Waste Minimization in Hospitals

Marzieh Javadi¹, Maryam Yaghoubi², Maryam Tavakoli³

¹Health Management and Economic Research Center, Medical Sciences University of Isfahan, Iran
²Health Management Research Centre, Baqiyatallah University of Medical Sciences, Tehran, Iran
³Msc degree in educational management, Medical Sciences University of Isfahan, Iran

Abstract

Introduction: The disposal of hospital waste should be processed by means of reliable and standard techniques; otherwise, it can lead to serious environmental and human health damages. Several approaches have been used for waste management; whilst, waste minimization (WM) is the best approach that focuses on the reduction and prevention of waste. This study investigated the WM approach through a number of selected hospitals in Isfahan.

Methods: Data was collected through a questionnaire, designed based on WHO recommendations regarding WM in hospitals. Ninety people from 7 (4 university affiliated and 3 private) hospitals participated in this study; which were selected by stratified sampling. Data analysis was done by T test and ANOVA using SPSS software.

Results: There was no significant difference between university and private hospitals in WM performance (p=0.2). Comparing university and private hospitals performance in WM domains revealed a significant difference in two domains of WM performance, Waste segregation, good management and control practices (p= 0.001, p= 0.03).

Conclusion: The private hospitals should be more concerned about waste segregation; accordingly, setting rules and increasing supervision for the application of guidelines are necessary. Management and control practices should be also reinforced through training programs.

Keywords: Waste minimization, Hospital waste, Waste management.

Introduction

Medical or clinical waste normally refers to waste products that cannot be considered general waste, produced from healthcare premises, such as hospitals, clinics, doctors’ offices, veterinary hospitals and laboratories. Medical waste has a variety of hazardous impacts on environment; it is a major source of toxic material and contains heavy metals; which is hazardous to the environment (1).

According to a literature review, 25% of medical waste is regarded as hazardous. Although the portion of infectious and hazardous waste is relatively small, improper medical waste management can lead to waste, potentially infectious and hazardous (2).

Waste management is crucial in preventing the exposure of health-care workers, patients, and the community to infections, toxic waste and injuries as well as the protection of the environment.

Health-care institutions are using various alternatives to the treatment and disposal of waste from landfills and then incineration. Although using these methods is necessary, each alternative for disposing the waste has its own disadvantages.

For example, one of the most used alternatives of waste disposal is incineration and hospitals generally use incinerators to dispose medical waste. This alternative has itself various consequences. Many products used in health care settings contain polyvinyl chloride, which when incinerated, can result in the release of dioxin, a known carcinogen, into the environment. Once, EPA considered dioxin from incinerated medical waste to be the second largest source of carcinogen (3).

Medical waste incineration also is responsible for the release of mercury into the environment (4). In addition, landfills make a clear and obvious threat against human health as well as a threat to our environment, in consequence of hazardous contaminated air emissions from the landfill biodegradation(5).

Even though the landfills are considered sanitary, but toxic chemicals emitted from them are released both into the air and into the ground. If rainwater seeps through the ground where these chemicals are, and it will transport them to the groundwater table and into our sources of drinking water (6).

Considering all of the mentioned problems, it seems that man should be more responsible for this concern, and try to reduce consequences of these problems. One of the most economic and efficient strategies of reduc-
ing these effects, is waste minimization (WM). Today speaking about waste management regardless of waste minimization is something futile and vain. Waste minimization not only protects the environment; it also makes a good economic and business sense. At the same time, waste minimization practices have helped many organizations reduce the quantity and toxicity of hazardous and solid waste generation, raw material and product loss, waste management costs, environmental liability etc. (3). Significant reduction of the waste generated in health-care establishments and research facilities may be encouraged by the implementation of certain policies and practices as follows:

- **Source reduction**: measures such as purchasing restrictions to ensure the selection of methods or supplies that are less wasteful or generate less hazardous waste;

- **Recyclable products**: use of materials that may be recycled, either on-site or off-site;

- **Good management and control practices**: applies particularly to the purchase and use of chemicals and pharmaceuticals; and, Waste segregation: careful segregation (separation) of waste matter into different categories helps to minimize the quantities of hazardous waste.

Waste minimization usually benefits the waste producer: costs for both the purchase of goods and for waste treatment and disposal are reduced and the liabilities associated with the disposal of hazardous waste are lessened.

Health-service employees have a role to play in this process and should be trained in waste minimization and the management of hazardous materials (7).

Healthcare facilities in Iran generate significant quantities of hazardous waste material every day (8). Medical waste management in Iran, as is the case in most economically developing countries, has not received enough attention (9). Public hospitals produced the more quantity of waste and as reported in some studies, public hospitals have a worse situation in waste management. Considering the efficient and economic strategy for reducing effects of medical waste, Waste minimization, the main objective of the present study was comparing the Waste minimization practices in Isfahan’s selected hospitals.

### Material and Methods

This study was conducted to investigate how the public and private hospitals of Isfahan act for waste minimization (WM). Study domain included seven hospitals (4 university affiliated and 3 private hospitals) in Isfahan, the second largest city in Iran. Hospitals were selected by stratified sampling method.

We performed data gathering through a self-designed questionnaire. Items of the questionnaire were grouped according to 4 constructs that have been recommended by WHO (1999), with slightly adjustment based on chosen hospitals’ condition. It was set into 5 domains: 1) Source reduction, 2) Good managing and controlling, 3) Managing the store of chemicals and pharmaceutical products, 4) Waste segregation, 5) Managing recyclable products; domain which listed in table 1. The questionnaire was constructed in 39 questions and responses given on a five-point Likert Scale. Content Validity of the questionnaire was confirmed by experts, with reliability Cronbach's alpha of 0.89%.

Ninty people from 7 hospital participated in this study were selected by stratified sampling and include directors of hospitals auxiliary departments such as purchasing, stores, pharmacy, and a number of clinical nurses. Data were analyzed using SPSS software.

### Results

In seven studied hospitals totally 90 questionnaires were completed; 45 questionnaires (50%) in public hospitals and 45 (50%) in private hospitals. Demographic characteristics of samples were as below:

- 45% were nurses and 55% were personnel of auxiliary and official departments.

The highest score in five domain of W.M was calculated for private hospitals as: management in stores of chemicals and pharmaceuticals products (92.09±13.51). The lowest score was reported from private hospitals in Waste segregation domain (31.08±30.05). Comparing hospitals in each aspect of WM indicated differences between their performances in WM. To understand how hospitals differ in WM practices ANOVA test was performed. There were significant differences between private and public hospitals in two domains of WM: Source reduction and waste segregation (p<0.001). Duncan post hoc test showed that the differences are related to Hospital G, a private hospital.

### Discussion

According to the results of the present study, the minimizing waste strategies mean scores in all domains of WM was not satisfactory. Comparing the private and public hospitals performance mean scores by each domain of MW, showed that private hospitals in the second domain, Good management and control practices, with the mean of 70.38±12.4 had a significant different with public ones (63.53 ± 16.9) so private hospitals were in a better situation.

These results are against of the results of a study of hospitals in Jordan which claims that the university affiliated hospitals, with the lowest amount of waste, have been performed better than others regarding waste generation (10). Contrarily to the second domain, in the fourth domain - Waste segregation - the public hospitals had a better situation and the mean score of these hospitals in this domain was 52.75±26.99, whereas the mean of private ones was 31.08 ± 30.05. These finding is contradictory with the results of a study in another city of Iran which claims that private hospitals do better in waste segregation as an aspect of waste management (11). In present study, the best findings for public hospitals were in the third domain - management in stores of chemicals and pharmaceuticals products - with the mean score of 88.50±13.24 and the worst finding was in the fifth domain - Recyclable products - with the mean score of 36.12 ± 19.97.
The best finding for the private hospitals was in the third domain, like public ones, with the mean of 92.09 ± 13.51 and the worst finding was in the fourth domain - Waste segregation - with the mean score of 31.08 ± 30.05. Results of good management in stores of chemicals and pharmaceutical products are respectively satisfying. Chemicals and pharmaceuticals products are as the most important materials used in hospitals and storing these materials should have a series of special regulations. Careful management of stores will prevent the accumulation of large quantities of outdated chemicals or pharmaceuticals and limit the waste to the packaging (boxes, bottles, etc.) plus residues of the products remaining in the containers. The small amounts of chemical or pharmaceutical waste can be disposed easily and relatively cheaply, whereas disposing of larger amounts requires costly and specialized treatment, which underlines the importance of waste minimization. The health service can encourage this by ordering only from suppliers who provide rapid delivery of small orders, and accept the return of unopened stock, and offer off-site waste management facilities for hazardous wastes (7).

The weakness of these 2 types of hospitals were in the fourth and fifth domains: waste segregation and Recyclable products. Observations during the present study showed that any segregation of the different types of wastes was not implemented satisfactorily. This is one of the most important problems in many hospitals in Iran. Lack of separation of infectious and non-infectious wastes at source increases the percentage of infectious wastes. According to the definition of hazardous waste, any amount of contact between infectious and non-infectious waste leads to contamination of all the waste involved (12).

It has been observed that the percentage of infectious waste was increased by 15.1% due to contamination of regular and medical wastes by coming into contact with infectious waste materials (13). Regarding to all of these findings, performing waste minimization strategies in hospitals are important. In contrast with these results, findings of a study conducted in governmental hospitals in Kuwait showed that Segregation of the different types of wastes is practiced in nearly all of the studied hospitals (14). Recyclable products were another weakness point in both private and public hospitals, which has an important role in reducing waste. This finding can be attributed to naturally sensitive performance of hospitals especially in contamination problems and patient safety.

### Conclusion

Beside of Increasing Public awareness about waste hazards, guidelines should be provided regarding ways of how to use goods effectively, and to reduce waste in all of hospital departments. Furthermore, private hospitals should be more concerned about waste segregation; as setting rules and increasing guidelines supervision are necessary. Public hospitals should be reinforced on how to perform good management and control practices throughout training programs.

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