DOI: NJLM/2015/12212:2040

Original Article

Microbiology Section

Evaluation of Knowledge, Attitude and Practices Regarding Health-Care Waste Management

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ABSTRACT

Introduction: Waste management in health care establishment is governed by rules and heavy penalty is imposed on those showing non-compliance. Training of biomedical waste management is essential for effective management of health care waste.

Aim: To train and evaluate health care workers on biomedical waste management rules & regulations and occupational safety, followed by post-training assessment.

Settings and design: This study was designed and conducted by the Department of Microbiology in coordination with the Biomedical waste management Cell.

Materials and Methods: A study was planned for health care workers (HCW) over a period of nine months (May 2013 – January 2014). The study included presentations on health care waste management, knowledge and prevention of occupational exposure; and a virtual tour along with visit to waste management site in hospital. Post-training evaluation included ten questions followed by feedback. Practical evaluation was done on basis of demonstration by the participants.

Results: A total of 459 HCW including doctors, nurses, technicians, and nursing assistants attended the training. The impact of training was most prominent among the nurses who scored an average of 86.7% marks followed by doctors (82%), technicians (72.6%) and nursing assistants (66.3%). The comparison of results was statistically significant ($p<0.05$) among doctors versus technicians, doctors versus nursing assistants; nurses versus technicians; and nurses versus nursing assistants. Feedback was given by 170 participants of which, 94.7% found great increase in knowledge and 94.1% found the topic adequately described.

Conclusion: Training of Health Care Workers (HCW) imparts knowledge, brings positive attitude and improves practices related to management of biomedical waste. Health care related activities generate waste which should be managed scientifically and in an environment friendly manner.

Keywords: Biomedical waste management, Health care workers, Training

INTRODUCTION

Health Care Workers (HCW) are responsible for the Health-care related waste generated by them. It is their duty to comply with the rules and regulations formulated for management of Health care waste in the hospitals. Therefore it is necessary to have adequate knowledge regarding its segregation, management and disposal. To impart or refresh this knowledge and prevent associated hazards, structured training sessions were conducted over a period of nine months followed by post-test evaluation.

MATERIALS AND METHODS

Our hospital is a 500 bedded referral hospital in Delhi providing out-patient, in-patient and intensive care services. A dedicated 'Biomedical Waste management Cell' has been set up to assess and record the current practices, fill existing gaps through training and continuous review of procedures to address new issues. Training sessions were conducted for all health care workers in different categories including doctors, nurses, technicians, nursing assistants and sanitary staff by the Microbiology and biomedical waste management departments. A pre-designed questionnaire was given to all except sanitary staff due to their low education level and hence could not be assessed likewise. For the nursing assistants, similar questionnaire was used in Hindi. These sessions were completed over a period of nine months (May 2013-January 2014). Each training session was for three hours which included presentations on health care waste management, knowledge and prevention of occupational exposure; and a virtual tour of waste management in hospital and the storage site through digital photographs. The first presentation focussed on the rules and regulations of health care waste management, the magnitude of waste generated and the implications of improper management. The second presentation focussed on the sharps and the spill management and the hazards they pose as occupational exposure. The needle stick injury policy and the spill policy were discussed. In the third presentation, a virtual tour of the biomedical waste management site was undertaken through photographs and the correct and incorrect

methods were shown and discussed. After the presentation an evaluation was conducted in questionnaire format. Feedback form was distributed to all participants; participation was purely voluntary. This questionnaire consisted of ten questions of one mark each and their feedback regarding content and adequacy of the information provided. At the end of each session a game-quiz was organised for health-care waste segregation. Different types of items including medical and general wastes were mixed in a container. An item was randomly picked and a participant was chosen on the basis of 'fastest response' to tell about its mode of treatment and disposal. After each session the questionnaires and feedback forms were assessed and results compiled for different categories.

RESULTS

Training was imparted to doctors, nurses, technicians (from operation theatres and laboratories), and nursing assistants. Total 459 HCW attended but only 316 (68.8%) attempted the questionnaire [Table/Fig-1,2]. They were evaluated as 'Good/ Average or unsatisfactory'. The percentage of participants scoring 5 or more was 90.5%. The most well attempted question was about the correct identification of the 'Bio-hazard' symbol (83.2%) including correct answer (100%) by all nurses and doctors. The least well attempted question was

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BMW TRAINING: QUESTIONAIRE AND FEEDBACK FORM

Q.1.Define Biomedical waste

Q.2. BMW (Management &handling rules) were notified on
a) 27 June 1996
b) 27 August 1997
c) 20 July 1998
d) 27 October 1999

Q.3. Diseases likely to spread through needle stick injuries are:
a) HBV
b) HCV
c) HEV
d) HIV-1& 2

Q.4.  indicates
a) Biohazard
b) Cytotoxic
c) Biodegradable
d) Recyclable

Q.5. Which toxic gases are emitted if we burn chlorinated plastics?
a) Furans
b) Carbon monoxide
c) Dioxans
d) All of the above

Q.6. How many categories are there for biomedical waste?
a) 2
b) 4
c) 8
d) 10

Q.7. As per BMW management & handling rules, Biomedical waste cannot be stored beyond:
a) 24 hours
b) 48 hours
c) 72 hours
d) 96 hours

Q.8. What is the punishment in case of violation of BMW rules?
a) Fine upto one lakh
b) Imprisonment up to five years
c) Imprisonment up to ten years
d) a) and/or b)

Q.9 Containers of sharp should be
a) Resistant to puncture
b) Tightly closed by a lid
c) Properly labelled
d) All of the above

Q.10 General Waste includes all except
a) Kitchen waste
b) Non infectious plastics
c) Cardboards
d) Gloves

Your Feedback is valuable. Kindly help us to perform better by answering the following:

a) How much has this exercise increased your knowledge?

b) Was the topic well covered and adequately described?

Name and Designation (optional):

[Table/Fig-1]: Questionnaire in English

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"बायो मेडिकल वेस्ट ट्रेनिंग : प्रश्न प्रणाली"

प्रश्न 1. बायो मेडिकल वेस्ट की परिभाषा लिखिए?

प्रश्न 2. बायो मेडिकल वेस्ट के "मैनेजमेंट व हैंडलिंग" नियम कब बनाये गये-
क) 27 जून 1996 *ख) 20 जुलाई 1998*
ग) 27 अगस्त 1997 *घ) 27 अक्टूबर 1999*

प्रश्न 3. निम्नलिखित बिमारियों में से कौन सी बीमारी सुई चुभने से नहीं होती
क) हेपेटाइटिस बी *ख) हेपेटाइटिस ई*
ग) हेपेटाइटिस सी *घ) एचआईवी I/ II*

प्रश्न 4.  *चिन्ह किसका है-*
क) बायो हजार्ड चिन्ह *ख) साइटोटोसिक*
ग) जीवाणु द्वारा अपघटित होने वाला *घ) सेवाय उपलेमाल होने वाला वेस्ट*

प्रश्न 5. क्लोरीन युक्त प्लास्टिक जलाने से कौन सी हानिकारक गैस निकलती है-
क) फ्युरानस (Furans) *ख) डायक्सान्स*
ग) कार्बन मोनोऐसाइड *घ) सभी*

प्रश्न 6. बायो मेडिकल वेस्ट की कितनी श्रेणियां (Categories) हैं-
क) 2 *ख) 4*
ग) 8 *घ) 10*

प्रश्न 7. बायो मेडिकल वेस्ट को नियमानुसार कितने घंटों तक वेस्ट भंडार में रखा जा सकता है-
क) 24 घंटे *ख) 48 घंटे*
ग) 72 घंटे *घ) 96 घंटे*

प्रश्न 8. बायो मेडिकल वेस्ट के नियमों का उल्लंघन करने से क्या दंड मिल सकता है-
क) एक लाख रुपये जुर्माना *ख) पाँच साल की कैद*
ग) दस साल की कैद *घ) क और ख दोनों*

प्रश्न 9. शार्प कन्टेनर कैसा होना चाहिए -
क) जिसमें आसानी से छेद न हो सके *ख) पूरी तरह लेबल*
ग) जिसका ढक्कन पूरी तरह बन्द हो सके *घ) उपरोक्त सभी*

प्रश्न 10. निम्नलिखित में कौन सी वस्तु सामान्य कचरा नहीं है-
क) रसोई का कूड़ा *ख) गत्ता*
ग) असंक्रमित प्लास्टिक *घ) दस्ताने*

☆
- आपका सहयोग अमूल्य है, अतः प्रश्नों का उत्तर लिखकर हमारी सहायता करें-

क) इस ट्रेनिंग से आपके इस विषय के ज्ञान में कितनी वृद्धि हुई?

ख) क्या हमारा यह प्रयास आपको बायो मेडिकल वेस्ट के बारे में जानकारी देने में पर्याप्त रहा?

नाम व पदः
विभागः

[Table/Fig-2]: Questionnaire in Hindi

the date of notification of biomedical waste management rules (58.9%). Proper definition of health care waste/ biomedical waste was given by 43.7%. The impact of training was judged by the average marks obtained in each group. It was the most prominent among nurses who scored an average of 8.67 marks [Table/Fig-3]. However, the participants scoring good marks (8 to 10) were maximum among doctors (33.1%), followed by nursing assistants (32.4%), nurses (28.27%) and technicians (6.2%). The results of evaluation were compared among these groups of health care workers and the results of comparison were found to be statistically significant among doctors versus technicians or nursing assistants ($p< 0.001$), nurses versus technicians ($p<0.01$) or nursing assistants ($p<0.05$) but not significant when compared between doctors versus nurses and technicians versus nursing assistants ($p>0.5$). Feedback was provided by 170 participants only. Of these, 94.7% experienced great increase in their knowledge after our training programme and 94.1% found the topic adequately described. The game quiz was an interesting fun-filled learning exercise to check their practices related to waste management. On an average, 20 items were mixed and there were 5% errors noted. The attitude was assessed by discussion with the participants about the importance they attributed to waste segregation and protection against occupational exposure pre-training and post training. One hundred forty three participants who opted out of evaluation

Group	No. attended	Questionnaire attempted (n)	Good (8-10 marks)	Average (5-7 marks)	Unsatisfactory (1-4 marks)	Total marks	Average marks	Min marks	Max. marks
Doctors	113	81	48	32	1	665	8.20	4.0	10.0
Nurses	163	76	41	31	4	659	8.67	3.0	9.0
Technicians	46	35	9	19	7	254	7.26	4.0	9.0
Nursing assistants	137	124	47	59	18	822	6.63	3.0	10.0

[Table/Fig-3]: Post training performance and evaluation of health care workers

were considered to have negative attitude towards waste management. All participants felt that there was a remarkable change after attending the training programme. The training ended with a pledge by all health care workers that they would follow practices to ensure 'Patient Safety' and be careful while handling biomedical waste; notify all incidents related to occupational exposures like needle stick injuries and spills.

DISCUSSION

Just like a surgery is incomplete without skin closure, the task of managing hospital waste is incomplete before its final correct disposal. Approximately one-fifth of health care/ biomedical waste is considered hazardous as it poses risks of exposure to infectious agents, hazards associated with sharps, toxins/ chemicals present in the waste, genotoxicity, cytotoxicity and radioactivity. Apart from these risks, there is possibility of water, air & soil pollution. It also has considerable impact on mental health due to aesthetic effects. [1]The health care waste management aims to minimise and manage waste in a scientific and environment friendly way, starting from segregation, collection and handling to disposal. It should not pose occupational hazards to the health care workers and should be cost effective. [2] According to WHO, in 2000, injections with contaminated syringes caused an estimated 21 million hepatitis B virus (HBV) infections, two million hepatitis C virus infections and 260 000 HIV infections worldwide. Many of these infections were avoidable if the syringes had been disposed of safely. [3] Out of these 66,000 HBV, 16000 HCV and 200-5000 HIV infections were among HCWs. [4] An outbreak of Hepatitis B in Gujrat in 2009 claimed 60 lives and was traced to the reuse of injection equipment. Additional hazards from sharps occur during sorting activities at waste disposal sites in health-care establishments. [4]

The support of the hospital administration is crucial for implementation of biomedical waste management rules. The emphasis was on responsibility of each and every health care worker in the institution to follow the rules. Only a 'team-approach' would be fruitful for the implementation.

In our study, best performance was of nurses, followed by doctors, technicians and nursing assistants. However, proportion of members securing best marks (8-10 marks) was among doctors followed by nursing assistants, nurses and technicians. This could be attributed to prior training of nurses two years back. No other group of health care worker could be trained at that time. In a study by Mathur et al., [5], knowledge about biomedical waste rules, colour coding, segregation, transmission of disease and practices were highest among the doctors followed by laboratory technicians, nurses and least by sanitary staff. The practice of self-reporting injuries was found to be very low among their technical staff and was found to be completely absent among non-technical sanitary staff [5]. The best practice observed in our hospital was of proper segregation as observed during the game quiz, which is the key to effective management of biomedical waste.

In our study all doctors and nurses knew about the biohazard symbol while 91.4% technicians and 59.7% of nursing assistants knew in contrast to study by Bathma et al., [6] in which only 68.4% doctors, 81.8% nurses and 85.7% waste handlers could identify the biohazard symbol.

In a study by Sharma et al., [7], 29% disagreed that the BMW should be handled safely while 41% agreed, half of the study subjects considered it to be an extra work. The topmost agenda in health- care waste management should be aimed at minimisation of waste [8].

During this training, we have achieved to train a large number of health care workers over a short period of time. Different categories of hospital staff were trained including administrators, doctors, nurses, technicians, nursing assistants and sanitary staff. The health care workers from different generation sites voluntarily came to clear their doubts about the BMW management. Segregation practices in the hospital has significantly improved post-training and the HCWs are now motivated to report and record the occupational exposures including needle stick injuries and spills as noted during our daily rounds in the hospital.

LIMITATION

The limitations of this study has been lack of a pre-test questionnaire, therefore, the magnitude of knowledge imparted during the training could not be assessed. The evaluation and feedback was voluntary therefore, around 31% of the participants opted out and could not be evaluated. The questionnaire consisted of four questions where more than one option was correct. Majority of the participants have marked one of these as correct.

In future we plan to include professional development skills in our training to improve the attitude of hospital staff towards health care waste management. We plan to extend the training

programme for other categories including pharmacists, staff of forensic medicine department, security personnel, clerical staff and visitors. It would be mandatory for all staff to attend and to be evaluated. By imparting this knowledge, we aim to minimise waste and create safe and healthy environment for ourselves, our colleagues and our society. We aim to do away with, "It is not my job" attitude when it comes to the management of health-care waste.

CONCLUSION

The training was effective in majority of health care workers. Compilation of results would help us to stress on points which were not adequately retained by participants. This started as a voluntary exercise; therefore participation was not 100%. Continuous logistic support and user friendly approach is equally important while implementing in the process of any rules, regulations concerning the medical practice other than the core mandate the area they are assigned to. The hospital administration has planned to make it compulsory for all current employees and new recruits. Waste management in health care establishment is governed by rules and heavy penalty is imposed on those showing non-compliance. It is therefore pertinent that all health care workers undergo this training and manage the health-care waste appropriately and safely.

REFERENCES

[1] Saini S, Nagarajan SS, Sarma RK. Knowledge, Attitude and Practices of Bio-Medical Waste Management amongst Staff of a Tertiary Level Hospital in India. *Journal of the Academy of Hospital Administration.* 2005;17(2):1-12.

[2] Guidelines for protecting the safety and health of health workers. NIOSH /Health Care Workers guidelines / Chap 6 Available at: http://www.cdc.gov/niosh/docs/88-119/

[3] Waste from health-care activities. Fact sheet N°253. November 2011 WHO. http://www.who.int/mediacentre/factsheets/fs253/en/.

[4] Pruss-Ustun A, Emmanuel J, Rushbrook P, Zghondi R, Stringer R, Pieper U, et al. Risks associated with health-care waste. In: Safe management of wastes from health-care activities. 2nd edition WHO 2005.

[5] Mathur V, Dwivedi S, Hassan MA, Misra RP. Knowledge, attitude and practices about biomedical waste management among health-care personnel: A cross-sectional study). *Indian J Community Med.* 2011; 36 (2): 143-15.

[6] Bathma V, Likhar SK, Misra MK, Athavale AV, Agarwal S, Shukla US. Knowledge assessment of hospital staff regarding biomedical waste management in a tertiary care hospital. *National Journal of Community Medicine.* 2012; 3(2): 197-200.

[7] Sharma A, Sharma V, Sharma S, Singh P. Awareness of biomedical waste management among health care personnel in Jaipur, India. *OHDM.* 2013; 12(1): 32-40.

[8] Al-Shahi Salman R, Beller E, Kagan J, Hemminski E, Phillips RS, Savulescu J, et al. Increasing value and reducing waste in biomedical research, regulation and management. *Lancet.* 2014; 383 (9912): 176-85.

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FINANCIAL OR OTHER COMPETING INTERESTS: None.

Date of Publishing: **Jul 01, 2015**