Outcome of 7-S, TQM Technique for Healthcare Waste Management

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ABSTRACT

Objective: To assess the present waste management system of healthcare facilities (HCFs) attached with Shalamar Hospital, Lahore by applying the 7-S technique of Total Quality Management (TQM) and to find out the outcome after imparting training.

Study Design: Interventional quasi-experimental study.

Place and Duration of Study: The Shalamar Hospital, Lahore, Punjab, Pakistan, November, 2009 to November, 2010.

Methodology: Mckinsey's 7-S, technique of TQM was applied to assess the 220 HCFs from Lahore, Gujranwala and Sheikhupura districts for segregation, collection, transportation and disposal (SCTD) of hospital waste. Direct interview method was applied. Trainings were provided in each institution. After one year action period, the status of four areas of concern was compared before and after training. The parameters studied were segregation, collection, transportation and disposal systems in the 220 HCFs. Each of these were further elaborated by strategy, structure, system, staff, skill, style and stakeholder/shared value factors. Standard error of difference of proportion was applied to assess significance using 95% confidence level.

Results: There was marked improvement in all these areas ranging from 20% to 77% following a training program of 3 months. In case of disposal of the waste strategy, structure and system an increase of 60%, 65% and 75% was observed after training.

Conclusion: The 7-S technique played a vital role in assessing the hospital waste management system. Training for the healthcare workers played a significant role in healthcare facilities.

Key words: Healthcare facilities (HCFs). Hospital waste management. Segregation. Collection. Disposal. Risk factors. Incinerator. SCTD Cycle.

INTRODUCTION

Healthcare waste management (HCWM) practices in the three large districts of Punjab have been recognized as unsatisfactory and hazardous. The unauthorized re-use and recycling practice particularly of disposable syringes is a very serious problem in the world. It poses a potential danger to almost everyone. The most common and most investigated cause of the micro-biological risks associated with healthcare waste is injuries due to needles.[1-4]

Planning in HCWM system is a very complex and difficult task since it is always dealing with the dynamic nature of waste and uncertainty, as well as it is necessary to take into account the demographic, social, economic and health factors.[5,6]

Various units of healthcare facilities contribute variety of the waste in mainstream. The main categories of the healthcare waste are human blood and blood products, cultures and stocks of infectious agents, pathological wastes, contaminated sharps, contaminated laboratory wastes, contaminated wastes from patient care, discarded biological and body parts.[7]

Mckinsey's 7-S technique of total quality management (TQM) has vast application to assess the present situation in any organization by considering the strategy, structure, system, staff, skill, style and stakeholder/shared value.

Out of the work of some well known quality *gurus*, 13 principles have been evolved and applied with varying degrees of success. These principles are innovation in all areas including training and providing resources, "zero-defect" philosophy and continuous improvement.[8-11] In any organization, 75% of the quality deficiencies are management related deficiencies.[12,13] As of now, there is no report of application of such quality improving exercises in the health care sector.

The objective of this study was to systematically assess the role of Mckinsey's 7-S technique of TQM among the 220 healthcare facilities of Lahore, Gujranwala and Sheikhupura regarding HCWM.

METHODOLOGY

An interventional quasi-experimental study of healthcare facilities (HCFs) situated in Lahore, Gujranwala and

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Table I: Healthcare facilities examined (n=220).

Districts	Hospitals	Pathology laboratories	Clinics	Dental surgeries	Pharmaceuticals companies	Poultry laboratories	Total
Lahore	106	29	13	6	9	2	165
Gujranwala	32	1	5	0	0	0	38
Sheikhupura	13	4	0	0	0	0	17
Total							220

Sheikhupura districts of Punjab, Pakistan, was conducted to identify the exact management problems related to the segregation, collection, transportation and disposal of hospital waste. The study was conducted from November 2009 to November 2010. The inclusion criterion was that all those HCFs (220) which were affiliated with Shalamar Hospital, Lahore, were studied. Out of 220, the hospitals included were 106, 32 and 13 from Lahore, Gujranwala and Sheikhupura respectively. Similarly, in the same districts, 29, 1 and 4 pathology laboratories were included in the data collection. In the district of Gujranwala and Sheikhupura there were no dental surgeries, pharmaceutical and poultry laboratories eligible for inclusion. In Lahore district, 6 dental surgeries and 2 poultry laboratories were available for inclusion. A total of 165, 38, 17 healthcare facilities (HCFs) were studied in Lahore, Gujranwala and Sheikhupura districts (Table I).

The importance of 7-S technique which includes strategy, structure, system, staff, skill, style and stakeholder/shared value was explained in each healthcare facility. Personal visits were made in the respective districts and direct personal interviews were undertaken. Approximately 2 hours were spent in each healthcare facility to get the relevant informations.

The interviews were held with medical superintendents/ administrators of HCFs in the presence of paramedical and sanitation staff. In addition to the interviews, the factors relating to the waste were observed directly. Study variables were mainly qualitative in nature; e.g. segregation, transportation, structure, training etc. The data was entered in Statisitcal Package for Social Sciences (SPSS) version 17 and analyzed for proportions. The data of pre-intervention was compared with post-training observation and "Chi-square test" was applied to assess significance using 95% confidence level.

Shalamar Hospital was the local hospital for this study. Infectious waste generated from the 220 healthcare facilities was collected, transported and incinerated by HWM Co., Shalamar Hospital. Custom-made trucks are in practice to collect the infectious waste from the healthcare facilities.

Mckinsey's 7-S technique was applied to assess the actual status of segregation, collection, transportation and disposal methods of hospital waste in the respective HCFs.

The norms developed to assess segregation were: segregation of risk and non-risk waste at source, placing of infectious waste in yellow bags and sharp containers, filling and labelling of yellow bags. The indicators for the collection/storage of waste were: availability of storage room, location and capacity of the room, inaccessibility of the waste from animal, insects and birds, drainage and ventilation facility in the storage area. The indicators for the transportation were divided into on-site transportation and off-site transportation and trolleys, vehicles require for transportation of waste. The indicator for the disposal of waste was only to know how health institutions dispose off medical waste in terms of using incinerator facility or not.

After assessing, a training module was established. The main components of the training module were standard operating procedures (SOPs) for segregation and collection of risk and non-risk waste, hospital waste management plan, introduction of colour coding scheme for the segregated waste, safety protection from the infectious waste especially from needles, syringes and sharps and quality assurance procedures. One day training in each hospital was provided to sanitation, paramedical, doctors and administrative staff. A special presentation was developed to impart training with the help of multimedia, computer and other teaching aids. Director, Hospital Waste Management, Shalamar Hospital, Lahore, conducted the training in each hospital. Approximately 3 months were spent to cover all institutions. After three months of training, the data was collected again to assess the improvement in segregation, collection, transportation and disposal methods.

RESULTS

All the four parameters that are segregation, collection, transportation and disposal were given equal importance. Their relative outcome before and after training program was observed as under:

In the area of segregation, the pre-training assessment showed a range of 20-50% satisfactory arrangements. The best being in skill (50%) and lowest 20% in system and stakeholder / shared value (Table II).

All the factors for segregation in the post-training assessment showed improvement ranging from 20% to 35%. The highest improvement was in structure and lowest in both staff and style. The difference in pre- and post training was found to be statistically significant (p < 0.001, Table II).

Table II: Outcome of 7-S technique (n=220).

Parameter	Satisfactory Segregation %		Satisfactory Collection %		Satisfactory Transportation %		Satisfactory Disposal %	
	n (%)		n (%)		n (%)		n (%)	
Factors	Pre-Training	Post training	Pre-training	Post training	Pre-training	Post training	Pre-training	Post training
Strategy	77 (35%)	147 (67%)	77 (35%)	154 (70%)	88 (40%)	198 (90%)	22 (10%)	154 (70%)
p-value	< 0.001		< 0.001		< 0.0001		< 0.00001	
Structure	66 (30%)	143 (65%)	66 (30%)	143 (65%)	77 (35%)	176 (80%)	44 (20%)	187 (85%)
p-value	< 0.001		< 0.001		< 0.0001		< 0.00001	
System	83 (38%)	154 (70%)	105 (48%)	132 (60%)	70 (32%)	165 (75%)	33 (15%)	198 (90%)
p-value	< 0.001		< 0.01		< 0.0001		< 0.00001	
Staff	88 (40%)	132 (60%)	88 (40%)	132 (60%)	198 (90%)	198 (90%)	154 (70%)	198 (90%)
p-value	< 0.01		< 0.001		< 0.00001		< 0.001	
Skill	110 (50%)	160 (73%)	88 (40%)	110 (50%)	176 (80%)	187 (85%)	55 (25%)	193 (88%)
p-value	< 0.01		< 0.01		< 0.0001		< 0.00001	
Style	44 (20%)	88 (40%)	55 (25%)	99 (45%)	99 (45%)	165 (75%)	6 (03%)	176 (80%)
p-value	< 0.001		< 0.001		< 0.01		< 0.0001	
Stakeholder/Shared value	44 (20%)	99 (45%)	39 (18%)	77 (35%)	77 (35%)	143 (65%)	44 (20%)	154 (70%)
p-value	< 0.01		< 0.001		< 0.01		< 0.0001	

Chi-square test at df 42 (p < 0.01)

Key:

Strategy - the process which involves high level requirement / consideration of the objectives and means to achieve.
Structure - the organizational arrangements that carry out project.
System - the method for the work to be designed, monitored and control.
Staff - the selection, recruitment of the worker on the project.
Skill - the management and technical tools available.
Style/Culture - the way of working and inter-relating within the team work.
Stakeholder / Shared Value - individual or group having the interest in the project.

For collection, the pre-training status as satisfactory was seen to range from 18% in stakeholder to 48% in system. These were similarly found to improve by 10% in skill to 35% in strategy and structure. The difference in pre- and post training was found to be statistically significant (p < 0.001, Table II).

In transportation parameter was found satisfactory to a large extent even in the pre-training assessment. It ranged from 32% in system to 90% in staff. The training further improved in this area from 40% in strategy to 90% and in structure from 35% to 80% (Table II).

The disposal activity ranged from 3% to 25% in all the factors except 70% in staff before training. This area improved tremendously reaching 70-90% in all factors (p < 0.00001) which is highly significant (Table II).

The overall changes in the entire Table II were subjected to chi-square test of significance and found to be significant at df 42 (p < 0.01).

DISCUSSION

Recent changes in the healthcare waste disposal have raised many questions in modifying approaches. Different countries have put forward suggestions and devised strategies, systems, facilities and training needs. These are serving local guidelines and have not been standardized. The 7-S TQM technique has been tested in situation analysis, training need assessment (TNA) and comparing any impact of interventions.

In the absence of uniform national and international standards for healthcare waste management, the 7-S technique was applied. It successfully identified gaps in seven factors governing four major components of waste disposal (SCTD).

The technique could identify weakest area of disposal to better component of transportation. The style of disposal was least satisfactory (3%) and allocation of staff for transportation was most satisfactory (90%). Training program of 3 months uniformly applied to all factors and parameter very successfully improved the awareness and availability of facilities. The assessment was thus found to be very successful as a comprehensive approach to address hospital waste management.

The maximum improvement in the disposal of waste was observed because the waste was being disposed off in Shalamar Hospital, Lahore where incinerator is installed (Figure 1).

A study regarding hospital waste management with reference to Total Quality Management was also done in Namazi Hospital, Iran by Askarian *et al.* They emphasized on the reduction of infectious waste. It was found that the total waste 6.6 kgs per bed per day was reduced to 5.92 kgs per bed per day because of the new guidelines and new waste management concept.[14] That study also supports the present point of view because new guidelines and new concept of hospital waste management disposal method improved the efficiency, skill and system of the institution.

Another study was also done in Tata Main Hospital, India. They also applied the concept of 4'M-Total Quality Management for the management of hospital waste.
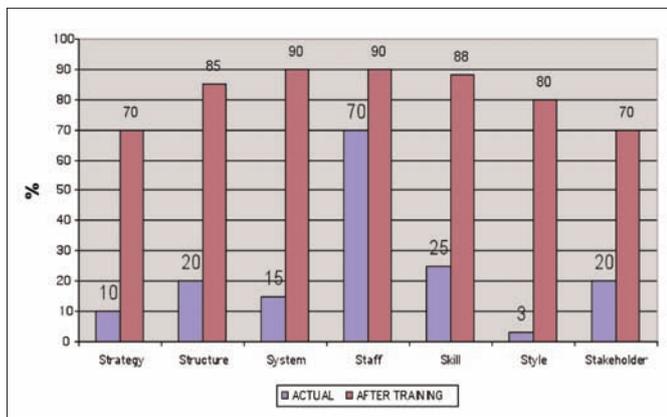
Figure 1: Improvement in the disposal of hospital waste.

They emphasized the importance of proof of need, diagnostic journey, remedial journey and implementation and holding the gains. They also stressed upon the importance of training, awareness of the hospital waste management and installation of new incinerator.[15] Training module developed by us also gained high level of result especially in the disposal method of hospital waste.

Similar ideas were also being elaborated in the study by Al-Nofal, associate of the European centre. Critical quality factors (CQFs) like leadership, top management commitment, maximizing employees commitment, involvement and empowerment, customer driven system, continuous improvement were found most effective and successful factors to achieve goal.[16] Employees commitment and style (culture) for segregating infectious and non-infectious waste from 20% to 40% and 25% to 45% in case of segregation and transportation were enhanced with the help of our training programs. So, study undertaken by Al-Nofal also supported our way of enhancing capacity and capability of the staff.

A study done by the Veda Hegde regarding infectious dental waste, safe and effective management of waste was not only considering legal necessity but also a social responsibility. Lack of concern, motivation and awareness are some of the problems faced in proper hospital waste management. An effective communication strategy was imperative keeping in view the low awareness level among different category of staff in healthcare establishment regarding biomedical waste management.[17] Author also emphasized the reduction of waste generated in clinics and hospitals.

The study applied specially designed standards, criteria of judgment and recommended 7-S, TQM technique. This did not provide a uniform base for generalization till tested extensively. The study also did not extend the post-training period beyond 6 months. The effect of retraining was also not studied.

Continuous training program of the hospital waste management should be maintained. For further scope of study, it is recommended that alternative technologies other than incineration should be studied for the disposal of hospital waste.

CONCLUSION

Applying 7-S, TQM technique in assessing the healthcare waste in various institutions was found useful in discovering important factors and helped greatly in identifying the training needs. The post-training changes were found to be significantly improved.

REFERENCES

1. Dale JC, Pruett SK, Maker MD. Accidental needle sticks in the phlebotomy service of the department of laboratory medicine and pathology at Mayo Clinic Rochester. *Mayo Clin Proc* 1998; **73**:611-5.

2. Haiduven DJ, Simpkins SM, Phillips ES, Stevens DA. A survey of percutaneous/mucocutaneous injury reporting in a public teaching hospital. *J Hosp Infect* 1999; **41**:151-4.

3. Morgan DR. Needle stick and infection control: policies and education. *AIDS* 1999; **71**:1-4.

4. Smedley J, Coggon DE, Heap D, Ross A. Management of sharp injuries and contamination incidents in healthcare workers. *Occup Med* 1995; **45**:273-5.

5. Rahman MT, Sarkar MS, Chowdhury MA, Haque KE, Hasan MM. Solid waste pollution in Sylhet city, *Bangladesh J Environmental Sci* 2003; **9**:297-303.

6. Sarkar SK, Haque MA, Khan TA. Hospital waste management in Sylhet city. *Procurement Operation* 2006; **1**:32-40.

7. Garner J S. Guideline for isolation precautions in hospitals. *Infect Control Hosp Epidemiol* 1996; **17**:53-80.

8. Gitlow HS, Gitlow SJ. The deming guide to quality and competitive position. New York: *Prentice Hall*; 1987.

9. Juran J. Juran on planning for quality. New York: *The Free Press*; 1988.

10. Ishikawa K. What is total quality control: the Japanese way. London: *Prentice Hall*; 1985.

11. Cross P. Let's talk quality. New York: *McGraw Hill*; 1989.

12. Mitchell A. The quality pocketbook. London: *Management Pocket Books*; 1997.

13. Juran Institute. *Quality Improvement of Juran Institute*; 1996.

14. Askarian M, Heidarpoor, Assadian O. A total quality management approach to healthcare waste management in Namazi hospital, Iran. *Waste Manag* 2010; **30**:2321-6. Epub 2010 Jul 23.

15. Das NK, Prasad S, Jayaram K. A TQM approach to implementation of handling and management of hospital waste in Tata main hospital. India: *Hospital Waste Management Committee*; 2005.

16. Al-Nofal A, Zairi M, Ahmed AM. Working paper series. Critical factors of TQM: an international comparative benchmark analysis [Internet]. 2004. Available from: http://www.brad.ac.uk/acad/ management/ external/pdf/workingpapers/2004/Booklet_04-11.pdf

17. Hegde V, Kulkarni RD, Ajantha GS. Biomedical waste management. *J Oral Maxillofac Pathol* 2007; **11**:5-9.

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Safe management of wastes from health-care activities / edited by Y. Chartier et al. – 2nd ed. 1.Medical waste. Declarations of interest The members of the health-care waste-management working group completed the WHO standard form for declaration of interests prior to the meeting. At the start of the meeting, all participants were asked to confirm their interests, and to provide any additional information relevant to the subject matter of the meeting. Objective: To assess the present waste management system of healthcare facilities (HCFs) attached with Shalamar Hospital, Lahore by applying the 7-S technique of Total Quality Management (TQM) and to find out the outcome after imparting training. Study Design: Interventional quasi-experimental study. Place and Duration of Study: The Shalamar Hospital, Lahore, Punjab, Pakistan, November, 2009 to November, 2010. Methodology: Mckinsey's 7-S, technique of TQM was applied to assess the 220 HCFs from Lahore, Gujranwala and Sheikhupura districts for segregation, collection, transportation and di If we define quality management as "management focusing on maintaining and enhancing customer evaluation of the value that is provided through products and services", namely "management for quality", quality management will be a management tool covering a wide range of general management. There are two important leading principles in quality management. Dr. Masahiko Munechika presents a model for a quality management system for healthcare and reports on joint research done with hospitals, which introduces and promotes healthcare quality management systems. 8. structuring clinical knowledge. As mentioned above, the inherent technology is essential for quality of products and services.