in a comparative way between trained and non-trained staff of same health care institution. Similarly a waste management practice situation analysis study was also conducted with comparing past and present situation to assess the waste management practice.

The participant health care institutions of the training were twenty-three. Within this 23 health care institutions, Ten HCIs were selected for the study. These ten health care institutions covered Govt. hospital, teaching hospital, nursing home, missionary hospital and some specific hospital like maternity, eye and tropical disease hospital.

In each of these ten health care institutions, a study was conducted within 10 each trained and non-trained staff to evaluate the knowledge, their attitude and practice they are doing in their health care institution. Similarly, another survey was done with trained staff to find the past and present situation of waste management practice in the health care institution.

This study shows that the training was partially successful to provide the knowledge on health care waste management as well as to increase the attitude of the staff. In the practice situation, it was found positive improvement on waste segregation, collection, inside transportation and safety precautions. While in offside transportation & collection, treatment, disposal and record keeping sector has not found much improved even after the training.

Overall the impact of the training was found positive on both to increase the knowledge of the staff as well as in the waste management practice in the health care institutions. Staffs of health care institutions have desire to get such training continuously every year.

In the conclusion, it is realized that the training should cover more details and complete process for the management of all categories of waste. In such training, health care institution management committee staff should also be invited because they are the decision maker to change or improve any system in the institution.



# 1.0 Introduction

## 1.1 Background

The World Health Organization states that the human element is more important than the technology and almost any system of treatment and disposal that is operated by well trained and well motivated staff, can provide more protection for staff, patients and the community; than an expensive or sophisticated system that is managed by staff who do not understand the risks and the importance of their contribution.

Hazardous HCW present occupational health risk to those who generate, package, store, transport, treat and dispose of them. They also present environmental and public health risks through inappropriate management. But very few individuals of HCI's management staff are familiar with the elements of proper waste management. In fact the waste handling is left to poorly educated and lowest category of workers, operating without any training and guidance. Consequently, these hazardous wastes are mixed with municipal non-hazardous solid waste and deposited untreated in uncontrolled dumping where they contribute to environmental pollution and scavenging.

In order to achieve acceptable HCI waste management and compliance with regulation, training must be provided to those who are actually involved with the management of hazardous hospital wastes, particularly those involved with waste segregation, handling, treatment and disposal of the waste.

NHRC has initiated various activities like workshop, seminar, research, training etc related to medical waste management. In the past it had organized two trainings regarding HCWM. The first training was on "Dissemination and Training Workshop on National Health Care Waste Management Guidelines" in 2002. Similarly on 11<sup>th</sup> and 12<sup>th</sup> of November 2003, NHRC had conducted two days training on "Possible exposure and risk from health care waste and its management" for related staff of various hospitals at Dhulikhel.

As a follow up of those past trainings, NHRC had carried out this study to identify the impact of the training under the theme of "Impact assessment of the training conducted in the past on health care waste management".

## 1.2 Objective of the Study

The objective of the study was as follows:

- Evaluation of the effectiveness of the training.
- To assess the impact of the past training.
- To find the overall feedback of the training.

## 1.3 Scope of the Study

- To evaluate the improvement on both human resources as well as the institution on the waste management in the respective health care facility after the training.
- To identify the merits and demerits of the training.
- This study could help to develop more effective modules of the training for future.
- It helps to find the weak and strong side of the present practice of health care waste management.
- It also helps to find the target group for the next training.



## **2.0 Methodology**

This study was concentrated to evaluate the impact of the training to the trainee and its impact on the waste management situation of HCI. The main focus of the study was to visit various HCIs and get real situation by interviewing with trainee and non-trainee staff of waste management section.

A structured questionnaire was developed to assess the present condition of the waste management from both trainee and non-trainee staff of same HCI. And also it was tried to find the KAP position of the trained and untrained staffs of HCIs. After this field study it was tried to identify the impact of the training.

The questionnaire was developed to identify the changes on practice of HCWM and knowledge of waste handling staff of HCIs in between 2002 to 2005.

The method followed for the impact assessment of the training was as follows:

### **A) Planning and pre field visit preparation**

This was the initial stage of the study. In this preliminary phase, available literature including past training modules were studied (see chapter 3 for details). On the basis of those modules, two semi-structured types of questionnaires were developed. One was for the evaluation of the health care institution and another for the KAP study of the staff. Both the questionnaire were based on the comparative evaluation (see annex: I and II)

### **B) Selection of health care facility**

A sufficient numbers of health care institution were selected so as to able to extrapolate data. To keep the things simple, some of the health care facilities were chosen according to the size and category of structure like public, private, missionary etc. All together 10 hospitals were selected for the evaluation (See annex III list of hospital selected). On which, there were 3 public hospitals, 3 private nursing homes, one teaching hospital, one eye hospital, one maternity hospital and one Govt. hospital.

### **C) Conduction of field work**

The aim of site visit of health care facilities was to find the variation inside the institution on HCW management and within the HCW handlers in a comparative manner. There were two types of questionnaires developed. One was to find the changes on practice of HCW management before and after the training provided by NHRC. Another checklist was to find the differences of knowledge, willingness and participation between trained and non-trained HCW management staffs within the same institution. Both of these two surveys could help to assess the impact of the training on the waste management practice as well as on the awareness and behaviour changes of the human resource of health care institutions.

### **D) Identification of impact**

To make the impact identification process simple and easy, following parameters were selected to evaluate the impacts. On the basis of these parameters a comparative study was conducted by coding specific time frame to evaluate the changes on practice.

- i. Staff

- ii. Health Care waste generation
- iii. HCW segregation and handling
- iv. HCW storage container
- v. HCW storage area.
- vi. Collection and onsite transportation.
- vii. Offsite transportation.
- viii. Treatment.
- ix. Final disposal
- x. Regulation.
- xi. Policy and budget.
- xii. Sanitation and waste water
- xiii. Record keeping.

Similarly another checklist was developed for KAP study. This was a comparative evaluation between trained and untrained staff of HCW management section within the same HCI. Altogether forty questions were asked to evaluate the KAP position within trained and non-trained staffs of HCIs.

### **E) Impact analysis**

On the basis of the finding, all the impacts were described and calculated extensively. The analysis of the impact also surrounded in the above said specific parameters. This gave a comparative variation of the knowledge and waste management situation within time frame.

### **F) Assessment of the impact**

After the analysis of the impact, it was assessed to calculate the amount of the changes appeared on the institution as well as on the human resources. This would help to measure the effectiveness of the training and could suggest any improvement required or not.

### **G) Preparation of report**

Finally a complete report was prepared on the basis of the findings of the study. Which provided a conclusive result of the training and also recommended best suitable approach of training for future on the basis of the trainee's views.

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### 3.0 Review of the Past Training

To achieve acceptable hospital waste management and compliance with regulations, training must be provided to those who are actually involved with the management of hazardous hospital waste, particularly those involved with waste separation, handling, treatment and disposal of the wastes. Training is desirable to all health care institutions so as to sensitise the personnel regarding the various aspect of waste management.

#### 3.1 Training Activities

In the past NHRC with the support of WHO, had organised trainings. All together two trainings were organized related to the proper management of HCW. The main focus of the training was to minimize the environmental health hazards, which comes during source segregation, collection, handling, transportation, treatment and final disposal.

The main objective of the training was as follows:

- To aware the HCW handling staff about exposure risk with hazardous waste of HCIs.
- To discuss on the proper method of safe management of health care waste.
- To disseminate the health care waste management guideline developed by NHRC.
- To train health professional on health care waste management based on the training module designed by NHRC.

##### 3.1.1 First Training

The first training was organized in 2002 on the title of "Dissemination and Training Workshop on National Health Care Waste management Guidelines". Around 30 medical professionals from different hospitals, nursing homes and dental clinics were participants of the training workshop. The list of the participants of the first training is listed in annex: IV.

The objective of the training was to train the medical professional on HCWM. The following topics and issues were addressed in the training.

- Health Impact of Health Care Waste.
- An Experience of Hospital Waste Management in Manipal Medical College.
- Infection Prevention and Waste Management.
- National Health Care Waste Management guideline and Manual
- Need of laws and Regulations.
- Importance of Hospital Waste Management.
- Problems Generated by Hospital Waste Around the World.
- Handling, labelling, containment, transport and storage of waste.
- Treatment and disposal methods.

Some presented the Health Care Waste Management Training Manual developed by NHRC, while other shared the experiences of waste management practice in their HCI.

The following resource person presented training and shares their experiences during the training period:

- a. Mr. Jan A Speets, Environment Health Advisor, W|HO
- b. Dr. D. P. Saraswat, Medical Superintendent, Manipal Medical College

- c. Dr. Bal Man Singh Karki, Director, BP Koirala Cancer Hospital
- d. Mr. C. S. Yadav, Environmental Officer, NHRC
- e. Dr. Rita Thapa, Senior Public Health Advisor, MOH
- f. Mr. Salil Devekota, Consultant NHRC
- g. Mr. Sarad Aryal, Consultant, NHRC
- h. Mr. Ramesh Sedhain, Intern, NHRC

### 3.1.2 Second Training

- a) This two days training was organized in 2003 on the topic of "Possible Exposure and Risk from Health Care Waste and Its Management" at Dhulikhel. Total 30 trainees from various HCIs were participants of the training. The list of participants of the second training is included in annex: V.

The following topics of the Health care waste management were presented in the training.

- Overview of Health Care Waste Management.
- Situation of Health Care Waste Management in District and Periphery Level Health Facilities and an Integrated Approach for Improvement in Nepal.
- Possible Exposure and Risk from Health Care Waste and Its Management and Guidelines.
- Some Case Study of hospital waste management of Bir Hospital, BPKIHS, Dharan and Bio Medical Waste Management – An Indian Experience.
- Training on HCWM for Health Professionals Based on the Training Manual Prepared by NHRC.

The following experts presented their paper on the two days training.

- b) Mr. Shamsul Huda, Environmental Health Adviser, WHO
- c) Mr. Jayendra Bhatta, Health Support Program, GTZ
- d) Mr. Chandra shekar Yadav, Chief, Environmental Health Unit, NHRC
- e) Mr. Kiran Shapkota, student, TU
- f) Ms. Rashmi Adhikari, Environmentalist
- g) Similarly, Mr. Bachchu kailash Kaini, Chief, Administration, Shahid Gangalal National Heart Hospital
- h) Mr. Salil Devekota, Environmental Specialist
- i) Mr. Santosh Shrestha, Environmental Consultant.



## 4.0 Impact of the Training

The overall aim of the training was to develop awareness on the health safety and environmental issues related to health care waste and how these can affect employees in their daily work. It highlighted the role and responsibilities of health care personnel in the waste management activities. For the identification of the impact, some relevant specific parameters were chosen and around these parameters, impacts were calculated.

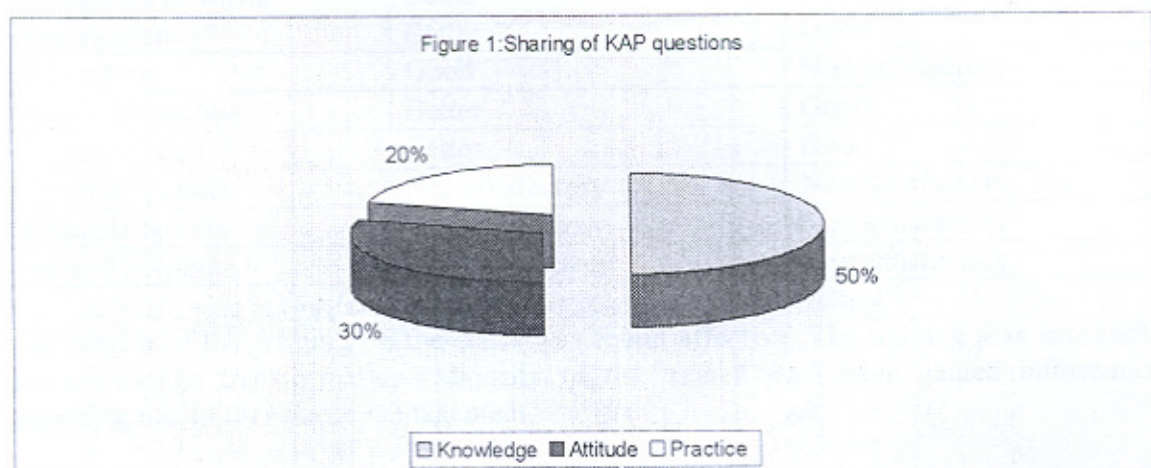
The training was provided for the total 23 health care institutions of Kathmandu valley including Dhulikhel hospital. For the impact assessment, 43% of these health care institutions were selected for sampling.

The impacts of the training are classified into two categories, which are as follows:

- Impact on the staff and
- Impact on the institution

### 4.1 Impact on the staff

To evaluate the impact of the training on the staff of the institution, a KAP study was conducted within trained and non-trained staff of the same HCI, which could help to compare the knowledge, attitude and practice of the trained and non-trained staff. For the assessment, total 40 questions were used with both trained and non-trained staff.



#### 4.1.1 Knowledge

To identify the impact of the training on the knowledge of the staffs, questions were asked with both trained and non-trained staff of same health care institution. The following situations were observed during the field visit. For detail information see annex VI.

Table 1: Knowledge of the trained & non-trained staff of the HCIs

Topics related to	Knowledge of the staffs of HCIs	
	Trained staff (%)	Non-trained staff (%)
Hazardous waste	90	60
Importance of segregation	70	50
Colour coding system	100	60
Exposure risk	60	10
Health safety	90	80
Definition of Treatment	100	90

Mechanism of incineration	30	10
Limitation of autoclave	40	20
Meaning of disposal	50	30
Methods of disposal	50	50
Record keeping	50	50

The above table gives the general picture of the knowledge of the trained and non-trained staff of the health care institutions. These above information shows that the staffs have only partial knowledge & do not have complete information of the related area, although the impact of the training looks effective to increase the knowledge of the staff. It shows that knowledge on categories of waste, segregation, colour coding, health safety and collection seems better in comparison to the knowledge on treatment option, disposal facility and record keeping.

On the base of the survey, the following situation of knowledge was differentiated between trained and non-trained staffs. Here, the level of knowledge was divided into three categories i.e. *better*, *good* and *not satisfactory*. Better means knowledge having more than 60% of the questions asked, good means around 55% and less than 50% is allocated as not satisfactory. This is the initial rating criterion and it should be improved gradually in the future.

Table2: Knowledge of staff

Parameters	Trained staff	Non trained staff
Categories of waste	Better	Good
Segregation	Better	Good
Collection	Good	Non satisfactory
Safety precaution	Better	Good
Transportation	Better	Good
Treatment options	Not satisfactory	Non satisfactory
Disposal facility	Not satisfactory	Non satisfactory
Record keeping	Non satisfactory	Non satisfactory

The impact of the training on the staffs was found effective. The training was successful for knowledge transformation. Majority of the trained staff have gained information regarding health care waste management.

Figure 2: Level of Knowledge





#### 4.1.2 Attitude

To identify the attitudinal differences, attitudes related questions were asked with the trained and non-trained staff of the same health care institution. The result of the survey is described in the following table. For detail information see annex VII.

Table 3: Attitude of the staff of HCIs

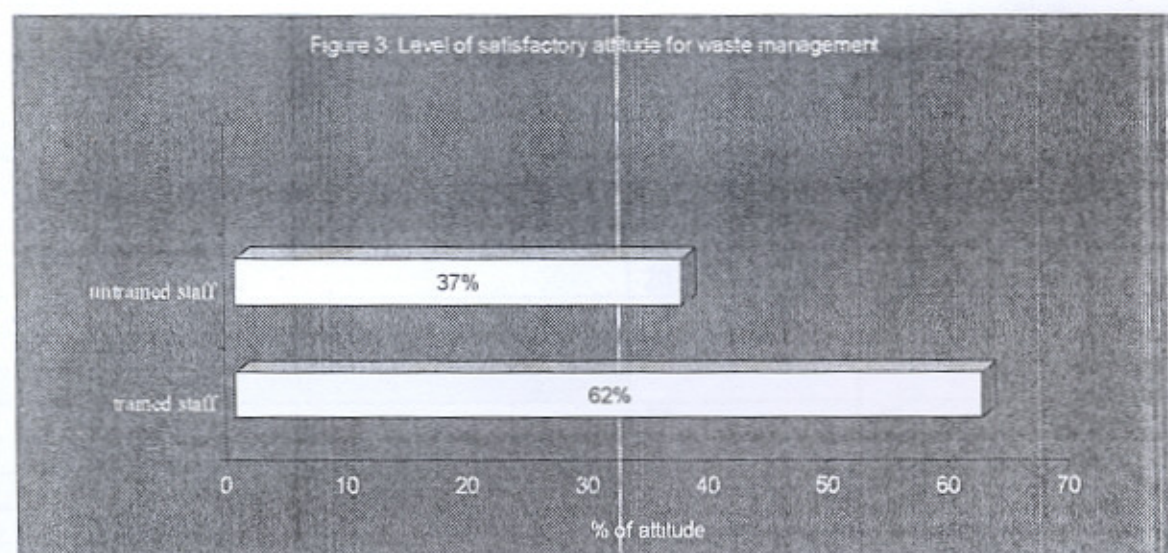
Related activities	% of HCIs with positive attitude	
	Trained staff	Non trained staff
Segregation	100	60
Necessity of vaccination	100	80
Treatment before disposal	90	80
Need of incineration	100	80
Need of improvement on disposal system	70	90
Necessity of training	100	100
Need of improvement on present HCWM situation	80	60

Attitudinal difference was observed on the trained and non-trained staff of the same health care institution. After getting the training, attitude of the staff seems changed for betterment. On the basis of the survey following conclusion was derived.

Table 4: Attitudinal variations of HCW management staff

Parameters	Trained staff	Non trained staff
Categorization of waste	Better	Good
Segregation	Good	Good
Collection system	Not satisfactory	Not satisfactory
Safety precaution	Better	Good
Transportation	Not satisfactory	Not satisfactory
Treatment system	Good	Not satisfactory
Disposal	Not satisfactory	Not satisfactory
Record keeping	Good	Not satisfactory

The willingness of the trained staff for implementation of their knowledge was increased. Although, their motivation could not materialized properly because of some limitation of the staff, they seem eager for positive changes.





### 4.1.3 Practice

For the assessment of the practice situation by the staff, related questions were asked with both trained and non-trained staff. The situation observed is given in the following table. For detail see annex VIII.

Table 5: Practices in the HCIs

Parameters	Practice by staff in %	
	Trained staff	Non trained staff
<b>Segregation categories</b>		
Infectious	100	80
Pathological	0	0
Sharps	90	60
Chemical	0	0
Radio active	0	0
Anatomic	30	30
General	100	80
Other	10	10
Do not know	0	10
<b>Colour coding system</b>		
Yes	70	60
No	30	40
<b>Health safety precaution</b>		
Vaccine	80	40
Mask	80	60
Gloves	80	80
Apron	60	50
Boots	50	20
No facility	10	10
<b>Treatment method</b>		
Incinerator	60	40
Autoclave	60	40
Microwave	0	0
Chemical disinfections	40	30
Dumping	0	40
<b>Disposal method</b>		
Sanitary landfill	0	30
Burial	20	40
Inertisation	10	0
Encapsulation	10	10
Municipal container	90	80
Private sector	20	0
<b>Record keeping including</b>		
Quantity of waste	30	60
Cost of management	60	30
Cost of labour & materials	30	30
Cost of maintenance	20	20
Cost of contractor service	40	30
Do not know	20	20
<b>Training facility</b>		
Yes	50	40
No	50	60
<b>Changes done</b>		-
Collection	80	40
Segregation	90	30
Transportation	30	10



Treatment	70	40
Disposal	40	20
Health safety	60	40
Non	0	10

Implementation side of their knowledge was very weak. Although they have awareness about health care waste management, they were unable to use their knowledge. In spite of all, some changes were observed. The trainees were head of their unit and their decision has to follow by other non-trainee staff also. So the practice of HCW management by both trained and non-trained categories of staff was very much similar. It shows that if we will success to change the attitude and behave of one staff especially head of unit of a HCI, It will help to improve the HCWM system in some extent. By the information of the above table, following result was concluded.

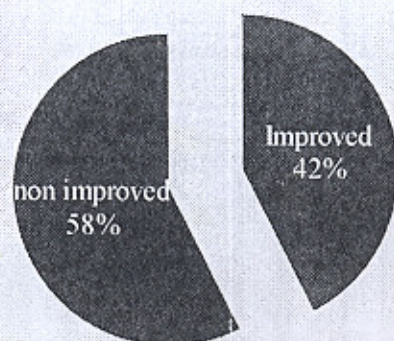
Table 6: Practice situation of HCWM by the trained & untrained staff

Parameters	Trained staff	Non trained staff
Segregation	Good	Good
Collection system	Good	Good
Safety precaution	Good	Good
Transportation	Not satisfactory	Not satisfactory
Treatment system	Not satisfactory	Not satisfactory
Disposal	Not satisfactory	Not satisfactory
Record keeping	Not satisfactory	Not satisfactory

After all, the implementation of knowledge for the better management of healthcare waste was very poor. Both trained and untrained staffs were unable to implement changes according to their knowledge.

Some changes were observed on segregation, collection and safety precautions in some health care institutions while on the transportation, treatment, disposal and record keeping system had observed no impact. In case of practice there was not much difference between trained and non-trained staff. So the impact of the training on practice was all most same by both trained and non-trained staff.

Fig 4: Impact on the practice



Although the improvement was shown 42% in practice, there was some room for further improvement within this improved area.



It was observed that the trained staffs have better knowledge regarding types of waste, its hazardousness, collection, transportation and health protective methods. The treatment and disposal side looked weak in the trained personal also. They had willingness for positive changes but not materializing the knowledge they gained. Some of the reason for this situation was beyond the capacity of the trained and non-trained staff.

## 4.2 Impact on the Institution

All hospital personnel, including senior medical doctors, should be convinced of the need for a comprehensive health care waste management policy and the related training, and of its value for the health and safety of all. This should ensure their collaboration in the implementation of such a policy.

The impact on the institution was assessed by comparing present situation with past system of waste management of health care institution. There were observed some changes on the health care waste management trend during 2002 to 2005.

To identify the impact of the training on the management of HCW in the institution, some following factors were selected and within these factors the impact was measured. The variation of management activities before and after the training was considered as an impact of the training.

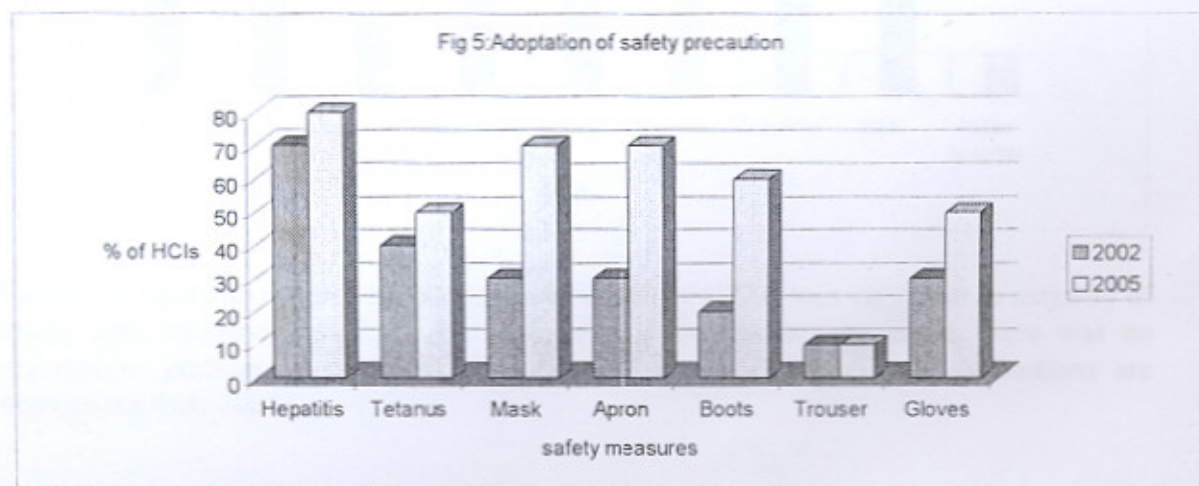
### 4.2.1 Staff

It was tried to find out the situation of the staff of waste management section. The aim of this point was to identify the number of staff, their health safety, and availability of related training. The following information was derived during the field visit. For detail see annex IX.

Table 7: Information related to the staff

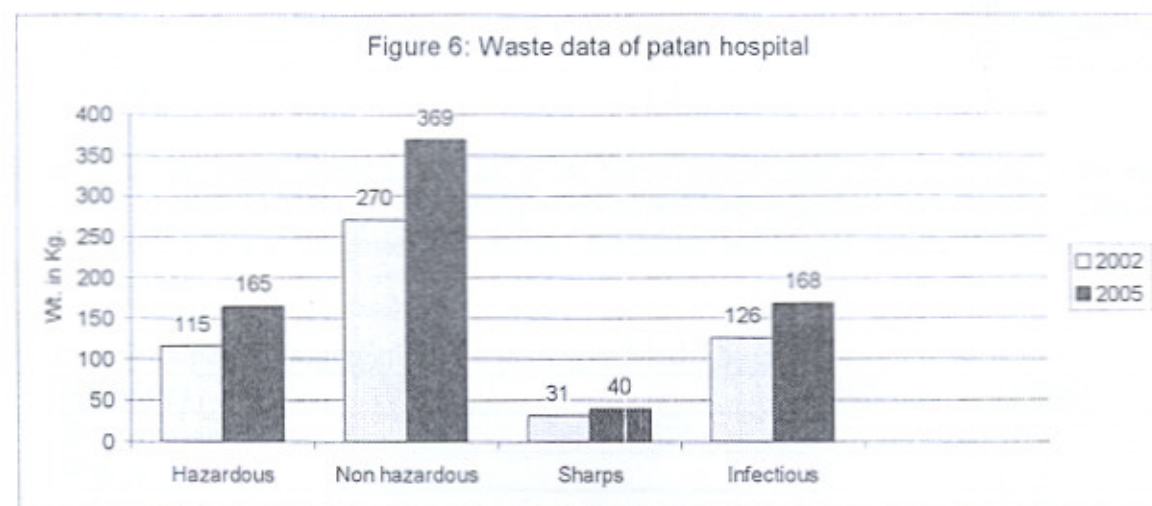
Activities	2002	2005
Availability of training (in % of HCIs)	30	60
Total no. of training conducted	8	12
Vaccinated HCIs (in %)	70	90

In the above table the training means out door as well as in hospital refreshment training. Similarly in the figure below is showing the health safety adopted by various health care institutions during 2002 to 2005.



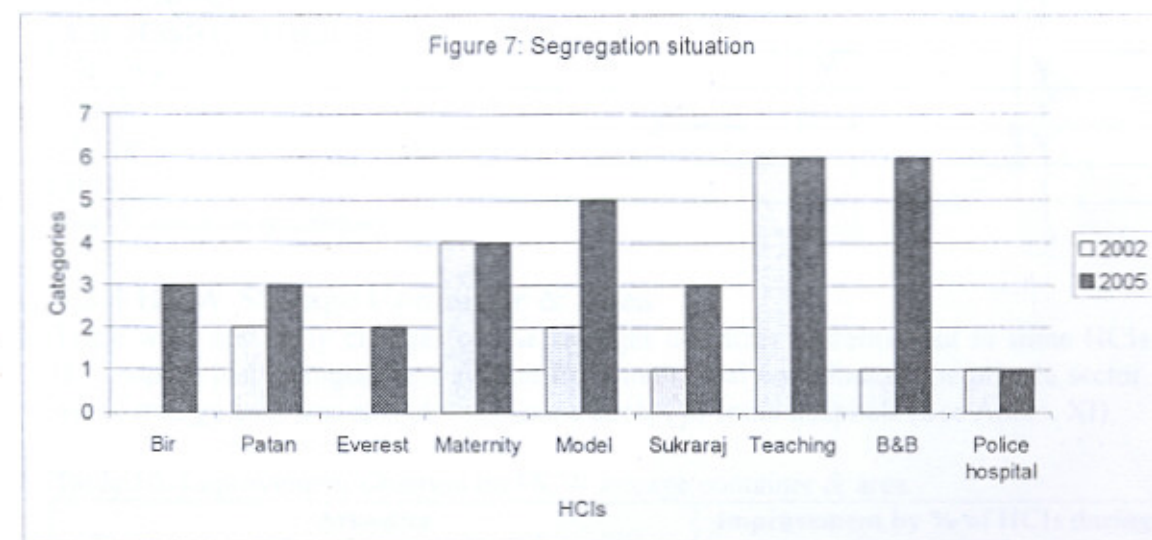
## 4.2.2 HCW Generation

Although the waste generation has no direct relation with the training of the staffs, there might be slight changes on the mode and composition of waste due to the improvement in segregation, collection and use of equipments etc. Generally the volume of the waste had increased due to the increasing of the patients and the capacity of the health care institutions. Majority of HCIs had not mentioned about the waste generating in their institution due to lack of the record keeping facility.



## 4.2.3 HCW Segregation and Handling

One of the main focused sectors of the training was on the segregation and handling of the waste generating inside the health care institutions. Following changes were identified on segregation and handling of the waste. For detail information see annex X.



The above figure shows that the segregation situation in 2002 was very poor in majority of health care institution, while in Bir hospital and Everest nursing home; there was no segregation practice at that time. But now all most all health care institutions are segregating their waste.



Table 8: Situation of health safety precautions

Precaution measures	% Of HCIs adopting	
	2002	2005
Hepatitis	70	80
Tetanus	40	50
Mask	30	70
Apron	30	70
Boots	20	60
Trouser	10	10
Gloves	30	50

Kathmandu Model hospital had achieved better improvement on segregation during the period of 2002 to 2005. TU Teaching hospital had best practice of segregation. They were segregating in six categories i.e. sharps, infectious, anatomical, pharmaceutical, chemical and radioactive.

Table9: Impact on segregation &amp; handling at Model hospital

Activities	2002	2005
<b>Segregation</b>		
Sharps	Y	Y
Infectious	Y	Y
Anatomic		Y
Radioactive		Y
General		Y
<b>Types of syringe using</b>		
Disposable	Y	Y
Sterilized	Y	Y
Auto disable		Y
<b>Use of safety measures</b>		
Glovers	Y	Y
Mask		Y
Aprons		Y
Boots		Y

Note: Y means yes (practicing)

#### 4.2.4 HCW Storage Container & Area

There were not many changes on the storages container systems. But in some HCIs like Bir hospital had changed their system from municipal container to the private sector. The waste storage area was also all most same except in some hospitals (See Annex XI).

Table 10: Improvement situation on HCW storage container &amp; area

Activities	Improvement by % of HCIs during 2002 to 2005
Specific container used for waste collection	20
Colour coding system	30
Area specification for waste	30
Making and adopting rules	10



#### 4.2.5 Collections and Onsite/Offsite Transportation

In the collection of waste some changes had appeared in comparison to the past situation. Onsite transportation had some improvement like health safety, covered movement of waste etc.

Offsite transportation was very much similar of the past system. Majority of hospitals were handing over the waste to the municipal container or to the private sectors (See Annex XII).

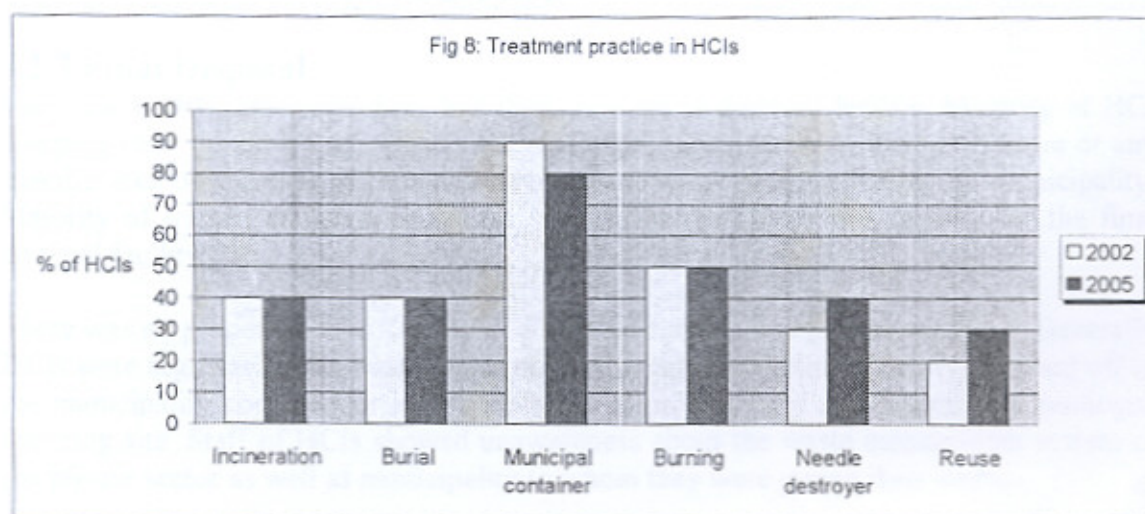
Table 11: Collection & offside transportation of waste

Activities	Adopting HCIs (%)	
	2002	2005
Use of closed device	30	60
Collection frequency (3 times/day)	30	50
Injury case reported	40	50
Off side transportation by municipality	90	70

#### 4.2.6 Treatment

The situation of health care waste treatment had not drastically changed. Although the level of knowledge of the importance and availability of technology had increased, it was not found any radical changes on the treatment adoption (see annex: XIII).

Generally, the majority of the visited hospital had no any means of facility for the treatment of waste and also not any system of central treatment facility outside of HCIs. The reason behind it was not lack of awareness and knowledge but due to the unavailability of the facility as well as insufficient budget allocation and lack of feeling of responsibility on waste management. It was observed that in private hospitals, there was good facility for health treatment but no system of proper treatment of waste. It shows that the hospital managing committee had not showing much interest on proper management of waste. In case of government hospital, there was always budget lacking for management of waste and government was also not giving sufficient attention on management of hazardous health care waste. So in case of treatment of waste only training was not sufficient. All HCIs were using autoclave only for the sterilization of reusable instruments.





Majority of the health care institutions were handing over their waste to the municipality or private waste collector without any treatment. Some hospitals were burning some specific waste like sharp while some have needle destroyer. While very few have burial space and incineration facility for limited waste only. Incineration was practicing with mixed waste. But no changes on their past activities were seen on waste treatment.

Table 12: Treatment practice for various types of waste

Types of waste	Adopted alternatives for treatment	% of HCIs adopted the facility	
		2002	2005
<b>General waste</b>			
	Drop in municipal container	90	80
	Reuse	20	30
<b>Sharp</b>			
	Drop in municipal container	30	10
	Needle destroyer	30	50
	Burning	10	20
<b>Infectious</b>			
	Drop in municipal container	30	20
	Burning	30	30
	Incineration	40	40
	Handover to private party	0	10
<b>Anatomic</b>			
	Incineration	40	50
	Burial	30	30
	Drop in municipal container	10	0
	Burning	10	10
<b>Pharmaceutical</b>			
	Drop in municipal container	30	20
	Burial	30	40
	Incineration	40	40
	Handover to private party	0	10
<b>Chemical</b>			
	Drop in municipal container	10	10
	Burial	30	30
	Incineration	20	20
	Flush into toilet	10	10

#### 4.2.7 Final Disposal

Very few health care institutions had their own waste disposal facility. Majority of HCI dumping their mixed waste either in the municipal container or in their own drum or any specific area on the side of the road. Then, these waste were collecting by municipality. Majority of trained staffs of HCIs had same view that space was lacking for the final disposal facility.

There was no proper disposal facility in all the visited hospital (see annex XIV). Generally HCIs were segregating the waste inside the health care institution & finally disposed off in the municipality container or in the container of private party and goes to the municipal dumping site. Staff of HCIs showed unawareness about the waste management system of the private sector as well as municipality to whom they were giving their waste.

Table 13: Disposal facility of HCIs

Disposal facilities	HCIs (%)	
	2002	2005
Available of facility	30	30
Onsite facility (within HCI)	20	20
Offsite facility (outside of HCI)	10	10
Roadside dumping (municipal service)	90	90
Burial	10	10

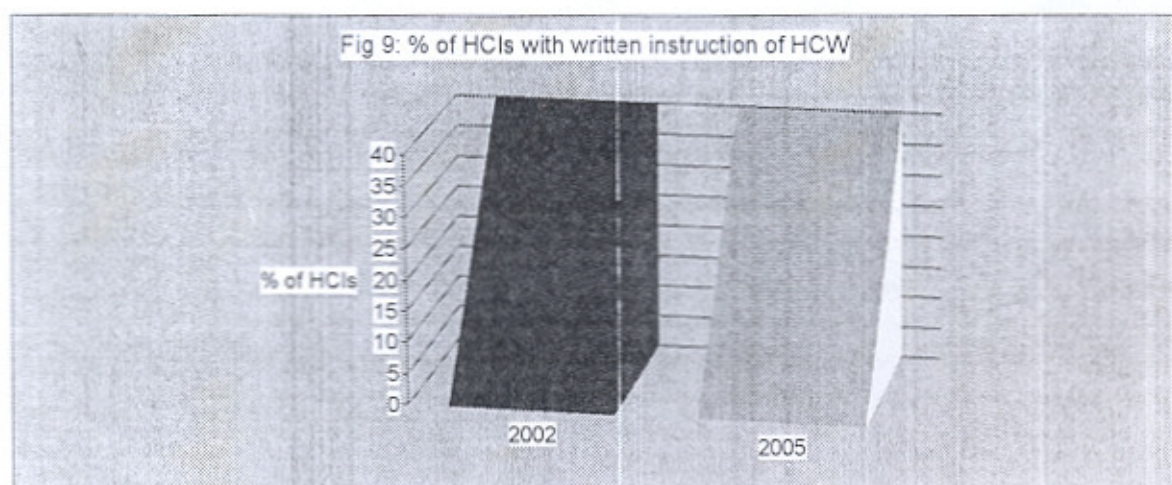
#### 4.2.8 HCWM Regulation

The intensity of making some written instructions of HCWM had increased on the staff. They had desire to get such instruction written in a big paper and wants to paste on the walls of the hospital to make staffs as well as visitors familiar with hazard ness and health safety from medical waste. Very few of the health care institutions had such instructions on their hospital.

Table 14: Instructions related to HCWM written in the HCIs

HCIs	Instructions written	
	2002	2005
Patan Hospital	Yes	Yes
Model Hospital	No	No
Bir Hospital	No	No
B&B Hospital	No	No
Maternity Hospital	Yes	Yes
N. Eye Hospital	Yes	Yes
Police Hospital	No	No
Sukraraj Hospital	No	No
Everest N. Home	No	No
Teaching Hospital	Yes	Yes

There was not seen any changes from 2002 to 2005 in the health care waste management regulation.





#### 4.2.9 Policy and Budget

Before such training of HCWM, the staffs of HCIs had no idea about the importance of the HCW management. But now they are sensitised by the training and now feeling the lack of the budget for proper management of the waste. But even today they do not know how much percent of the total budget is allocating for the waste management.

Table 15: Impact on policy & budget

HCIs	Is budget sufficient?	
	2002	2005
Patan hospital	Y	N
Model hospital	Dk	N
Bir hospital	N	Y
B&B hospital	Y	Y
Maternity hospital	N	N
N. Eye hospital	Y	Y
Police hospital	N	N
Sukraraj tropical disease hospital	N	N
Everest nursing home	N	N
T.U. Teaching hospital	Y	Y

Note: Y-Yes; N-No; Dk-Do not know

#### 4.2.10 Sanitation and Wastewater

It was observed that hospitals had sufficient toilet facility but with very poor condition. Even in some good hospitals the sanitation standard of the toilet was unsatisfactory for the visitors. Although it might be different section that of waste management of the hospital, it was also affecting the over all sanitation of the hospital and health of the hospital staff as well as the visitors. The wastewaters of the hospitals were mixing with city drainage system without any treatment and such drainages were connected with river like Bagmati. So it was realised that the wastewater treatment before disposing with other system had a similar importance on the environmental point of view. There was a need of some initiation on this matter.

Table 16: Sanitation system

HCIs	Availability of sufficient facility of toilet		Connection of Sewerage system	
	2002	2005	2002	2005
Patan hospital	Y	Y	Cd	Cd
Model hospital	N	Y	Cd	Cd
Bir hospital	-	-	Cd	Cd
B&B hospital	Y	Y	Cd	Cd
Maternity hospital	Y	Y	Cd	Cd
N. Eye hospital	N	N	Cd	Cd
Police hospital	Y	Y	Cd	Cd
Sukraraj hospital	Y	Y	Cd	Cd
Everest N. Home	Y	Y	Cd	Cd
Teaching hospital	Y	Y	Cd	Cd

Note: N-No; Y-Yes; Cd- City drainage

#### 4.2.11 Record Keeping

The record keeping facility was not properly developed in all the hospitals. But some hospitals like Model hospital had developed their record keeping system of waste

generation, collection and management. It was realised that the record-keeping format should be developed in a similar format to all the hospital as an umbrella concept.

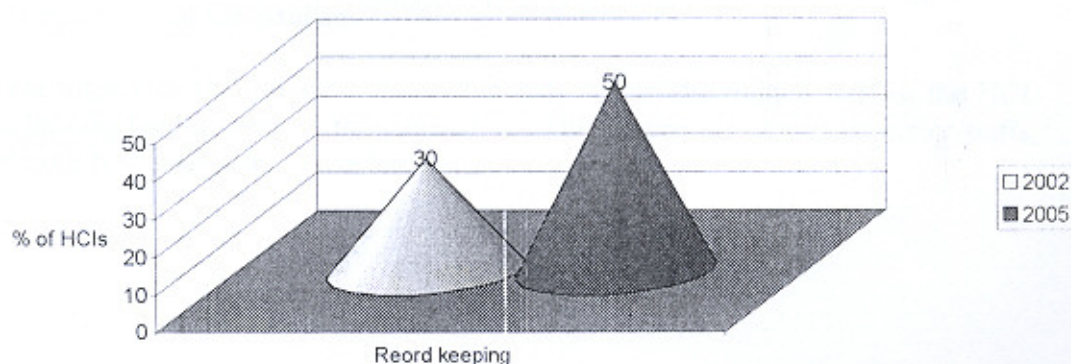
Table 17: Record keeping facility

HCIs	Availability of record keeping of HCWM		Record includes	
	2002	2005	2002	2005
Patan hospital	Y	Y	5 items	6 items
Model hospital	N	Y	N	6 items
Bir hospital	N	N	N	N
B&B hospital	N	Y	N	3 item
Maternity hospital	N	N	N	N
N. Eye hospital	Y	Y	1 item	2 item
Police hospital	N	N	N	N
Sukraraj tropical disease hospital	N	N	N	N
Everest N. home	N	N	N	N
T.U. Teaching hospital	Y	Y	6 items	6 items

Note: Y-Yes; N-No; Seg-Segregation; 1 item – no. of staffs; 2 item – waste amount; 3 item – staffs, segregated waste  
 5 items-segregated amount, collected & transported waste, staffs, accidents, materials required/used  
 6 items - segregated amount, collected & transported waste, staffs, accidents, materials required/used and total amount of waste

The above table shows that the record keeping facility was developed only in Patan hospital, Model hospital, B&B hospital, Nepal Eye hospital and TU teaching hospital. But the record they were keeping was not sufficient and there was need of further improvement.

Fig 10: Record keeping facility of HCIs



Overall the modifications were limited only on the handling of waste within the health care institution. For example improvement was experienced on segregation, collection, handling, transportation and health safety precautions, while in the treatment, off site transportation, disposal, record keeping etc had not seen any positive improvement because the improvement on these bigger area was beyond the capacity of the waste management staff in some extent.



Table 18: Impact on various stages of waste management

Parameters	Impacts observed during 2002 to 2005
Training facility	No
Vaccination	Yes
No. of staff	Yes
Segregation	Yes
Safety equipment	Yes
Waste container	Yes
Colour coding system	Yes
Onsite transportation	Yes
Off site transportation	No
Treatment	No
Final disposal	No
Management regulation	No
Policy and budget	No
Sanitation & waste water	No
Record keeping	No

### 4.3 Limitations of the Impact

The training had a positive impact on the target group and the health care institutions where they involved. A comparative study was conducted to evaluate past and present condition of waste management situation. According to the past trainee, they have gained lot of information regarding various issues of HCWM. But it is observed that their tendency for betterment is not so strong as their knowledge and they were able to do only minimal improvement in HCWM after the training. There might be various reasons behind this situation. Some of the reasons were as follows:

- Lack of facility
- Lack of rules and regulation.
- Lack of decision-making power with the waste manager of HCIs.
- Infrastructure and budget lacking.
- Lack of enforcement mechanism.

The positive impact of the training was limited only within the trained staff of the HCI. There was lacking the information transformation to the newcomer as well as junior staffs, who were more responsible for waste handling.

## 5.0 Conclusion

The main objective of the study was to find the impact of the past training. For the identification of the impact, two major parameters were chosen i.e. staff and institution. For the staff, a KAP study was conducted while comparative study had done for the waste management practice analysis on the institution.

The training was provided for 23 health care institutions. For the assessment of the impact 10 health care institutions were selected as a sampling. These 10 health care institutions including government hospital, teaching hospital, private nursing home, some specific hospitals like eye hospital, maternity hospital and missionary hospital were selected.

The training was successful for the knowledge transformation to the staff of the health care institutions. Basically the knowledge related to the types of waste, segregation categories, collection system, onsite transportation and health safety precautions were found improved, while about offsite transportation, treatment facility, final disposal options and the system of record keeping sector were observed poor.

Attitude of the staff for the betterment on the management of waste was also increased with trained staff of the institutions. But the willingness was limited within handling of the waste because for the complete management of waste there was required other things also which were beyond the reach of the trained staff.

The implementation part was poorest of all because of the following reason:

- Lack of budget.
- Lack of the sufficient area.
- Unavailability of the facility.
- Due to the lack of the commitment of decision-making authority of health care institution.
- Similarly policy, guideline and rules & regulation were also lacking.

All most staffs were found highly interested for the training. In their opinion it helps to update the knowledge as well as encourage for the improvement of the situation. It also helps to provide the in hospital refreshment training for the new staff of the waste management unit.

In future the training should be more rigorous and it should include as much as possible health care institution as well as overall complete health care waste management system.



## 6.0 Recommendations

On the conclusion of the study there were some recommendations for the improvement of the situations, which were as follows:

- Staffs of waste management section of health care institutions had high desire for the training. They wanted such types of training continuously every year. So there should be such facility available for regular training.
- Training should be more rigorous with effective training module as well as promotion materials, posters & pamphlets.
- Training module should include specific system of segregation, collection, transportation, treatment, disposal and a similar format of record keeping system to adopt umbrella concept for all HCIs.
- Training should be focused in on hand practice i.e. there should be practical training in health care institution so that trainee can get more knowledge.
- Training should give more emphasis on the suitable and available treatment facility; record keeping system and disposal options for various categories of waste in the context of the country.
- There is required some awareness and information related notice/poster in the health care institution.
- Waste handling related instruction is required in the hospital to remind for the waste handlers as well as visitors.
- Training should also be focused for decision makers of health care institution as well as to the related government authority for prompt decision.
- Such training should be provided for the waste transporters i.e. municipal/private sectors staff also for their health safety as well as for proper transportation of the waste.

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## Annexes

### Annex I: Questionnaire for the KAP Study of Staff

1. Name of institution:

2. Name of Interviewee:

3. Trainee [ ] Non trainee [ ]

Q. no.	Question	Possible options	Answer	Remarks
1	How much quantity of waste is generating in your HCI?			
2	What are hazardous wastes?	Infectious waste Pathological waste Sharps Pharmaceutical waste Genotoxic waste Chemical waste Waste with heavy metal content Pressurized container Radio active All generated waste Other Don't know		
3	Why segregation of waste is necessary?	To manage waste properly To minimize the possible health risk To minimize the volume of hazardous waste Easy to treat / dispose Other specific Do not know		
4	In how many categories waste should be segregated?	Infectious & normal Infectious-sharp-normal Sharp-anatomic-no hazardous-green-infectious Other Do not know		
5	In which category are you segregating?	Infectious & normal Infectious-sharp-normal Sharp-anatomic-no hazardous-green-infectious Other Do not know		
6	Is there colour-coding system necessary?	Yes No		
7	Which colour-coded container should be used for hazardous waste?	Red		

		Yellow		
		Black		
		Other		
		Do not know		
8	Do you have such system?			
		Yes		
		No		
9	Who is at the risk of HCW?			
		Waste collector		
		Waste transporters		
		All HCI staff		
		Waste handlers		
10	What are safety precautions for waste handlers?			
		Vaccine		
		Mask		
		Gloves		
		Apron		
		Boots		
		Other		
		Do not know		
11	What precaution have you adopted?			
		Vaccine		
		Mask		
		Gloves		
		Apron		
		Boots		
		Other		
		Do not know		
12	Why vaccination for waste handlers?			
		Prevent many diseases		
		Prevent Hepatitis		
		Prevent tetanus		
		Other		
13	Is vaccination necessary?			
		Yes		
		No		
14	What do you understand by treatment?			
		Making safe		
		Minimizing volume		
		Proper management		
		Making non hazardous		
15	What are the options for treatment of waste?			
		Incineration		
		Autoclave		
		Hydroclave		
		Microwave		
		Chemical disinfections		
16	Is a single method sufficient for all types of waste?			
		Yes		
		No		
17	Is treatment before disposal required?			
		Yes		
		No		
18	Which method are you using?			
		Incineration		
		Autoclave		
		Hydroclave		



		Microwave		
		Chemical disinfections		
		Other		
19	What is the mechanism of incineration?	Burning of waste		
		Decreasing the volume		
		Making non hazardous		
		Other		
		Do not know		
20	What are demerits of incineration?	Toxic ash production		
		Air pollution		
		Not suitable for hazardous waste		
		Not suitable for plastic waste		
		Other		
21	Do you feel incinerator is required for HCWM?	Yes		
		No		
		Do not know		
22	What are limitations of autoclave?	Do not minimize the volume of waste		
		Not suitable for anatomic waste		
		Not suitable for pharmaceutical waste		
		It is useful only for reusable equipments		
		Other		
		Do not know		
23	What do you mean by final disposal?	Throwing of waste out of HCl		
		Burring		
		Land filling		
		Dumping in municipality container		
		Other		
24	What are disposal methods?	Sanitary landfill		
		Burial		
		Encapsulation		
		Inertisation		
		Dumping in municipality container		
		Other		
25	Are you willing any changes on disposal of waste?	Yes		
		No		
26	Which method is applying in your HCl?	Sanitary landfill		

		Burial		
		Encapsulation		
		Inertisation		
		Dumping in municipality container		
		Private sector		
		Other		
27	Is it appropriate method?			
		Yes		
		No		
		Do not know		
28	If no, what is obstacle for betterment?			
		Lack of commitment		
		Financial obstacle		
		Lack of enforcing rules		
		Lack of decision making power		
		Lacking the willingness of head of HCI		
		Other		
		Do not know		
29	What is the role of record keeping in HCWM?			
		It provides the required data		
		It helps to analysis the waste management position		
		Other		
		Do not know		
30	What types of information should be included in record keeping system?			
		Amount of waste generated in each department		
		Cost for collection, transportation, storage, treatment and disposal		
		Cost for labour and materials		
		Cost of repair and maintenance of technologies		
		Cost for contractor service		
		Other		
		Do not know		
31	What is your practice on record keeping?			
		Amount of waste generated in each department		
		Cost for collection, transportation, storage, treatment and disposal		



		Cost for labour and materials		
		Cost of repair and maintenance of technologies		
		Cost for contractor service		
		Other		
		Do not know		
32	Is there any training facility of HCW handlers?	Yes		
		No		
33	Is training necessary for HCW manager?	Yes		
		No		
34	If yes, how it is useful?	It gives new information		
		It reminds any things		
		It encourages for commitment		
		It gives mental pressure for occupational safety and health hazards		
35	Are you getting or providing training?	Yes		
		No		
		Other		
36	Are you satisfied with HCWM situation of your institution?	Yes		
		No		
37	If no, what do you require for betterment?	Knowledge		
		Commitment		
		Facility		
		Budget		
		Other		
		Do not know		
38	What is important for HCWM?	Training		
		Enforcement rules		
		Facility		
		Budget		
		Commitment of senior decision maker in HCl.		
39	Are you willing for this?	Yes		
		No		
40	If yes, have you done any changes?	In collection		
		Segregation		
		Transportation		
		Treatment		
		Disposal		
		Health safety		
		Other		

## Annex II: Health Care Institution based questionnaire

Name of HCI:

Date of survey:

Name of interviewee:

Designation:

Trained | | non trained | |

Topics	Question	Possible options	Situation in	
			2002	2005
Staff	Is training of medical staff available regarding HCWM?	Yes		
		No		
	If yes what kind of training?	Waste collection		
		Handling		
		Exposure risk		
		Health safety		
		Treatment		
		Disposal		
		Others		
	How many training has organised?	One		
		Two		
		Three		
		Four		
		No		
Do you vaccinated?	Hepatitis			
	Tetanus			
	Other			
	No			
How many staff is there on HCWM?				
HCW generation	Do you have any figure of waste generation?	Yes		
		No		
	If yes how many quantities?	No data		
		Non hazardous		
		Sharps		
		Infectious		
		Anatomic		
		Pharmaceutical		
		Chemical		
		Radioactive		
HCW segregation & handling	Into which category are HCW separated?	No segregation		
		Sharps		
		Infectious		
		Anatomical		
		Pharmaceutical		
		Chemical		
		Radioactive		
		Others		
	What types of syringe do you use?	Disposable		
		Sterilisable		
		Auto disable		
		Safety syringe		
	Which equipment does the waste handling staff using?			



		Mask		
		Apron		
		Boots		
		Trouser		
		No		
HCW storage container	What kind of container do you use?	Plastic		
		Metallic		
		Cardboard		
		Bag		
		Box		
		Other		
		No specific		
HCW storage container	Do you have specific colour coding system?	Yellow		
		Red		
		Blue		
		Black		
		Green		
		No specific		
HCW storage area	Do you have a specific area for HCW?	Yes		
		No		
	Is the area only accessible for authorized person?	Yes		
		No		
		Do not know		
	Is waste stored according to the specific rules?	Yes		
No				
HCW collection & onsite transportation	What kind of means do you use?	Open device		
		Closed device		
		Other specific		
	Do you think the current practice offer enough safety?	Yes		
		No		
		Do not know		
	What is collection frequency per day?	Once		
		Twice		
		Thrice		
		Four time		
Five time				
How much injury case reported per month?	1-5 case			
	5-10 case			
	10-20 case			
	20-			
	Not reported			
	Do not know			
HCW off site transport	Who generally transport the HCW?	HCF		
		Municipality		
		Private sector		
		Other		
		Do not know		
	Are there any control measures?	Non		
		Transport form		

		Other specific			
HCW treatment	Is there any treatment facility available?	Non			
		Open burning			
		Incineration			
		Autoclave			
		Hydroplanes			
		Microwave			
		Chemical disinfections			
		Other			
	Is it onsite or off site?	On site			
		Off site			
	What is the capacity of the facility?	Do not know			
		Kg/day			
	Any operation problem, if so for what reason?	No problem			
		Economic problem			
		Maintenance problem			
		Spare parts problem			
		Public opposition			
		Any other			
	How domestic waste is treated?	Recycled			
		Reuse			
		Handover to private sector			
		Municipality			
		Other			
	How sharp is treated?	Autoclaving			
		Burning			
		Incineration			
		Micro waving			
		Hydroclaving			
Using needle destroyed					
Dump in municipal container					
Handover to private sector					
How infectious waste is treated?	Other				
	Autoclaving				
	Burning				
	Incineration				
	Micro waving				
	Hydroclaving				
	Chemical disinfections				
	Dump in municipal container				
How anatomic waste is treated?	Handover to private sector				
	Other				
	Autoclaving				



		Burning		
		Incineration		
		Micro waving		
		Hydroclaving		
		Chemical disinfections		
		Dump in municipal container		
		Handover to private sector		
		Other		
	<b>How pharmaceutical waste is treated?</b>			
		Autoclaving		
		Burning		
		Incineration		
		Micro waving		
		Hydroclaving		
		Buried		
		Dump in municipal container		
		Handover to private sector		
		Other		
	<b>How chemical waste is treated?</b>			
		Autoclaving		
		Burning		
		Incineration		
		Micro waving		
		Hydroclaving		
		Buried		
		Dump in municipal container		
		Handover to private sector		
		Other		
	<b>Have you practicing waste recycling?</b>			
		Yes		
		No		
HCW final disposal	<b>Is there any final disposal facility available?</b>			
		Yes		
		No		
	<b>If yes, which types of facility?</b>			
		On site		
		Off site		
	<b>Which kind of disposal site is used for the HCW?</b>			
		Open dump		
		Sanitary landfill		
		Small burial		
	Other			
	Non			
	<b>Is the area secured?</b>			
		Yes		
		No		
	<b>Where are the different types of HCW disposed of?</b>			
		Any specific area		
		Municipal disposal site		
		Private sector		
		Other		
HCWM regulation	<b>Are there displayed any written instruction?</b>			
		Yes		

Policy & budget	Do you think sufficient funds are allocated to HCWM?	No		
		Yes		
		No		
	Which % of the HCF budget is allocated for HCWM?	Do not know		
		Mention in %		
		Not available		
Sanitation and waste water	Do all patients have access toilet in the HCF?	Do not know		
		Not sufficient facility available		
	Where does the sewerage system lead?	Yes		
		Waste water treatment plant		
		Open water source		
		City drainage system		
Record keeping	Is there any record keeping facility of HCWM?	Other		
		Do not know		
		Yes		
	What types of record is available?	No		
		Do not know		
		Total volume / amount		
Segregated amount				
Collection and transportation				
Waste handling staff				
Accident / injury				
Materials required / used				
Non				
Other				



**Annex III: List of health care institutions and staff selected for the study**

Name of the institutions	Name of the interviewee (trained)
Everest N. Home	Ms. Krishna Udash
Maternity hospital	Ms. Sharmila Ligal
Sukraraj hospital	Ms. Ambika Dhungana
Nepal eye hospital	Ms. Mira Sharma
Patan hospital	Ms. Bhunu Bhandary
B&B hospital	Ms. Ambika Basnet
Bir hospital	Ms. Sarita Shrestha
Model hospital	Ms. Bindu Gurung
Policy hospital	Ms. Mira Thapa
Teaching hospital	Ms. Nirala Chitrakar

**Annex IV: List of the participants of the first training**

Name	Institution	Designation
Neelam Maharya	Bir Hospital	
Sudha Vadhya	Bir Hospital	
Padma Tamrakar	Bir Hospital	Matron
Ishwari Shrestha	Bir Hospital	Sister
Tulsi Gurung	Bir Hospital	
Durga Shrestha	Bir Hospital	Sister
Parmila Dewan	Bir Hospital	Lecture
BB Pantha	Bir Hospital	Emergency Chief
Dr. Sanjaya Shrestha	Bir Hospital	Resident
Pushapa Chhetrapal	Bir Hospital	S/ nurse
Nirala Chitrakar	Teaching Hospital	Super vision
Laxmi Shrestha	Teaching Hospital	Director
Dr. KP Rajendra	Teku Hospital	Sr. Physician
Dr. LP Thapa	Teku Hospital	Section officer
Amar Amatya	Prasuti Hospital	Asst. matron
Sajana Ranjit	Prasuti Hospital	Asst. Professor
Durga Manandhar	Kathmandu medical college	Matron
Shree shanker Shrestha	Sahid Gangalal heart foundation	Dental surgeon
Ambika Shrestha	Om nursing home	Mat
Rishi Sapkata	Himal hospital	Administration
Chini Manandhar	Birendra police hospital	Officer
Nalindra Pradhan	Bir Hospital	Asst.
Bhagawati KC	Bir Hospital	Nursing staff
Urmila KC	Bir Hospital	Nursing staff
Rabiman Ghimire	Life care hospital	Manager of P.R.O
Hari prasad Sharma	MOH	Sectrial officer
Laxaman Malla	MOH	



**Annex V: List of the participants of the second training**

Name of participants	Designation	Institution	Address	Telephone
Ms. Purn maya Shrestha	System Incharge	Ayurved Hospital	Narddevi, Ktm	259182
Ms. Ambika Basnet	Matron	B&B Hospital	Satdobato	533205
Mr. Madhav p. Khanal	ENT surgeon	Bhaktpur hospital	Doodh pati	6610676
Ms. Sarita Shrestha	House keeping	Bir Hospital	Kathmandu	221119
Mr. Shiva raj Ghimire	Technician Captain	Army hospital	Chaunni	4272621
Mr. Mira Thapa		Police hospital	Pano Pokhari	4412630
Ms. Krishna Udash		Everest N. Home	New Baneshwore	4781294
Mr. Bachu Kailash Kaeni	Chief admin. Officer	Gangalal Heart hospital	Kathmandu	371374
Mr. Ramesh narshing K.C.		Kanti children hospital	Kathmandu	411140
Ms. Bindu Gurung	Matron	Kathmandu Model hospital	Bagbazar	250848
Ms. Sharmila Ligal	Matron	Maternity hospital	Thapathali	253275
Mr. Sitaram Ghimire	Planning officer	National TB hospital	Thimi	6630033
Ms. Mira Sharma	Matron	Nepal Eye Hospital	Tripureshwore	250691
Ms. Ambika Shrestha	Asst. Matron	Ohm nursing home	Chabahil	4476225
Mr. Madhav Dhungana	Maintance officer	Patan hospital	Patan	5521553
Ms. Ekta Bandana	Teacher	Peoples dental college	New Baneshwore	4358937
Ms. Ambika Dhungana	Sister	Sukraraj tropical diseases hospital	Teku	4253395
Ms. Deependra Chaudhari		Sarbanga hospital	Kopundole	
Ms. Nirmala chitrakar	Housekeeping	Teaching hospital	Maharaj gunj	4412404
Mr. Ajeebra singh Thapa	Engineer	Tilganga eye hospital	Gausala	493775
Ms. Sarmila Basnet		Dhulikhel hospital	Dhulikhel	011-61497
Mr. Milan Gurung	Administrative officer	Banepa hospital	Banepa	661111
Ms. Nati Maya	Asst. Matron	Bir hospital	Kathmandu	221119
Ms. Dharma devi Shrestha		Kanti children hospital	Maharaj gunj	414798
Ms. Krishna Prajapati	Nursing supervisor	Teaching hospital	Maharajgunj	4412404



Annex VI: Table of Knowledge of trained and non-trained staff of various HCIs

Hospitals	Bir II.		Everest N.H		Maternity H.		Sukraraj T.H.		Patan H.		B&B H.		TU Teaching H.		N. Eye H.		Police H.		Model H.	
	Tr	Nt	Tr	Nt	Tr	Nt	Tr	Nt	Tr	Nt	Tr	Nt	Tr	Nt	Tr	Nt	Tr	Nt	Tr	Nt
<b>Hazardous waste</b>																				
Infectious	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓		✓		✓	✓
Pathological	✓	✓	✓	✓	✓	✓	✓		✓		✓		✓	✓	✓				✓	✓
Sharps	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓				✓	✓
Pharmaceutical			✓		✓	✓			✓		✓		✓			✓	✓		✓	✓
Genotoxic			✓		✓		✓		✓				✓		✓				✓	✓
Chemical					✓	✓			✓	✓	✓		✓	✓		✓			✓	✓
Heavy metal									✓				✓						✓	✓
Radio active					✓				✓		✓		✓			✓			✓	✓
All waste								✓								✓				
<b>Importance of Segregation</b>																				
To manage waste	✓	✓			✓	✓	✓		✓	✓	✓		✓	✓	✓	✓			✓	✓
Minimize health risk	✓		✓				✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓
Minimize volume	✓	✓					✓		✓		✓		✓	✓	✓	✓		✓		✓
Easy to treat/dispose	✓	✓					✓	✓	✓	✓			✓	✓	✓	✓	✓		✓	✓
Do not know				✓																
<b>Colour coding system required</b>																				
Yes	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
No				✓															✓	
<b>Which colour for hazardous waste</b>																				
Red	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Yellow	✓		✓																	✓
Black		✓					✓													
Other			✓																	
Do not know				✓																✓
<b>Risk of waste to</b>																				
Waste collector	✓		✓		✓		✓		✓	✓	✓		✓	✓	✓	✓	✓		✓	✓
Waste transporters	✓						✓		✓	✓	✓		✓		✓				✓	✓
All staff		✓		✓	✓	✓	✓	✓		✓	✓	✓	✓		✓		✓		✓	✓
Waste generator							✓		✓						✓					✓
<b>Safety precautions</b>																				
Vaccine	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓
Mask	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓
Gloves	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Apron	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓
Boots	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓
Others							✓	✓					✓	✓						
<b>Why vaccination</b>																				
Prevent hepatitis		✓		✓	✓			✓	✓	✓			✓	✓		✓	✓		✓	✓
Prevent tetanus		✓		✓	✓			✓	✓	✓			✓						✓	✓
Prevent many disease	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓		✓
<b>Treatment means</b>																				
Making waste safe	✓	✓					✓	✓	✓	✓	✓	✓	✓	✓		✓		✓		✓
Volume minimization	✓						✓						✓	✓		✓				✓
Proper	✓					✓		✓			✓		✓	✓		✓				✓





waste management situation																				
Do not know				✓														✓		
<b>Important factor for HCWM</b>																				
Training		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓	✓
Rules & regulation	✓	✓			✓	✓		✓	✓	✓	✓							✓	✓	✓
Facility				✓			✓	✓	✓	✓	✓					✓			✓	✓
Budget			✓				✓	✓	✓	✓	✓					✓			✓	✓
Commitment			✓		✓		✓	✓	✓	✓	✓				✓				✓	✓

Note: Tr - Trained Staff, Nt - Non-Trained Staff.

✓ - Yes.

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**Annex VII: Table of Attitude of trained and non-trained staffs of various HCIs**

Hospitals	Bir H.		Eve N.H		Maternity H.		Sukrara j H.		Patan H.		B&B H.		Teachig H.		N. Eye H.		Police H.		Model H.	
	Tr	Nt	Tr	Nt	Tr	Nt	Tr	Nt	Tr	Nt	Tr	Nt	Tr	Nt	Tr	Nt	Tr	Nt	Tr	Nt
<b>Segregation categories</b>																				
Infectious	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pathological																				
Sharps	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓
Anatomic		✓											✓		✓					✓
General	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Do not know				✓																
<b>Necessity of vaccination</b>																				
Yes	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
No											✓				✓					
<b>Requirement of treatment before disposal</b>																				
Yes	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
No		✓											✓							
<b>Incineration is required for HCWM</b>																				
Yes	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓
No																				
Do not know												✓						✓		
<b>Willingness of changes on disposal system</b>																				
Yes			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
No													✓							
<b>Disposal method of your HCI is appropriate</b>																				
Yes			✓	✓							✓	✓	✓	✓	✓	✓		✓	✓	✓
No	✓	✓			✓	✓	✓	✓									✓	✓	✓	✓
Do not know									✓	✓										
<b>If no, improvement required on</b>																				
Commitment		✓			✓			✓												✓
Financially		✓			✓		✓													✓
Rules & regulation	✓	✓			✓				✓								✓		✓	✓
Decision making power of you	✓	✓							✓											
Willingness of head of HCI					✓	✓			✓									✓		
<b>Training required for HCW manager</b>																				
Yes	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
No																				
<b>Satisfied with HCWM situation of your HCI</b>																				
Yes				✓			✓				✓	✓	✓							
No	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓
<b>Willing to improve on present situation</b>																				
Yes	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
No																				

Note: Tr - Trained Staff, Nt - Non-Trained Staff.

✓ - Yes.



**Annex VIII: Table of Practice of HCWM by trained and non-trained staff of HCIs**

Hospital	Bir II.		Eve II.		Maternity H.		Sukraraj II.		Patan H.		B&B II.		Teaching H.		N. Eye		Police H.		Model H.	
	Tr	Nt	Tr	Nt	Tr	Nt	Tr	Nt	Tr	Nt	Tr	Nt	Tr	Nt	Tr	Nt	Tr	Nt	Tr	Nt
<b>Segregation categories</b>																				
Infectious	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Pathological																				
Sharps	✓	✓			✓		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓
Chemical																				
Radio active																				
Anatomic		✓			✓								✓	✓	✓	✓				✓
General	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Other												✓			✓					
Do not know				✓																
<b>Colour coding system</b>																				
Yes	✓	✓					✓	✓	✓	✓	✓	✓	✓	✓			✓		✓	✓
No			✓	✓	✓	✓									✓	✓		✓		
<b>Health safety precaution</b>																				
Vaccine	✓	✓	✓		✓				✓	✓	✓		✓	✓			✓		✓	✓
Mask	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓					✓	✓
Gloves	✓		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓
Apron	✓				✓		✓	✓	✓	✓			✓	✓		✓			✓	✓
Boots					✓		✓	✓			✓		✓	✓					✓	
No facility						✓										✓				
<b>Treatment method</b>																				
Incinerator					✓				✓	✓	✓		✓	✓			✓	✓	✓	✓
Autoclave	✓	✓	✓				✓	✓	✓	✓					✓				✓	✓
Microwave																				
Chemical disinfections			✓				✓	✓		✓			✓						✓	✓
Burning																				
Dumping				✓		✓				✓							✓			
<b>Disposal method</b>																				
Sanitary landfill		✓								✓		✓								
Burial		✓	✓							✓				✓	✓	✓				
Inertisation														✓						
Encapsulation															✓	✓				
Municipal container			✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Private sector	✓																			✓
<b>Record keeping</b>																				
Quantity of waste		✓						✓	✓	✓		✓	✓	✓					✓	✓
Cost of management	✓	✓			✓	✓		✓	✓		✓						✓		✓	✓
Cost of labour & materials	✓	✓							✓	✓									✓	✓
Cost of maintenance								✓	✓										✓	✓
Cost of contractor service	✓	✓							✓	✓						✓	✓			✓
Do not know			✓	✓			✓												✓	
<b>Training facility</b>																				
Yes		✓			✓		✓	✓	✓	✓	✓	✓	✓	✓						✓
No	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓
<b>Changes by you in</b>																				
Collection	✓				✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓
Segregation	✓		✓		✓		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓
Transportation								✓	✓				✓	✓		✓	✓		✓	✓
Treatment	✓		✓				✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓	✓
Disposal							✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓	✓
Health safety	✓						✓	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓
Non				✓																

Note: Tr - Trained Staff, Nt - Non-Trained Staff.

✓ - Yes



**Annex IX: Table of Information related to the staff**

Indicators →	Availability of training		No. of training gained		No. of vaccinated		Total no. of staff	
	2002	2005	2002	2005	2002	2005	2002	2005
Hospitals								
Everst N. home	N	N	N	N	N	Y	6	6
Bir hospital	Y	Y	-	1	-	2	N	5
Birendra police hospital	-	-	-	-	1	1	12	12
Teaching hospital	Y	Y	4	4	1	1	75	75
Maternity hospital	-	Y			1	1	-	100
Nepal eye hospital	-	-	-	-	-	-	13	13
Sukraraj Tropical disease hospital	-	Y	-	1	2	2	N	N
B & B hospital	N	N	3	4	2	2	N	N
Patan hospital	Y	Y	1	1	5	5	N	N
Model hospital	-	Y	-	1	1	2	5	10

Note: "Y" means Yes

"N" means not available of data

"-" means not mentioned in survey form

Annex X: Table of Waste handling activities of HCIs

Hospitals		Segregation					Use of safety measures				
		Sharps	Infectious	Anatomic	General	Other	Gloves	Mask	Apron	Boots	Uniform
Bir	2002	-	-	-	-	-	✓	✓	✓	✓	
	2005	✓	✓		✓		✓	✓	✓	✓	
Everest	2002	-	-	-	-	-	-	-	-	-	-
	2005	✓	✓				✓				
Patan	2002	✓	✓						✓		✓
	2005	✓	✓			✓		✓	✓		✓
B&B	2002	✓					✓				
	2005	✓	✓	✓	✓	✓	✓		✓	✓	
Maternity	2002	✓	✓	✓	✓		✓	✓	✓	✓	
	2005	✓	✓	✓	✓		✓	✓	✓	✓	
Sukraraj	2002	✓						✓			
	2005	✓	✓					✓	✓	✓	
Nepal Eye	2002	✓	✓	✓	✓		-	-	-	-	-
	2005	✓	✓	✓	✓			✓			
Police	2002	✓					-	-	-	-	-
	2005	✓					-	-	-	-	-
TU teaching Model	2002	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	2005	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Model	2002	✓	✓		✓						
	2005	✓	✓	✓	✓						



### Annex XI: Table of Impact on the storage container and area

Hospitals	Types of container used		Colour coding system		Area specific for waste		Rules & regulation available	
	2002	2005	2002	2005	2002	2005	2002	2005
Everest N. home	a	a	6	6	Y	Y	N	N
Bir hospital	a, b, d	a, b, d, e	1, 2	1,2,3,5	N	Y	N	N
Birendra police hospital	a	a	6	6	Y	Y	N	N
Teaching hospital	a	a	1,2,3,5	1,2,3,5	Y	Y	Y	Y
Maternity hospital	a,b	a,b	1,2,3,4	1,2,3,4	Y	Y	N	N
Nepal eye hospital	a,b	a,b	6	6	Y	Y	N	N
Sukraraj Tropical disease hospital	c,e	a	6	2,3,5	N	Y	N	Y
B & B hospital	a	a	6	2,3,5	Y	Y	Y	Y
Patan hospital	a, b, f	a,b,f	1,2,3,5	1,2,3,5	Y	Y	Y	Y
Model hospital	a,b	a,b	2,6	2,3	N	Y	N	N

Note: a- plastic, b- metallic, c- cardboard, d- bag, e- box, f- other, g- not specified.

1- yellow, 2- red, 3- blue, 4- black, 5-green, 6- not specified. Y- Yes, N- No

**Annex XII: Table of Changes on collection & transportation**

Hospitals	Transportation device		Collection frequency/day		Injury case/month		Off site transportation	
	2002	2005	2002	2005	2002	2005	2002	2005
Everest N. home	Od	Cd	3	3	Nr	Nr	M	Ps
Bir hospital	Od	Cd	3	3	Nr	Nr	M	Ps
Birendra police hospital	Od	Od	3	3	Nr	Nr	Hcf	Hcf
Teaching hospital	Cd	Cd	2	2	1-5	1-5	M	M
Maternity hospital	Na	Na	2	2	Nr	Nr	M	M
Nepal eye hospital	Od	Od	2	2	Nr	Nr	M/Hcf	M/Hcf
Sukraraj Tropical disease hospital	Na	Na	Na	3	1-5	1-5	M	M
B & B hospital	Od/Cd	Od/Cd	2	3	1-5	1-5	M	M
Patan hospital	Cd	Cd	1	2	1-5	1-5	M	M
Model hospital	Od	Cd	1	2	Nr	1-5	M	M

Note: Cd-Closed device, M- Municipality, Od- Open device, Nr-not reported. Ps- Public Sector. Hcf- Health care facility. Na-Not available



Annex XIII: Table of Impact on the treatment system

Parameters	Date	Everes t N. home	Bir hospital	Birendra police	Teaching hospital	Maternity	N. Eye hospital	Sukraraj hospital	B&B	Patan	Model
Availability of Facility	2002	Av	Na	Na	Av	Av	Av	Av	Av	Av	Av
	2005	Av	Av	Na	Av	Av	Av	Av	Av	Av	Av
General waste	2002	Muni	Muni	Reuse	Muni	Muni	Muni	Muni	Muni	Muni	3R, Muni
	2005	Muni	Reuse/Private	Reuse	Muni	Muni	Muni	Muni	Muni	Muni	3R, Muni
Sharps	2002	Muni	Muni	Needle destroyer	Incine	Burning	Needle destroyer	Muni	Incine	Incine	Incine/destroye r
	2005	Muni	Burning/Destroy	Needle destroyer	Incine	Burning	Needle destroyer	Destroy	Incine	Incine	Incine/destroye r
Infectious	2002	Muni	Muni	Burning	Incine	Muni	Burning	Burning	Incine	Incine	Incine
	2005	Muni	Private	Burning	Incine	Muni	Burning	Burning	Incine	Incine	Auto/Incine
Anatomic	2002	Na	Na	Incineration	Incie	Burial	Burning	Na	Incine	Incine	Muni
	2005	Na	Na	Incineration	Incine	Burial	Burning	Na	Incine	Incine	Incine
Pharmaceutical	2002	Muni	Muni	Burial	Incine	Burial	Burial	Na	Incine	Incine	Incine/Muni
	2005	Muni	Private	Burial	Incine	Burial	Burial	Burial	Incine	Incine	Incine/Muni
Chemical	2002	Muni	Burial	Burial	Burn	Burial	Na	Na	Incine	Incine	Flush into toilet
	2005	Muni	Burial	Burial	Burn	Burial	Na	Na	Incine	Incine	Flush into toilet

Note: Na-Not available, Av-Available, Muni-Municipality container, Incine-Incineration

#### Annex XIV: Table of Disposal facilities of HCIs

Hospitals	Time period	Availability of facility	Types of facility	Kind of site	Security of area	Disposing place
Model hospital	2002	Na	Na	Muni	Dn	Muni
	2005	Na	Na	Muni	Dn	Muni+Pvt
Teaching hospital	2002	Na	Na	Na	Av	Muni
	2005	Na	Na	Na	Av	Muni
Everst N.H	2002	Na	Na	Na	Na	Muni
	2005	Na	Na	Na	Na	Muni
Patan hospital	2002	Av	Off/s	Burial	Av	Muni
	2005	Av	Off/s	Burial	Av	Muni
Bir hospital	2002	Na	Na	Od	Av	Muni
	2005	Na	Na	Od	Av	Pvt
B&B hospital	2002	-	-	-	-	-
	2005	-	-	-	-	-
Maternity hospital	2002	Na	-	-	-	-
	2005	Na	-	-	-	-
N. Eye hospital	2002	Av	O/s	Od	Na	Muni
	2005	Av	O/s	Od+Burial	Av	Muni
Police hospital	2002	Av	O/s	Od	Na	Muni
	2005	Av	O/s	Od	Na	Muni
Sukraraj hospital	2002	Na	Na	Na	Na	-
	2005	Na	Na	Na	Na	-

Note: Na-not available; Av-available; Off/s-off site; Muni-municipality; Od-open dump  
Dn-do not know; Y-yes; Pvt-private; O/s-on site



**Annex- XV: List of Participants of the dissemination workshop**

S.N.	Name	Designation	Institution	Address	Phone/fax
1	Dr. S.K. Pahari	Chairman	NHRC	Ramshapath	4254220
2	Dr. S.P. Singh	Membe- secretary	NHRC	Ramshapath	4254220
3	Dr. Saroj Prasad Rajendra	Chief Environmental Health Administrator	MoHP	Ramshapath	
4.	Dr. Mira Ojha	Chief, Curative Division	MoHP	Ramshapath	
5	Mr. Meghnath Dhimal	Research officer	NHRC	Ramshapath	4254220
6	Mr. Vikram Basyal	Consultant	NHRC	Ramshapath	
7	Mr. Rajesh Manandhar	Chief solid waste section	KMC	Teku	
8	Dr. Rajendra Kumar B.C.	Research officer	NHRC	Ramshapath	
9	Mrs. Bindu Gurung	Nursing- incharge	Kathmandu Model Hospital	Pradarsani Marg	4222450
10	Mr. Laxi Ghimire	-	NEPCEMAC	Ekantakuna	
11	Mrs. Anup Regmi	Member	CRMC	Jawalakhel	
12	Mr. Gopal Raj Joshi	-	Clean energy Nepal	Anamnagar	
13	Mrs. Gayatri Paudel		Dhulikhel Hospital	Banepa	
14	Mrs. Pearl Banmali	Research Officer	NHRC	Ramshapath	
15	Mr. Subodh K. Karn	Account Officer	NHRC	Ramshapath	
16	Dr. Naresh KC		DoHS	Teku	
17	Mr. Gopal K. Prajapati	Program Assistant	NHRC	Ramshapath	
18	Mr. Bijay K. Jha	Program Assistant	NHRC	Ramshapath	
19	Mr. Ajeeb Bar Thapa		Tilganga Eye Hospital	Gausala	4493775
20	Mrs. Nirmal Chitrakar	House keeping	TU Teaching Hospital	Maharajgunj	
21	Mr. Shiva raj Ghimire	Sanitation officer	Army Hospital	Chaunni	
22	Mr. Kapur Paudel	Consultant	NHRC	Ramshapath	
23	Mr. Arun Acharya	Consultant	NHRC	Ramshapath	
24	Mrs. Smrit pokhrel	Consultant	NHRC	Ramshapath	
25	Mr. Dipendra Chaudhary		Sarvanga Nursing Home	Kopundole	
26	Mr. Rajkumar Dikpal	Reporter	Annapurna Post	Anamnagar	4770629
27	Mr. Kedar Bhattari	Editor	Times of Kathmandu	Anamnagar	4228782
28	Mr. Bhatta	Reporter	Weekly mazine "Nepal"		
29	Mr. Shanker Shah	Reporter	Media		4310498
30	Mr. Ghnu Pd. Bhatta	Reporter	Media		4445412
31	Mr. Indraman Suwal	HoD	KMC	Bagdurbar	242148

32	Mr. Atul Mishra	Sr. Sub editor	Kantipur		480100
33	Ms. Toxa Dahal	Sr. sub editor	KTV		4466100
34	Mr. Amar Amatya	Asst. Hospital admin.	Maternity Hospital	Thapathali	4260231
35	Mr. Deepak Shah	Reporter	Gorkhapatra	Newroad	4244429
36	Mr. Rajan Phuyal	Chairman	Our's platform	Alapot	4450691
37	Mr. Nimesh Regmi	Reporter	Nepal Samarchar Patra	Kalimati	4287777
38	Mrs. Rasila Deshar	Member	Norms-Nepal	Chapagaon	5571884
39	Mr. Sarad Aryal	Reporter	ECR FM 104.2	Lalitpur	5560782
40	Ms. Shanti		Patan Hospital	Lagankhel	5522266
41	Mr. Ramesh KC		Kanti Hospital	Maharajgunj	423398
42	Dr. M.P Khanal	ENT surgeon	Bhaktpur Hospital	Bhaktpur	6610676
43	Ms. Usha KC		CRMC		
44	Ms. Palpasa Tuladhar	Research assistant	ENPHO	New Baneshwor	4468641
45	Nityanand Timilsina	Reporter	The Kathmandu Post	Tinkune	4466320(fax)
46	Ms. Mira Thapa	DSP	Birendra Police Hospital	Maharajgunj	
47	Ms. Sita Pandey	Student	CDES, TU	Kirtipur	4278572
48	Mr. Raju Gayawali	Consultant	Pesticide monitoring Nepal	Tahachal	
49	Ms. Dharma Devi		KCH		
50	Ms. Krishna Prajapati	Nursing Supervisor	TUTH	Maharajgunj	
51	Ms. Chandra Sijapati		BSBN		
52	Mrs. Ambika Thapa	Matron	Om Hospital & Reseach Center	Chabahil	
53	Ms. Krishna Udash	Matron	Everest Nursing Home	New Baneshwor	
54	Mrs. Sarita Shrestha	Asst. House keeping	Bir Hospital	Mahaboudha	
55	Mrs. Natimaya Shrestha	Asst. Matron	Bir Hospital	Mahaboudha	
56	Mr. Nirmal Darshan Acharya	Engineer	SWMRMC	Pulchowk	
57	Mr. Ashok Pande	Project coordinator Health	Pro-public	Anamnagar	
58	Mr. Nirbhay Kumar Sharma	Administrative Officer	NHRC	Ramshapath	
59	Mr. Sarswoti P. Bhattra	Store-Keeper	NHRC	Ramshapath	



# **Annex XVI: Slides of Paper Presentation**

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## Training Modules of Past Training Conducted by NHRC

Meghnath Dhimal  
Research officer  
Environmental Health Unit (EHU)  
Nepal Health Research Council(NHRC)

1

## Background:

- Established on 12th Jan. 2001 by the support of WHO
- Has been conducting series of research studies workshops and training on environmental issues with an objective to highlight the key environmental health issues in Nepal.
- The research study findings assist the HMG in formulating policies, strategies and action plans

2

## Training Modules of Past Training(Contd)

- Absence of national policies and guidelines on health care waste management
- In order to assist HMG, NHRC has prepared the National Health Care Waste Management Guideline and Health Care Waste Management Training Manual for health professionals in May 2002 with the support of WHO
- To disseminate the guidelines on Health care waste management and to train the medical professionals, the first training was organized in May 30<sup>th</sup> -31<sup>st</sup>, 2002

3

## Training Modules of Past Training(Contd)

- As the follow-up of these guidelines and training manual developed by NHRC, the two days training for health professionals on "Possible Exposure and Risk from Health Care Waste and Its Management" was conducted by EHU, NHRC with the support of WHO on 11<sup>th</sup> -12<sup>th</sup> Nov. 2003
- There were altogether 30 participants from different health care institutions of within and outside the Kathmandu valley

4

## Training Modules of Past Training(Contd)

### Objectives of the Training:-

- To disseminate the HCWM guidelines developed by NHRC
- To disseminate knowledge on the proper method of safe management of healthcare waste
- To train health professionals on HCWM based on training modules designed by NHRC
- To highlight the possible exposure and risk from health care wastes.

## Training Modules of Past Training(Contd)

Mr. Salil Devkota, Environmental Specialist Provided training for participant about Module 1-6 of HCWM Training Manual for Health Professionals

### Module-1 What is Health- Care Waste?

- explained the definition of health care waste, its categories and defined the different health care waste terms

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#### **Training Modules of Past Training(Contd)**

##### **Module –2 Hazards of Health- Care Waste**

- Briefly highlighted the hazards of health care waste, person at risk from health care waste, and unsatisfactory status of present HCWM system in Nepal

##### **Module –3 Management Responsibility**

- Illustrated the necessity of HCW management Plan, management responsibility, different steps of effective Health care waste management, costing during auditing as well as reviewing and up dating of health care waste management Policy.

#### **Training Modules of past Training(Contd)**

##### **Module – 4 Waste Management**

- focused on the waste management principles and waste identification and segregation method

##### **Module - 5 Handling**

- briefly explained about handling technology of waste and collection system of waste

##### **Module – 6 Transport of Waste**

- presented the system of transportation of waste and vehicles that can be use in practice during collection of HCW

#### **Training Modules of past Training (Contd)**

##### **Module – 7 Treatment and Disinfectant**

- briefly described the treatment and disinfectants that can be suitable for HCWM practice in Nepal.

- Also briefly explained about use of incineration and certain precaution to be taken during its use.

- Further highlighted other treatment methods like steam sterilization, autoclave, microwave, irradiation, chemical disinfections and encapsulation.

#### **Training Modules of past Training(Contd)**

##### **Module –8 Disposal**

- focused on the disposal technique and highlighted the sketch diagram of small burial pit for Health Care Waste disposal

##### **Module – 9 Record Keeping and Training**

- briefly explained about record keeping technique and training for health care professionals

#### **Training Modules of past Training(Contd)**

##### **Module – 10 Worker's Health and Safety**

- clarified on worker's health and safety measures and devices that required during HCWM.

- In the end, he presented some of the clips of HCWM practices of different hospitals of Kathmandu Valley.

- His presentation ended with group discussion with participants.

#### **Training Modules of past Training(Contd)**

Other Papers presented in the workshop were

- ✓ Overview of Health Care Waste management

- Mr. Shamsul Huda, Environment Health Advisor, WHO Nepal

- ✓ Situation of Health Care Waste Management in Districts and Periphery Level Health Facilities and an Integrated Approach for Improvement in Nepal

- Mr. Jayendra Bhatta, GTZ, Health Support Programme, Teku

### **Training Modules of past Training**

✓ Possible Exposure and Risk from Health Care Wastes and Its Management and Guidelines

- *Mr. Chandra Shekhar Yadav, Chief Environmental Unit, NHRC*

A Case Study on Health Care Waste Management in Bir Hospital

- *Mr. Kiran Sapkota, M.Sc Microbiology Student of T.U*

✓ A Case Study on Health Care Waste Management in BPKHS, Dharan

- *Mrs. Rashmi Adikari (Sharma), Environmentalist*

### **Training Modules of past Training(Contd)**

✓ Bio- Medical Waste Management: An Indian Experience

- *Mr. Bachu Kailash Kaini, Chief of Administration, Shahid Gangalal National Heart Center and Associate Professor of National Open College.*

# **Thank You**



## Impact Assessment of the Training Conducted in the Past on Health Care Waste Management

By Vikram Basyal  
(Principal Investigator)  
for NHRC  
With the support of WHO

## Objective of the Study

- Evaluation of the effectiveness of the trainings.
- To assess the impact of the past trainings.
- To find the overall feedback of the trainings.

## Scope of the Study

- To evaluate the improvement on both knowledge of human resources as well as the practice in institution in the waste management.
- To identify the merits and demerits of the trainings.
- Assist to develop more effective modules of the training for future.
- To identify the weak and better side of the present practice of health care waste management.

## Background of the Study

- First Training: In 2002
  - Title: Dissemination and Training Workshop on National Health Care Waste Management Guidelines.
- Second Training: In 2003
  - Title: Possible Exposure and Risk from Health Care Waste and Its Management.

## Methodology

- Developed two separate questionnaires:
  - Staff(KAP) – To comparative evaluation of trained and non trained staffs within same HCIs
  - Institutional Analysis- evaluation of the variation on practice of management before and after training
- Selection of HCIs – Ten HCIs including private nursing home, government and public hospitals, Teaching hospital and specific hospitals like eye and maternity.

## Methodology (cont...)

- Used Parameters to assess the condition:
  - Staffs
    - ◇ Knowledge
    - ◇ Attitude
    - ◇ Practice
  - Institutions
    - ◇ Staffs
    - ◇ HCW generation
    - ◇ Segregation & handling
    - ◇ Storage & container
    - ◇ Storage area

## Methodology (cont...)

### Institutions (cont...)

- ◊ Collection & onsite transportation
- ◊ Offsite transportation
- ◊ Treatment
- ◊ Final disposal
- ◊ Regulations
- ◊ Policy & budget
- ◊ Sanitation & waste water
- ◊ Records keeping.

## Impact of the Training

- Impact on the Staffs of HCIs
- Impact in HCIs (on the practice of HCW management)

## Impacts on the Staffs

### Knowledge

Topics related to	Knowledge of staffs of HCIs	
	Trained staff(%)	Non-trained staff(%)
Hazardous waste	90	60
Segregation	70	50
Color coding	100	60
Exposure risk	60	10
Health safety	90	80
Definition of treatment	100	90
Mechanism of incineration	30	10

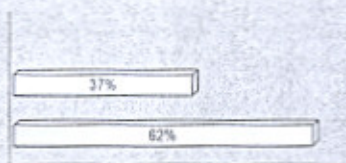
## Impact on the staff (cont...)

### Level of Knowledge:



## Impact on the staff (cont...)

### Attitude:



## Impacts on the Staff (cont...)

### Practice:

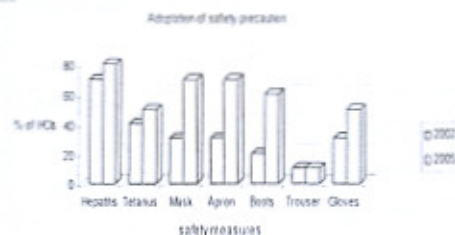
#### Impact on the practice





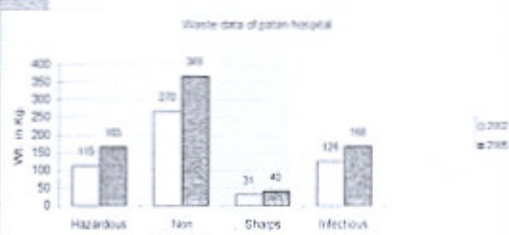
## Impacts in the HCIs

### Staffs (safety precautions):



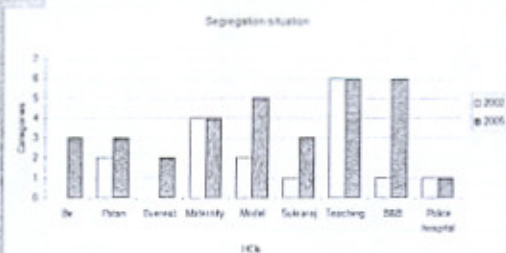
## Impacts in the HCIs (cont...)

### HCW generation:



## Impact in the HCIs (cont...)

### Segregation & handling:



## Impacts in the HCIs(cont...)

### Storage container & area:

Activities	Improvement by % of HCIs from 2002 to 2005
Specific container for waste collection	20
Color coding system	30
Area specification for waste	30
Making & adopting rules	10

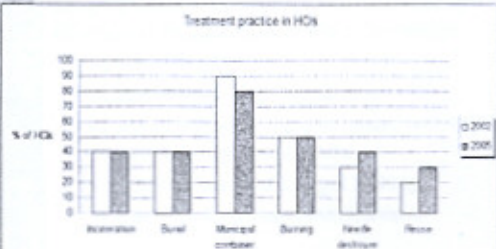
## Impact in the HCIs (cont...)

### Collection & onsite/offsite transportation

Activities	Adopting HCIs (%)	
	2002	2005
Use of closed device	30	60
Collection frequency (3 times/day)	30	50
Offsite transportation by municipality	90	70
Injury case reported	40	50

## Impact in HCIs (cont...)

### Treatment:



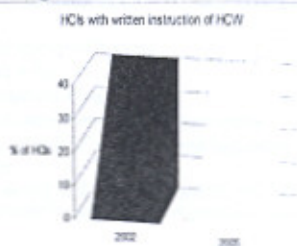
## Impacts in the HCIs (cont...)

### Final Disposal:

Disposal facility	HCIS (%)	
	2002	2005
Available of facility	30	30
Onsite facility	20	20
Offsite facility	10	10
Roadside dumping	90	90
Burial	10	10

## Impact in the HCIs (cont...)

### HCWM regulations:



## Impact in the HCIs (cont...)

### Policy & Budget:

HCIs	Budget sufficient?	
	2002	2005
Patan hospital	Y	N
Model hospital	Dk	N
Bir hospital	N	Y
B&B hospital	Y	Y
Maternity hospital	N	N
N. Eye hospital	Y	Y
B. Policy hospital	N	N
S.T hospital	N	N
Everest N. home	N	N
TU teaching hospital	Y	Y

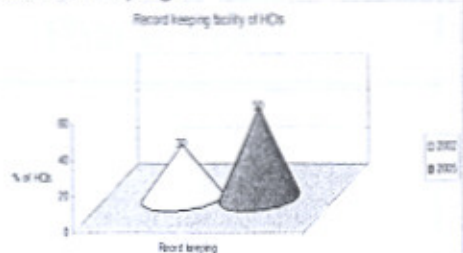
## Impact in the HCIs (cont...)

### Sanitation & waste water:

HCIs	Sufficient toilet facility		Sewerage system	
	2002	2005	2002	2005
Patan hospital	Y	Y	Cd	Cd
Model hospital	N	Y	Cd	Cd
Bir hospital	-	-	Cd	Cd
B&B hospital	Y	Y	Cd	Cd
Maternity hospital	Y	Y	Cd	Cd
N. Eye hospital	N	N	Cd	Cd
B. Policy hospital	Y	Y	Cd	Cd
S.T hospital	Y	Y	Cd	Cd
Everest N. home	Y	Y	Cd	Cd
TU teaching hospital	Y	Y	Cd	Cd

## Impact in the HCIs (cont...)

### Records Keeping:



## Limitations of the Study

- May be because of the following reason, it is observed less improved on the management situation in comparison to their knowledge.
  - ◊ Lack of facility.
  - ◊ Lack of rules and regulations.
  - ◊ Lack of decision making power with the waste management staffs.
  - ◊ Infrastructure and budget lacking.
  - ◊ Lack of enforcement mechanism



## Conclusion

- For the study 10 HCIs were selected among 23 participants HCIs.
- Generally improvement observed on
  - Segregation categories.
  - Collection system
  - Onsite transportation and
  - Health safety precautions
- Poor(non improved) sectors are
  - Offsite transportations
  - Treatment
  - Final disposal and
  - Records keeping

## Conclusion (cont...)

- Knowledge is better increased than attitude and practice, may be because of the any of following reason
  - Lack of sufficient budget.
  - Limited area.
  - Unavailability of facility.
  - Lack of commitment of decision maker
  - Policy, guideline and rules and regulation's lacking.
- Overall training had positive impacts and the staffs of HCIs are keen to get training regularly in future

## Recommendations

- Staffs of HCIs wanted such types of training every year. So there should be such facility available for regular training.
- Training should be more rigorous with effective training modules as well as promotion materials, posters and pamphlets.
- Training module should include some specific system of segregation, collection, transportation, treatment, disposal and a similar format of record keeping system as a umbrella concept.
- Training should be focused in on hand practice i.e. practical training.

## Recommendations (cont...)

- Training should be focused on the suitable and available system and facility for various stage of waste management.
- Need of awareness related materials like information notice, posters etc.
- Waste handling related instructions is required for waste handlers as well as visitors.
- Training should also be focused for decision makers of HCIs as well as related Govt. authority for prompt decision.
- Waste transporter and handlers(municipal/private company) should also be included in such training

Thank You !

## Problems & Issues of Medical Waste Management in Kathmandu

Rajesh Manandhar  
Kathmandu Metropolitan City  
Environment Department  
Dec. 25, 2005

### Problem.....

- ◆ Everyday app. 3 ton of hazardous waste get mixed up with household waste and dumped along the banks of Bagmati River

### What is medical waste:

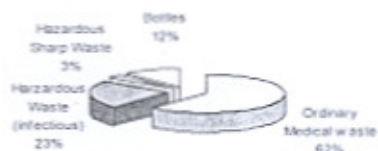
- ◆ All waste generated during the process of examining and treating patients, immunization and conducting research in health-care facilities are known as medical waste. About 80% of such waste is ordinary or non-hazardous in nature, while about 20 % is hazardous. Of this 20 % about 15 % is usually infectious while 5% is non-infectious

Source: Medical waste Guidelines

### Classification:

- ◆ Ordinary Biodegradable Waste
- ◆ Ordinary Inorganic Waste
- ◆ Hazardous Waste Suitable for Incineration (pathological waste, discarded medicines, & infectious waste other than PVC plastics)
- ◆ Hazardous Sharp Waste
- ◆ Non-burnable Hazardous Waste (plastic)

### Composition:



Generation: 1.72 kg/day/bed

KMC/Enpho 2001

### In-source Management

- ◆ Waste Minimization
- ◆ Waste Segregation & Collection
- ◆ Waste Storage & Transportation
- ◆ Waste treatment



## Technologies for Treatment

- ◆ Autoclaving (121 degree C for 15 minutes or 134 degree C for 4 minutes, &
- ◆ Incineration
- ◆ Safe Burial

## Challenges...

- ◆ Everybody think it is a serious problem & needs to address urgently but nobody wants to take a lead role
- ◆ it is not clear who is responsible, KMC???
- ◆ Political commitment
- ◆ Costly
- ◆ Different views in technology. Incinerator Vs. Autoclave
- ◆ NIMBY syndrome
- ◆ From October Sisdol landfill site will be fully operated & it will not take medical waste
- ◆ Lack of know-how and trained manpower

## Activities conducted....KMC

- ◆ various meetings & workshops
- ◆ requested various donors for support (Japanese Embassy, JICA, DINIDA, GTZ, EU, USAID etc)
- ◆ Under Kathmandu Valley Mapping Program (KVMP) EIA, Infrastructure, & equipment have been provided
- ◆ Medical Waste Guide Line & Awareness programs by USAID
- ◆ CKV is considering a awareness program in Health Care Institutes using JOVC

## Summary of outcomes...

- ◆ Most of the agencies viewed that KMC should take a lead
- ◆ One centralized treatment system should be established
- ◆ Most of the institutes are willing to share cost
- ◆ Combined technology should be introduced (incinerator & auto clamp)
- ◆ EIA & pilot scale medical waste facility

## Why it is not in operation...

- ◆ Location (teku)
- ◆ People against incinerator (any waste related activities at their back yard)
- ◆ International debate on technology
- ◆ Why it is only KMC's responsibility?

### What now?

- ◆ from Oct. 2005 Sisdol landfill will operate in full scale & will not receive any medical waste
- ◆ Balkhu Dumping site will be closed

### Rays of hope..

- ◆ KMC, NHRC, WHO, and other agencies are actively involving to come up with a sustainable solution
- ◆ Healthcare institutes are serious and taking responsibilities
- ◆ Sharing of Facilities
- ◆ Technologies and trained manpower
- ◆ Positive attitude
- ◆ Private sectors have shown interest
- ◆ Operation of Sisdol Landfill Site

### EIA Recommendations

- ◆ MOPE should formulate policies & legislation on hazardous waste
- ◆ MoH should issue directives to all HCIs to segregate waste at least into 3 categories & properly handle waste at source
- ◆ MoH and KMC should provide technical and financial assistance for establishment of proper waste segregation and handling system in HCIs

### Other Recommendations

- ◆ something must be done urgently & somebody must take a lead
- ◆ Work together
- ◆ start putting pressure to concerned agencies to formulate appropriate policies & legislation
- ◆ common view on technology
- ◆ HCI should start separation & treat their waste where possible
- ◆ Concern Agencies should request donor agencies for needed help
- ◆ Share facilities- until facility has not been established

Thank you