Original Article

Function of nurses and other staff to minimize hospital waste in selected hospitals in Isfahan

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Abstract

Context: Medical waste (MW) is all waste materials generated at health care facilities. MW naturally is hazardous for environment and subsequently for human. Waste minimization (WM) is the latest alternative for risk reduction. All hospital staff generally and nurses specially can play an active role through education and the implementation of measures to reduce medical wastage and their environmental effects.

Aims: This study is aimed to compare nurses and other staff functions in selected hospitals in Isfahan about waste minimization strategies.

Settings and Design: This is a descriptive analytical study. The study tool was a researcher –designed questionnaire in five area of waste minimization based on WHO recommendation.

Materials and Methods: There were 90 nurses and other staff from randomized selected public and private hospitals of Isfahan as the sample of this research. This study was done in 2009.

Statistical Analysis Used: Data were analyzed by *t*-test using $SPSS_{16}$.

Results: Nurses mean score of WM performance was 58.16 (12), and others was 58.56 (12.18) (of max 100). There was no significant difference between nurses and others mean score of WM performance according to *t*-test. There was not significant difference between WM performances of two studied groups in public and private hospitals based on *t*-test. Comparing between two studied groups mean scores by waste minimization areas indicated that nurses have done significantly better in source reduction area and other staffs have acted better in waste segregation ($P < 0.05$).

Conclusions: All of hospital staff specially, nurses have an important role in qualified waste management practice of hospitals. Totally mean score of WM performance in hospitals (nurses and other) was average. With regard to other countries activities, this result is disappointing. So, it is necessary to plan educational programs for hospital staff, especially nurses.

Key words: Hospital staff, nurses, waste management, waste minimization

Introduction

Increased standard of living is creating a great risk to the environment by generating a large quantity of waste.[1] Medical waste (MW) is all waste materials generated at health care facilities, such as hospitals, clinics, physician's offices and so ondental practices, blood banks, and veterinary hospitals/clinics, as well as medical research facilities and laboratories.[2]

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Today medical waste management is a crucial public health and environmental issue because poor medical waste management unquestionably exposes healthcare workers, waste handlers, and the community to infections, toxic effects, and injuries.[3] The main portion of MW is non-hazardous.

According to Practice Green health, "the nation's hospitals generate approximately 6600 tons of waste per year"1 and "as much as 80 to 85% of a healthcare facility's waste is non-hazardous solid waste—such as paper, cardboard, food waste, metal, glass, and plastics."[4] The World Health Organization (WHO) reports similar data and adds that "a smaller portion (10 – 25%) (of health care waste) is infectious/hazardous waste that requires special treatment.[5]

Although the infectious and hazardous waste have a small portion in MW, improper medical waste management, and mixing infectious waste with the general waste, can lead to the entire bulk of waste becoming potentially hazardous.[6]

In fact disposing waste is an important problem for health

and environment. Many materials are used in health care facilities, such as PVC and mercury, whether incinerated or disposed through other methods such as landfill, can result in the release of hazardous substances into environment.[7,8] The hazards to the human health and to the environment, posed by MW justify a high level of concern with its management.[9]

The problems of MW incineration, improper waste disposal, and general environmental degradation and the effects of these issues on human health eventually were recognized. Organizations such as the EPA, Environmental Protection Agency, American Nurses Association, HealthCare Without Harm (HCWH), and Hospitals for a Healthy Environment (H2E) have looked for ways to reduce the negative effects of health care practices on the environment.[7]

Considering all of mentioned problems and according to literature review, the best and most economical way of dealing with waste is to minimize its production.[10]

Waste minimization means The reduction, to the extent feasible, in the amount of hazardous waste generated prior to any treatment, storage, or disposal of the waste. Because waste minimization efforts eliminate waste before it is generated, disposal costs may be reduced, and the impact on the environment may be lessened.[11]

WM 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.

- Source reduction measures such as purchasing restrictions to ensure the selection of methods or supplies that are less wasteful or generate less hazardous waste.
- Good management and control practices apply to commitment and support of managerial team, set rules and regulations to reduce waste.
- Management in stores of chemicals and pharmaceuticals products apply particularly to the purchasing, keeping, storing, and using of chemicals and pharmaceuticals.
- Waste segregation is careful segregation (separation) of waste matter into different categories, which helps to minimize the quantities of hazardous waste.
- Recyclable products is use of materials that may be recycled, either on-site or off-site.

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In Iran, as many other countries, environmental impacts and hazards of hospital waste have not received sufficient attention. In fact, the management of MW in Iran is struggling with numerous problems.[10] In a study aimed to investigate waste management in primary healthcare centers of Iran in 2009, the mean of solid waste generation was reported 3.8 kg (bed-day)/1, respectively.[12] In another study Sabour investigated the quality and quantity of hospital wastes in Iran, and based on this research Isfahan MW generation were reported 3.14 kg (bed-day/1.[13] It is obvious that treating this huge quantity of MW explicitly has a variety of unfavorable effects on the environment. Hence, we should be more responsible about healthy environment. As said before hospital staff specially nurses play important role in waste management.

If we want to improve standards of waste management in hospitals it should be initiated from personnel. In other words all of the hospital personnel are considered as a team for waste management. As WHO said, Good health care waste management in a hospital depends on a dedicated waste management team, good administration, careful planning, sound organization, underpinning legislation, adequate financing, and full participation by trained staff.[14]

It could be said, using WM strategies is the most appropriate alternative for managing waste anywhere especially in hospitals and all health-service employees, especially nurses, who have direct involvement in a majority of client care, have a role to play in this process. Nurses and other staffs who generate large quantities of hazardous waste in hospitals should therefore be trained in waste minimization and the management of hazardous materials. [15] Health care personnel should become ecologically sensitive and advocate changes that reduce the quantity of waste generated while maintaining quality patient care and worker safety.[16]

If the WHO recommended measures implement well by them, it will lead to the proper management of MW and a reduction in the environmental and health problems. So the first step for dealing this issue is, knowing present situation and that how do the hospital personnel act in daily works or to what extent they are sensible about waste reduction? The main objective of the present study was to investigate and regarding critical role of nurses in this process, the waste minimization performance of nurses and other.

Materials and Methods

This descriptive cross-sectional study aimed to assess the practice associated with waste minimization (WM) among nurses and the other personnel in selected hospitals of Isfahan in 2009. In order to provide comparability between both

private and university hospitals in WM performance, study samples were selected from university and private hospitals. Four university and three private hospitals selected through simple random sampling. The sample size calculated as:

$$n = \frac{(z^2).(s^2)}{d^2}$$

120 person. From which, 30–40 subjects, included auxiliary department directors, such as store, kitchen, pharmacy, housekeeping, and suppliers, which participated in study through the census method. The rest of the sample size (80–85 persons) included clinical nurses, which were calculated based on their proportional population in each hospital. Selecting nurses within each hospital was done through simple random sampling. Using a list of clinical nurses who have the inclusion criteria of study. The inclusion criterion was full-time employment in the study setting for a minimum of 2 year.

The study tool was a self-designed questionnaire which was derived from WHO guideline about waste minimization in health care facilities.[15]

It was set into five area of:
1) Source reduction, 2) Good managing and controlling, 3) Managing stores of chemicals and pharmaceuticals products, 4) Waste segregation, 5) Managing recyclable products, as listed in Table 1. The initial draft was circulated to the members of an expert team, included (three nurses, two academic members and three director in auxiliary departments from hospitals) and modifications were carried out. Finally, the questionnaire set in 39 questions and responses given on a five-point Liker Scale (1 = It is never being done, 5 = It is thoroughly being done).

To simplify analyzing and comparing results values of questionnaire were multiplied by 100 and responses were classified as (0–34 = weak performance, 34–67 = average, and 67–100 = good). Content validity of questionnaire was confirmed by experts. Reliability Cronbach's alpha was calculated for 0.89%, using a sample consisted of 20 randomly selected hospital staff (10 nurses and 10 supportive staff). Reliability Cronbach's alpha was calculated for each area of questionnaire as:

Source reduction (0.85% 0), good management, and control practices (0.81%) management in stores of chemicals and pharmaceuticals products (0.70%), waste segregation (0.69%), and managing recyclable products (0.75%).

Data gathering was done by observation and interviewing personnel, i.e. all of questions asked from people and complementary information were obtained through observation of daily works and documents in field. In spite of approving this research by research department, all of participants was justified about research objectives and the necessary official permissions were obtained. Descriptive statistics such as mean and standard deviation were employed for calculating participants functions. in order to determine differences between performances mean scores of respondents by job (nurses/other staff) and by workplace ospital (private/public) *t*-test were used. The statistical significance level was considered as *P* value less than 0.05. Data were analyzed using $SPSS_{16}$ software.

Results

This study was aimed to investigate performance of nurses and other staff of selected hospitals in waste minimization strategies. It was carried out in seven randomly selected hospitals (four public and three private) in Isfahan. A total of 89 questionnaires were completed. Respondent rate in clinical nurses was (60%), and in other staff (100%). Totally 51 (57%) of respondents were nurses, and 38 (42%) from other staff. Thirty-nine (43%) were working in private hospitals and fifty (56%) in public hospitals.

Findings showed that the mean score of WM performance

Table 1: Questionnaire areas (waste minimization aspects) and definitions

Area	Definition
Source reduction	Measures such as purchasing restrictions to ensure the selection of methods or supplies that are less wasteful or generate less hazardous waste.
Good management and control practices	Apply to commitment and support of managerial team, Set rules and regulations to reduce waste.
Management in stores of chemicals and pharmaceuticals products	Apply particularly to the purchasing, keeping, storing and using of chemicals and pharmaceuticals.
Waste segregation	Careful segregation (separation) of waste matter into different categories helps to minimize the quantities of hazardous waste.
Recyclable products	Use of materials that may be recycled, either on-site or off-site.

in hospitals was 58.33 (12.01 (of max 100) nurses mean score of WM performance was 58.16 (12), and others was 58.56 (12.13) totally. There was no significant difference between nurses and others mean score of WM performance according to *t*-test ($P = 0.6$) [Table 2].

Comparing performance mean scores of staff in private and public hospitals showed that, there was not significant difference between WM performances of two studied groups in public and private hospitals based on *t*-test ($P > 0.05$) [Table 3].

Calculating mean score performance of respondents in each area of WM showed that both nurses and other staff had a good or satisfactory practice in the area of management in stores of chemicals and pharmaceuticals products: nurses 91.89 (13.5) and other staff 89.05 (13.2).

For comparing between two studied groups mean scores by waste minimization areas, *t*-test was performed and indicated significant difference between their performance in two areas: Source reduction ($P = 0.01$) and waste segregation ($P = 0.01$). Nurses have done significantly better in source reduction area and other staffs have acted better in waste segregation.[4]

Discussion

In this study performance of nurses comparing other personnel were investigated. Results showed that nurses' mean score of WM performance was 58.16 (12), and others' was 58.56 (12.13). Both group's scores were at lower average range. There was no significant difference between nurses and others mean score of WM performance according to *t*-test (*P*. v = 0.6). [Table 2]. The deficit in both group performances could be attributed to lack of supervision, weakness in education programs, and specifically in nurses, related to unavailability of waste minimization instructions or booklets to be used as a nursing guide.

This result is consistent with findings of a study aimed to assess the practice related to waste management, among doctors, nurses, and housekeepers in the surgical departments, which stressed that only 18.9% of the nurses, 7.1% of the housekeepers, and none of the doctors had adequate practice.[17]

As regard to nurses responsibility was defined by ICN: Nurses in clinical care are producers of health care waste and yet are active participants in waste disposal procedures. Nurses in management positions develop policies that deal with the procurement of supplies as well as the production and elimination of health care waste.[18] The nurses are expected to act better in this field. They must be equipped with the latest information, skills, and practices in waste management.[17] Nurses, as professionals, need to be aware of the consequences of the health care waste produced by the health sector. Nursing organizations need to: Define and regulate nursing competencies in environmental health and Facilitate nurses' access to continuing education programs on the subject of health care waste.[18]

Further, same comparison was done in public and private hospitals and revealed. There was not significant difference between WM performances of two studied groups in public and private hospitals based on *t*-test ($P > 0.05$) [Table 3].

This result is consistent with another study which stressed that there is no evidence that either public or private ownership is a decisive factor for the successful management of health care waste.[19] In this concern another study carried out in Jordan revealed that the university hospitals, with the lowest amount of waste, have been performed better than others about waste generation.[20] While private hospitals are expected to do better about wastes because of economic benefits of waste minimization program.

With respect to the mean scores of respondents in each area of WM, the findings revealed that both group of participants had a good or satisfactory practice in the area of management in stores of chemicals and pharmaceuticals products nurses 91.89 (13.5) and other staff 89.05 (13.2). Management in stores of chemicals and pharmaceuticals products apply to issues such as checking of the expiry date of all products at the time of delivery, use of all the contents of each container, or use of the oldest batch of a product first. Considering the content of this area, it could be attributed to high perception of personnel and due to

Table 2: Nurses and other staff Waste minimization performance mean score and SD for all hospitals (out of 100)

Personel	Mean* *(Max.100)*	SD	
Nurses	58.56	12.13	t = 0.155,
Other staff	58.16	12	*P*-value = 0.6

Table 3: Nurses and other staff waste minimization performance mean score and SD for university and private hospitals (out of 100)

Personel	Public hospitals		Private hospitals	
	Mean*	SD	Mean	SD
Nurses	58.8	11.8	58.29	12.8
Other staff	60.2	13	54.9	9.6
	P.v = 0.7		*P*.v = 0.07	
	t = -0.38		*t* = 0.92	

Table 4: Comparison of nurses and other staff performance by waste minimization areas in all hospitals

Waste minimization areas	Nurses		Other staff		
	Mean	SD	Mean	SD	
Source reduction	57.38	18.62	53.12	15.18	*P*-value=0.01 *T*=1.1
Good management and control practices	70.22	15.01	63.8	15.43	*P*-value=0.5 *T*=1.9
Management in stores of chemicals and pharmaceuticals products	91.89	13.5	89.05	13.2	*P*-value=0.5 *T*=0.9
Waste segregation	39.8	34.2	46.3	26.9	*P*-value=0.01 *T*=−0.99
Recyclable products	35.3	18.7	38.4	18.08	*P*-value=0.7 *T*=−0.80

the prominence of chemicals and pharmaceuticals hazards in people's minds.

Comparing between two studied groups mean scores by waste minimization areas, *t*-test was performed, and indicated significant difference between their performance in two areas: source reduction ($P = 0.01$) and waste segregation ($P = 0.01$). Nurses practiced significantly better in source reduction area and other staffs have acted better in waste segregation. In the other areas of WM nurses have obtained higher mean scores [Table 4].

Conversely, Mostafa in a study, reported that the percentage of adequate nursing practices related to waste management were low and only 18.9% had adequate practice.[17] Fortunately, the present study finding is a promising subject; it could be attributed to awareness and knowledge of nurses about their vital role in waste management. Nurses know that a healthy environment impacts the health of people, families, communities, and populations. This knowledge is a foundational element of nursing practice.[21] They must be equipped with the latest information, skills, and Nurses can become leaders in their work settings by advocating for the implementation of environmental health principles into both nursing. practice and the overall delivery of health care.[22]

Also comparing between two studied groups mean scores indicated that the other staffs have acted better in waste segregation. As mentioned above, careful segregation (separation) of waste into different categories helps to minimize the quantities of hazardous waste. Although the nurses have a major role to play about waste minimization but all of health services staff in all departments must be sensitive in this concern. Every one in the institution from the top down must be involved and must share the sponsorship of an environmentally sound and sustainable waste management program.[23]

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