

THE STUDY OF IMPROVED RESULTS OF INFECTIOUS WASTE MANAGEMENT PROCESS ON THE PRODUCTION IN NAMAZI HOSPITAL OF SHIRAZ

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ABSTRACT

The waste generated from hospitals due to pathogenic microbial agents such as bacteria, viruses and chemical carcinogens and having radioactive waste, potentially has the ability to transmit infectious diseases and public health can threatening. This study aims to reduce the amount of waste generated infectious waste management process was performed using the upgrade template. This experimental study was performed on Namazi Hospital efforts to improve the implementation model of waste management; the amount of infectious waste generated is reduced. In this study, two stages, before and after the upgrade process model, weighing one year of hospital waste (per kg per day for plays of bed days) and were compared. Descriptive statistics were used to analyze the data from the index. The results showed that the rate of hospital infectious waste per Kg / d 2.67 per patient bed per patient bed Kg/d1.42 reached after the intervention. The amount of infectious waste at the beginning of 1823.5 kg plan hospital after template implement improved waste management processes, this rate fell to 983.7 kg. In fact, the amount of infectious waste generated by implementing process improvement model was reduced to 46 %. The use of improved waste management processes, the amount of infectious waste is reduced by up to 46 percent. So hospitals can improve the prediction of waste management processes, reduce their infectious waste.

Keywords: *Infectious Waste, Improve Processes, Hospitals, Education*

INTRODUCTION

Man getting his daily activities on the environment and other organisms that threaten their survival placed and is a serious hazard. In order to protect the environment and human health protection and other organisms and solutions applying strategies for achieving sustainable development as a necessity of the past should be considered (Fadaei and Majeed, 2007). Classified as solid waste, medical waste, hazardous wastes are considered as approximately 1% to 2% of municipal solid waste that constitutes a health is important (Joneidi *et al.*, 2010). Among the various sources of medical waste, medical waste in hospitals, despite the country's highest number is produced (Bazr *et al.*, 2008). World Health Organization, Medical waste into ordinary waste, pathological, radioactive, infectious and will classify chemicals (Mardani, 2006). According to reports by the World Health Organization, infectious and hazardous wastes, 10 to 25 percent of total hospital waste form. Studies show that this group of wastes, municipal solid wastes in developing countries, and the problem (Mohamed *et al.*, 2009). Judgment about what is difficult infectious hospital wastes. Several concepts have been expressed infectious waste, keeping these concepts may select collection technology, cost management, environmental and health issues, and ultimately the final disposal of such waste are overshadowed. Some of the scientific material can cause infectious diseases are defined as infectious waste (Mohammadi and Gholizadeh, 1998). In recent years the problem of nosocomial infection and infection care workers to bacteria, viruses, fungi, and also the risks of hepatitis B virus and HIV is one of the major issues addressed by international organizations, especially the World Health Organization is located. According to the survey conducted by the WHO in 2002, it was

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found that the annual 23 million people worldwide are infected with the disease on contact with hospital waste and of these, 20 million related to hepatitis B, 2 million hepatitis C and 150 to 260 are related to HIV and the hospital waste is transferred from sharp objects. Many of these pollutants are known to be preventable if the right is scientific scrutiny shows that the bulk of infections caused due to carelessness and negligence in the storage, transportation and disposal of solid waste, respectively (Habib *et al.*, 2005). Research has been conducted on hospital waste. Almuneef and the amount of medical waste generated in the hospital Memish Riyadh in 1999 to 2000 kg per day and in 2000 the rate of 850 kg per day expressed due to the reduction of solid waste management plan using mandatory in-service training and review the type and volume of waste generated by each section describes and reducing medical waste produced by 58% (Almuneef and Memish, 2003). In a study at one of the hospitals in Tehran to determine the status of waste production in order to identify References of lead departments to reduce waste production was determined by separating and collecting wastes like household and infectious disease in 96% of sections were performed and doctors 10% of nurses and 40% had the highest participation. This study showed that the most important way to reduce solid waste generation, the need for proper model of purchasing, warehousing, distribution and consumption of goods and equipment and supplies appropriate approach is to reduce the production of waste and hospital requirements (Masoom *et al.*, 2011). Zafar and Butler in Maryland infectious hospital waste management plan, the amount of infectious waste from 407 kg to 1163 kg per day were decrease per day (Zafar and Butler, 2000). Implementation of waste separation scheme by Hagen *et al.*, in 1991 in a hospital in Saudi Arabia 410 board's infectious waste reduction rate was 65% (Hagen *et al.*, 2001). In a study by Suhair and Gayoum in 2012 for the eight main hospital in Khartoum took was a lot of waste, administrative, general, food debris, construction and hazardous chemicals all together mixed and added together Technologies and finally there are only a small portion of solid waste disposal in some hospitals (part of potentially infectious waste, body parts and blades) separately collected waste in a central fuel are burned. In this study, the amount of infectious waste generated per bed per day for an average of eight hospitals, 0.87, respectively (Suhair and Saad, 2013). Nominal per capita waste production at hospitals in Ahwaz *et al.*, 7-35 / 0 kg stated. In their study, the ratio of the total production of infectious waste production at hospitals in Ahwaz 22.99%, West 31.5%, Bandar Abbas 34.65% and Kerman 18.4% ratio of the total waste production wastes sharp Hospital Ahwaz 4.79%, Bandar Abbas 6.79%, West 5/4% and Kerman 16.3% has been reported (Nami *et al.*, 2013).

Astronomer and co-factors affect the poor performance of the process in four categories: personnel management, planning, construction, temporary storage and collection facilities grouping and the most important factor in view of employees involved in waste management and research groups as well as direct observations of non-compliance with the separation of waste at the place stated it is one of the most crucial steps in the process and in how it is expressed (Monajam *et al.*, 2012). Appropriate management measures to reduce the quantity of hospital waste and prevent exposure to them, is crucial. This study aims to reduce the amount of infectious waste generated Namazi Hospital Waste Management was conducted using the improved process.

MATERIALS AND METHODS

Methods

First, Before Upgrading Waste Management Process (Pre-Intervention)

This was a cross-sectional study was conducted interference. Given the importance of context in the production of waste, including various departments of the hospital including surgery, internal, emergency, pediatric, intensive, clinical, and administrative and operating room selected as the population studied. In the process of this research was to investigate the management of medical waste in the hospital for six months. Before the experiment, the shape of the infectious waste management, medical waste and pharmaceutical chemicals in the yellow bin, a typical waste water and waste buckets sharp safe containers

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(Safety Box) were poured in the room were sick. Patient, with the patient and medical personnel, regardless of color, in normal waste bins recycle large amounts of infectious or vice versa poured. Waste production in the patient room service staff in some sectors, especially in the evening and night shifts without any label identifying mixed collection and temporary storage of waste was transferred to the position.

It was at this stage that reviews the current status of the production of waste transported to a temporary location, infectious wastes, normal and the sharp separation of each section were measured for six months. After reviewing the current status of the process owners, including the hospital director, chief nursing office, department head, responsible for environmental health and hospital services were invited and the results obtained before the intervention was brought to their notice.

They were asked to form a working group on hospital waste management process is depicted as part of the process was that the need to be improved. Waste management was as follows:

- 1 - Production of all types of waste in the medical and administrative staff and support patient
- 2 - Collect service staff,
- 3 - Transportation of waste by storing temporary station personnel,
- 4 - Transfer from a hospital to a burial place outside the city,

To review the staff's awareness of the types of waste production, separation techniques, safety procedures, the importance of source separation in 1000 a self-administered questionnaire prepared various groups such as doctors, nurses, health workers, assisting health workers, laboratory staff, operating room staff, the unit was placed on clinical staff.

Second, Improved Management of Infectious Waste (Post Intervention)

At this stage, storming the charts with process owners and fish bones are laid waste management and the factors that contribute to the increasing production of infectious waste was identified. To identify the main factors producing waste on fish bone diagram, respectively. Measures to reduce the production of infectious waste done by the process owners, including:

- 1 - Hold a seminar or face to face classes for all hospital staff (doctors, nurses, health workers, services, and clinical staff).
- 2 - According to the results obtained in the previous primary producers infectious waste management personnel during tasks such as dressing change and they were For this purpose, infectious waste and yellow Tralee of dressing equipped buckets Ayman containers (Safety Box) to the buyer and yellow bins and containers safely (Safety Box) was removed from the room.

There was only a bucket of water in each room of the patient and his companions then poured waste production. All medical personnel to perform any act aimed at the treatment of clinical cases, requiring the use of Tralee dressing with yellow Bucket and Safe Containers (Safety Box) was. The infectious waste after production was moved to Tralee dressing. Pharmaceutical waste separation chamber was placed in a white bucket.

Colored tag that specifies the type of waste produced at source was prepared and service personnel were required to separate waste into normal, infectious, chemical and pharmaceutical Tizo win with a label on the bag would and specifies the name of the department, the department of history and was immediately shifted to the transmit position temporarily held. It sanitation experts, administrators sections, the Services and through field observations, error reports, to encourage excellence in the areas of resolution, face to face tutorials and weigh at 6 months was monitored to determine the effectiveness of the promotion of infectious waste management process.

Then, given that there was a positive impact on reducing infectious waste all program guidelines and procedures for stabilizing the directive and to fit the specific nature of each section, the department announced. The final stage of data analysis, the residue was weighed before and after implementation of

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the model in terms of kilograms of waste produced per day per occupied bed was measured and compared with each other.

RESULTS AND DISCUSSION

Results

The results of the review of the current status of Namazi Hospital waste management before the intervention and review the results of the questionnaire showed that 86% of the staff any training in the field of hospital waste and separating them from the source were not significant. 72% of all hospital staff was not familiar with the methods of safe storage of infectious waste. 71% of the staff was not familiar with identifying the types of hospital waste. Using field observations and daily weighing of waste, the residual amount of the average monthly production of Namazi Hospital in 2011 six month period before intervention (Table 1) are presented. Infectious waste generated per capita formula No (1) was calculated. Number of formula (1):

Infectious Waste per Capita kg/d.bed) = [(Average Infectious Waste(kg/d))+ (Average residual sharp(kg/d))] / Average beds occupied per day

Maximum infectious waste produced per month at a rate of 88/2 and the minimum in October 2.67 pounds per day per occupied bed was obtained. Table 1 also shows that the sum of infectious and sharp waste in the past six months, 11.8/ 11608 kg is about 68% of the total waste generated form.

Table 1: Residual amount of the average monthly production of Namazi Hospital six month period in 2011 (pre-intervention)

Capitation Infectious Waste (kg / d.bed)	Average Sharp waste (kg / d)	Average ordinary waste (kg / d)	Average Infectious Waste (kg / d)	Average number of occupied beds	Month
2.67	36.2	938	1823.5	696	September
2.84	19.3	958.9	1961.3	695	October
2.88	23.2	912.7	1996.7	699	November
2.73	18.6	1066.7	1872.7	692	December
2.85	25.6	902.6	1950.4	691	January
2.75	28.4	779.9	1852.9	683	February
2.79	151.3	11457.5	5558.8	4156	Total

Total waste generated (kg):17167.6

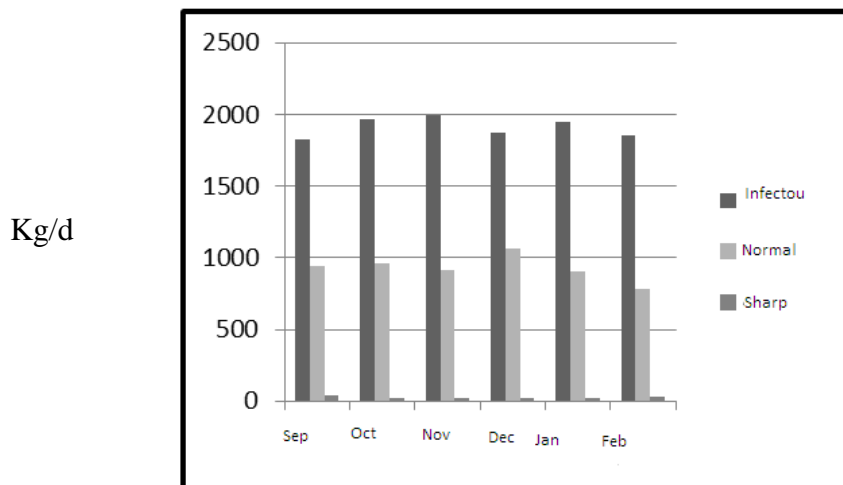


Figure 1: Average waste generated in the second half of 2011 (before the intervention)

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Figure (1) Average of waste production in the second half of the 90 interventions identified on the chart indicates the amount of infectious waste generated in the six months prior to the intervention, the greater the amount of waste produced is normally due infectious waste is mixed with normal waste.

The results of Namazi Hospital waste management status after intervention the average monthly amount of production waste Namazi Hospital six months of 2012, after the intervention plan to promote waste management process in Table 2 can be seen. By comparing Tables (1) and (2) it can be concluded that after the intervention, the average daily production of infectious waste per capita rate of 2.79 pounds per occupied bed (median six months) in October 2011 to 1.42 kg per occupied beds in September 2012 fell. The comparison table (1) and (2) also show that the total waste generated in the 6 months before the intervention, a total of 17167.6 respectively, but the total waste generated in the 6 months after intervention 16333052 kg seemed fall 5% of the total waste produced show. Table 2 also shows that the sum of infectious and sharp waste and chemicals - pharmaceuticals in September about 1051.5 kg, which is 42% of total hospital waste production compared with the six months prior to the intervention 68%, which was significantly lower in the show. The composition of the solid waste management plan upgrades include infectious waste 39.2%, average 57.9%, chemical - pharmaceutical sharp 2% and 0.6%.

Table 2: Average monthly production rate of Namazi Hospital waste six months of the year 2012 (post-intervention)

Capitation Infectious Waste (kg / d.bed)	Average Sharp waste (kg / d)	Average chemical waste (kg / d)	Average ordinary waste (kg / d)	Average Infectious Waste (kg / d)	Average number of occupied beds	Month
2.24	15.01	44.97	1293.4	1449.1	652	March
1.97	11.1	52.7	1388.8	1352.9	689	April
1.87	18.5	61.5	1428.3	1271.8	688	May
1.79	17.4	49.3	1512.9	1221.65	689	June
1.48	12.7	48.2	1644.2	1025.7	699	July
1.42	15.4	52.4	1452	983.7	699	August

Total waste six months (kg): 16333.52

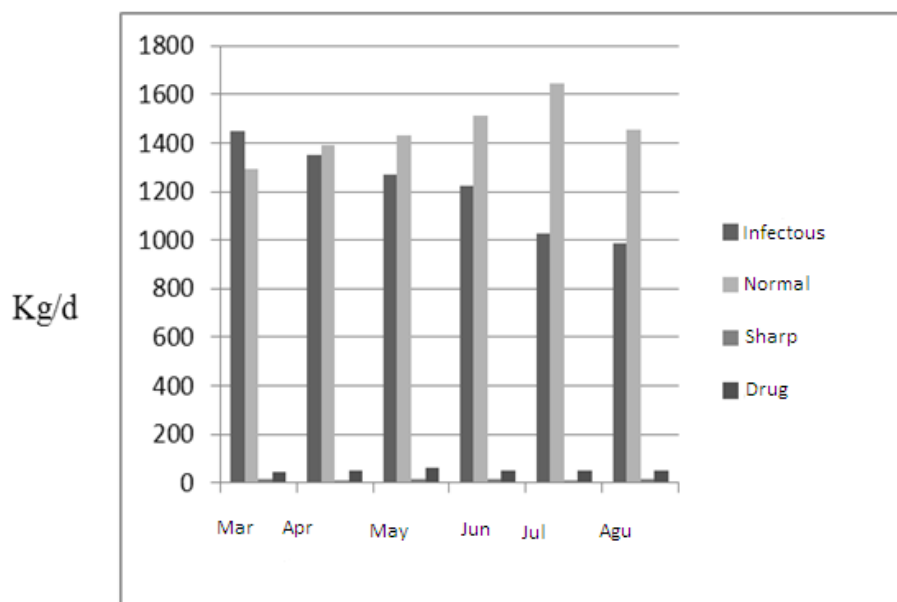


Figure 2: Average waste generated in the second half of 2012 (after the intervention)

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Graph (2) the average waste production in the first six months after the intervention shows 91. This chart shows that interventions carried out on the reduction of infectious waste compared to the second half of 2011 has been very effective in the reduction of infectious waste is significant. A waste management plan to upgrade the level of infectious waste from general waste is much less than this, while the pre-intervention levels of infectious waste than normal waste.

Infectious waste generated per capita rate of decline after interventions, and in September the rate of 1.42 kg per occupied bed has been compared with the average production per capita at the beginning of the project 2.79 pounds per occupied bed was the value of 1.37 kg per day per occupied bed, which dropped 49 percent reduction in the show. The cause of the decline of infectious waste management process owners can learn better with time communication and it can be hoped that with the passage of more time and better monitoring and continuous improvement initiatives more successful waste management is also removed.

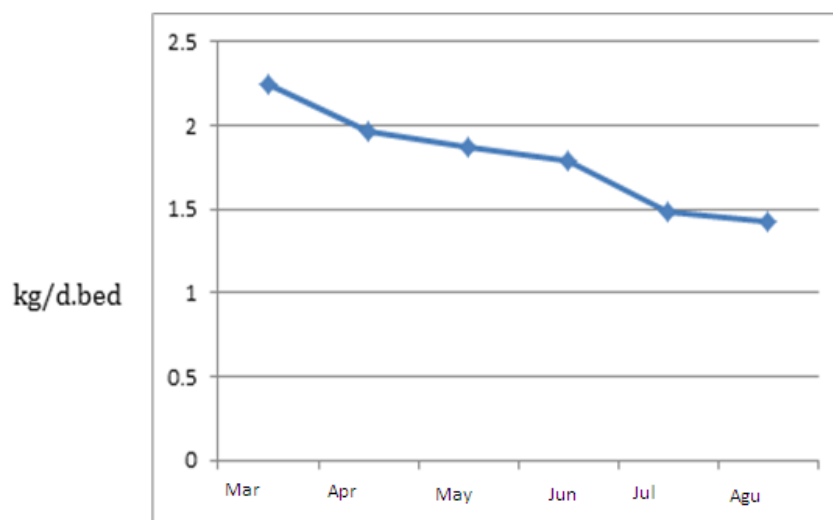


Figure 3: Infectious waste generated per capita rate in the first six months of 2012 (after the intervention)

Discussion and Conclusions

Namazi Hospital is one of the largest hospitals in the country; many people from around the country are referred to the hospital for diagnosis and treatment. According to the academic hospital and a daily visit to various groups of educational training courses, teaching content to students, patients and their relatives seemed almost impossible. Using brainstorming process owners causes leading to increased production of infectious wastes were determined and were plotted on a fish bone diagram (Figure 5). Accordingly, measures to reduce infectious waste done in collaboration with the owners. Based on the scores given by the owners of the fish bone diagram of the process according to the main reason for the increased production of non-infectious waste, waste separation was achieved by patients and staff. Tralee making a dressing with buckets and containers of infectious safe (Safety Box) and take the yellow bins patient rooms, training seminars, tutorials, face local, modify monitoring procedures by hospital officials, authorities, departments, authorities and environmental health services using the methods of punishment and reward, reporting and monitoring has dramatically reduced the amount of infectious waste. Given that there was a positive impact on reducing infectious waste all guidelines and procedures for stabilizing the program directive and to fit the specific nature of each section to section and patients on arrival was announced.

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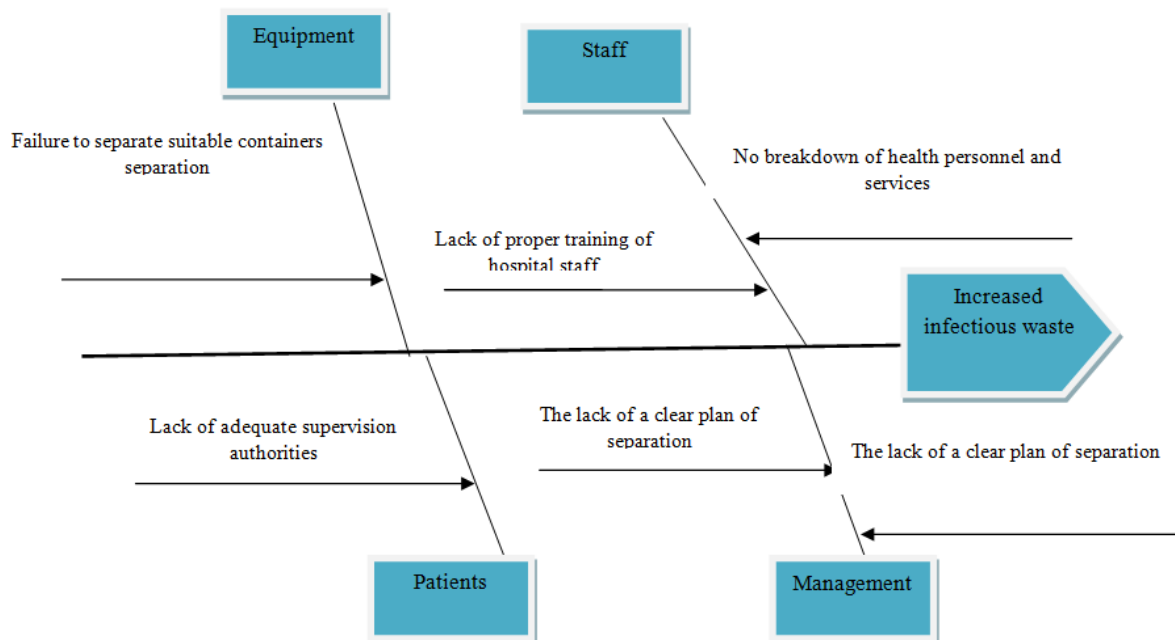


Figure 4: Fish bone diagram causes an increase in infectious waste Namazi Hospital in 2012

The study showed that the amount of infectious waste generated per capita after interventions performed in Namazi Hospital waste management using trend has improved waste management processes and in September of 91, the rate of 1.42 kg per day per occupied bed.

Compared with the average production per capita in the six months prior to the intervention, 2.79 pounds per day per occupied bed was the value of 1.37 kg per day per occupied bed fell 49% reduction in the amount of infectious waste produced per capita shows. The amount of infectious waste generated per capita compared Namazi Hospital Suhair al's study in hospitals in Khartoum (0.87 kg occupied bed per day) is higher. Almuneef ET infectious waste reduction 58%, Hagen and colleagues expressed the rate of decline of 65%. Almuneef ET because the reduction of mandatory training and the study of infectious waste generated each part separately expressed. Hagen and colleagues due to the increasing production of infectious waste materials disposable plastic (Bathtay serum, etc.) are requested. The amount of infectious waste generated in a hospital prayer Performing the upgrade process, the rate dropped to 49% when compared with studies mentioned in this article this amount is less than the cause of the poor resolution in the special wards and operating rooms due to the fact that there are special circumstances in these sections of the rooms is not possible to remove the yellow bins. According to the results of the implementation method of solid waste management in Namazi Hospital upgrade process can be expressed the further reduction of infectious waste with appropriate segregation of infectious waste non-infectious materials can also save money and increase revenue, reducing environmental risks arising from the entry of infectious waste recycling and waste production cycle to be held that, with the collaboration of all the process owners are involved in the production of waste is possible.

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