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RESEARCH ARTICLE

STATUS OF BIOMEDICAL WASTE AND THEIR POSSIBLE PUBLIC HEALTH RISKS WITH CONTROLLING MEASURES IN THE JHANSI CITY, BUNDELKHAND REGION, INDIA: A CASE STUDY

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ABSTRACT

The biomedical wastes generated from various hospitals in he Jhansi city are going to inversely impacts on environment and potentially alarming the spreading of hazardous infections due to indiscriminate and unscientific management posses serious threats to human health. Hospitals have no mention of worker's safety, training, operation and monitoring activities. The rag pickers and waste workers are often worst affected, because unknowingly or unwittingly, they rummage through all kinds of poisonous material by trying to salvage items which they can self for reuse. At the same time, this kind of illegal and unethical reuse can be extremely dangerous and even fatal. Diseases like cholera, plague, tuberculosis, hepatitis; AIDS, diphtheria etc occur in either epidemic or even endemic form poses grave public health risks. Author has attempt of critically review and effective current biomedical waste management practices followed by some selected Jhansi's hospital with regrets to the chain of environmental and health risks.

INTRODUCTION

The rules framed by the ministry of Environment and forests (MoEF), Govt. of India, known as Biomedical waste (Management and Handling) Rules, 1998, notified on 20th July, 1998, provides uniform guidelines and code of practice for the whole nation. It is clearly mentioned in this Rule 3 (8) that the "occupier" (a person who has control over the concerned institution/premises) of an institution generating biomedical waste (e.g. hospitals, nursing home, clinic dispensary, veterinary institution, animal house, pathological laboratory, blood bank etc.) shall be responsible for taking necessary steps to ensure that such waste is handled without any adverse effect to human health and the environment (Rule 4). Ministry of environment and forests (MOEF), Govt. of India has described ten categories with colour coding and their treatment and disposal methodologies viz; Human anatomical waste (yellow, incineration/deep burial), Animal waste (yellow, incineration/deep burial), Microbiology and Biotechnology waste (yellow/red, local autoclaving/ microwaving/incineration), Waste sharps (Blue/white translucent, disinfection, chemical treatment/ autoclaving /Microwaving and mutilation/ shredding), Discarded Medicines and Cytotoxic drags (Black incineration/destruction and drug disposal in secured landfills), Solid waste items contaminated with blood and body fluids (yellow/ Red, incineration, autoclaving/ microwaving) Solid wastes generated from disposable items (Red/Blue/White translucent, disinfection by chemical treatment, autoclaving/ microwaving and navigation/ shredding), Liquid waste generated from laboratory and washing (disinfection by chemical treatment and discharge into drains), Incineration Ash (Black, disposal in municipal landfill), Chemical waste as solid from (Black, disposal in secured landfill). In the Jhansi city study on the selected five hospitals in which one government hospital (R.L.M.C.) and four private hospitals (Naza, Life Line, Shree Ji and Sherawaali) have been generated various types of hazardous and contagious material. The indiscriminate disposal of these biomedical waste poses a great risk to human health and environment and could cause an epidemic as well as endemic form warned the environmentalists. The most important to protect public health is a manifest system of cradle-to-grave accountability for an infectious portion of a hospitals waste. These wastes produced in the course of health-care activities carries a higher potential for infection and injury than any other type of waste. Inadequate and inappropriate handling of healthcare waste may have serious public health consequences and a significant impact on he environment (Pruss *et al.,* 1999). The main reasons for improper management of these biomedical wastes are financial and technological constraints and difficulty in monitoring of scattered health care facilities. To realize a sustainable development with hospitals, it is necessary that the need to maintain a balance between effective infection control and a good ecological environment is recognized and

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supported by health-care worker's and the hospital management (Daschner and Dettenkofer, 1997).

Possibility of Health risks hazard

For our health and life followed the medical care is vital need which concerned the improper management of biomedical wastes. But the improper management of waste generation from various hospitals has creating a numbers of health risk problems to living nature and human world. Human beings are exposed to a huge variety of health risks over their entire life. Every day, relatively large amount of potentially infectious and hazardous waste are generated in the healthcare hospitals and facilities around the world (E.C. Cole, 1995). Within a hospital the main groups namely healthcare workers find at great risks where three infections are most commonly transmitted viz; hepatitis B virus (HBV), hepatitis C virus (HCV) and human immunodeficiency virus (HIV). Among the 35 million healthcare workers worldwide, the estimations show that each year about 3 million receive hard exposures to blood born pathogens, 2 million of those to HBV, 0.9 million to HCV and 1,70,000 to HIV (Diaz, L.F. and Savage, G. M. 2003 ; Sulmer, P. 1989). By the study, those workers who involved in the collection and treatment of the biomedical waste are highly exposed to a certain risks. Types of infections determined by the contact with biomedical waste, pathogen agents and transmission are given below in Table (1).

Review of literature

In accordance with the rules, 1998 (MoEF), every hospital generating biomedical waste (BMW) needs to setup requisite treatment facilities on- site or off-site may be at common treatment facility. The biomedical waste should not be stored at any place for more than three days. The exposure of highly infectious waste like living or non-living pathogens, human body parts, soiled wasted (bandages, dressing, plaster casts, contaminated with blood), laboratory culture stocks, human blood, bodily fluids, blood products, contaminated medical equipment, dialysis wastes, surgery wastes, chemical (expired) and pharmaceutical products and incineration ash could cause spreading serious diseases (HCWH, 2001). The hospital waste, in addition to the risk for patients and personal who handle these wastes poses a threat to public health and environment (Sing and Sharma, 1996). Bags and containers for infectious waste should be marked with Biohazard symbol. Highly infectious waste would be sterilized by autoclaving. Cytotoxic wastes are to be collected in leak proof containers clearly labeled as cytotoxic waste. Handling, segregation, mutilation, disinfection, storage, transportation and find disposal are vital steps for safe and scientific management of biomedical wastes in any establishment (Acharya and Singh, 2000). On- site collection requires staff to close the waste bags when they are three granters full either by tying the neck or by sealing the bag.

Table 1 : Shows the types of infectious, pathogens agents and transmission path due to Biomedical waste generations (Sulmer, P. 1989 ; Doucet, L.G. 1989).

S. No.	Infection Type	Pathogen Agents	Transmission Path
1.	Gastrointestinal Infections	Enterobacteria : salmonell, Shigella Spp, vibrio cholera Helminths.	Faeces or/and vomiting liquid
2.	Respiratory Infection	Mycabocterium tuberculosis Measles virus Streptococcus preumonae Herpes virus	Respiratory secretions, saliva
3.	Eye Infections	Herpes virus	Eye secretions
4.	Genital Infections	Neisseria gonorrhoeae Herpes virus	Genital secetions.
5.	Skin Infections	Streptococcus spp.	Purulent secretions.
6.	Anthrax	Bacillus anthracis	Secretions of skin lesions.
7.	Meningitis	Neisseria meningitides	L.C.R.
8.	AIDS	HIV	Blood,Semen,Vaginal Secretions.
9.	Haemorrhagic fevers	Iunin viruses, Lassa, Ebola Marburg	Bilogical fluids andsecretions
10.	Septicemia	Staphylococcus ssp	Blood
11.	Viral Hepatitis type A	VHA	Faeces
12.	Viral Hepatitis type B and C	VHB, VHC	Blood, biological fluids.

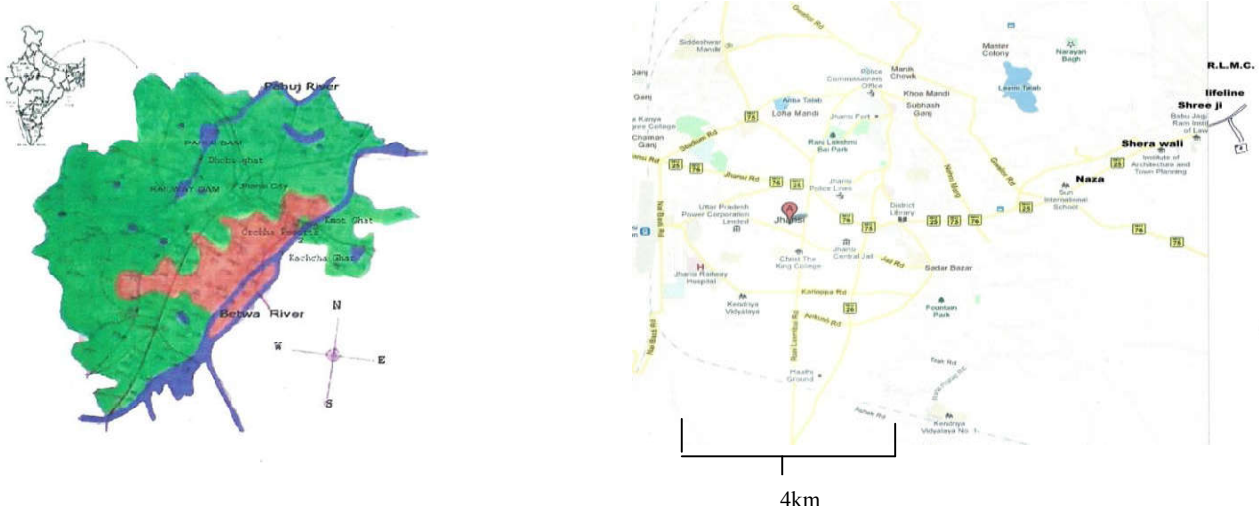


Table 2 : Shows the monthly data collections of the BMW for 5 hospitals in the month of February (2010. Bracket indicate the number of beds.

S. No.	Feb. Date wise collection	Naza (23) waste Generated perday	Sherawali (50) waste Generated perday	Life Line (40) waste Generated perday	Shree Ji (28) waste Generated perday	R.L.M.C. (600) waste Generated perday	
1.	01	14 kg.	20 kg.	22 kg.	11 kg.	234 kg.	
2.	02	16	22	16	16	246	
3.	03	11	18	18	12	281	
4.	04	10	19	19	14	270	
5.	05	18	15	18	10	248	
6.	06	13	23	21	12	263	
7.	07	14	20	24	14	254	
8.	08	18	12	18	16	248	
9.	09	15	21	17	16	285	
10.	10	10	19	23	13	240	
11.	11	16	23	16	16	226	
12.	12	10	27	22	13	271	
13.	13	11	16	21	11	242	
14.	14	11	22	19	13	261	
15.	15	14	15	24	15	264	
16.	16	19	20	19	12	219	
17.	17	16	13	26	15	226	
18.	18	16	20	17	17	256	
19.	19	12	24	22	14	292	
20.	20	15	20	20	10	270	
21.	21	14	18	24	12	264	
22.	22	11	14	16	13	241	
23.	23	16	22	16	13	216	
24.	24	14	25	18	16	274	
25.	25	16	22	16	17	286	
26.	26	10	15	20	15	249	
27.	27	13	19	23	13	253	
28.	28	12	25	28	10	284	
	Total	387 kg.	549 kg.	563 kg.	379 kg.	6910 kg.	8788 kg/ month

Kerb side storage area needs to be impermeable and hard standing with good drainage. It should provide an easy access to waste collection vehicle (Srivastava, J.N. 2000).

Cradle-to-Grave Cost Accountability for BMW

For the cost of biomedical waste management, some money investments in different phases viz; cost of construction, operation and maintenance of system for managing biomedical waste represent a significant part of overall budget of a hospital if the biomedical waste handling rules (1998) have to be implemented in their true spirit. Total cost in terms of capital cost as well as operational cost (per month) for the infrastructural requirement was worked out for biomedical waste management. Govt. of India in its pilot projects for hospital waste management in Government hospitals has estimated Rs. 85 lakh as capital cost in 1000 bedded super specialty teaching hospital which includes on site final disposal of biomedical wastes. Two types of costs are required to be incurred by hospitals for biomedical waste management, where internal and external acts. Internal cost is he cost for segregation, mutilation, disinfection, internal storage and transportation including hidden cost of protective equipment. External cost involves off-site transport of waste, treatment and final disposal.

Table 3 : Shows the monthly data collections of the BMW for 5 hospitals in the month of March (2010). Bracket indicate the number of beds.

S. No.	March Date wise collection	Naza (23) waste Generated perday	Sherawali (50) waste Generated perday	Life Line (40) waste Generated perday	Shree Ji (28) waste Generated perday	R.L.M.C. (600) waste Generated perday	
1.	01	12 kg.	12 kg.	22 kg.	13 kg.	255 kg.	
2.	02	17	17	16	15	265	
3.	03	14	14	18	14	289	
4.	04	16	16	19	14	233	
5.	05	13	13	18	10	221	
6.	06	17	17	21	12	252	
7.	07	12	12	24	14	278	
8.	08	15	15	18	12	271	
9.	09	14	14	17	16	264	
10.	10	14	14	23	10	244	
11.	11	16	16	16	14	211	
12.	12	18	18	22	12	270	
13.	13	12	12	21	13	217	
14.	14	17	17	19	21	246	
15.	15	12	12	24	17	239	
16.	16	14	14	19	13	238	
17.	17	13	13	26	12	238	
18.	18	16	16	17	11	229	
19.	19	14	14	22	13	247	
20.	20	13	13	20	10	267	
21.	21	17	17	24	14	237	
22.	22	15	15	16	13	276	
23.	23	14	14	16	14	277	
24.	24	16	16	18	11	265	
25.	25	16	16	16	15	286	
26.	26	12	12	20	12	277	
27.	27	15	15	23	10	237	
28.	28	17	17	28	10	244	
29.	29	14	14	18	11	245	
30.	30	16	16	20	14	268	
31.	31	13	13	24	12	288	
	Total	441 kg.	441 kg.	625 kg.	368 kg.	787 kg.	9750 kg/ month

MATERIALS AND METHODOLOGY

From the field work collection of monthly data of the generated various biomedical wastes was carried out to explore the quantity and quality from selected 5 hospitals namely Naza, Sherawali, Life line, Shree Ji and R.L.M.C. situated along the Kanpur Road in Jhansi City, Bundelkhand. In these hospitals, various type of basic components of hazardous biomedical waste generated mainly human anatomical wastes (body parts, tissues, organs), microbiology and biotechnology wastes (human cell culture, laboratory culture, toxins), waste sharps (hypodermic needles, syringes, broken glass, scalpets), discarded medicine and cyto-toxic drugs, soiled wastes (items contaminated with blood and body fluids including cotton, soiled plaster casts), Solid wastes (disposable items like tubes, catheters etc excluding sharps), liquid wastes (waste generated from laboratory and wasting, cleaning and disinfecting activities), incineration ash and chemical wastes. From the above biomedical wastes generation different methodologies

Table 4 : Shows the monthly data collections of the BMW for 5 hospitals in the month of April (2010). Bracket indicates the number of beds.

S. No.	March Date wise collection	Naza (23) waste Generated perday	Sherawali (50) waste Generated perday	Life Line (40) waste Generated perday	Shree Ji (28) waste Generated perday	R.L.M.C. (600) waste Generated perday	
1.	01	15 kg.	22 kg.	25 kg.	16 kg.	215 kg.	
2.	02	14	24	24	19	274	
3.	03	12	21	18	12	248	
4.	04	13	18	23	11	253	
5.	05	12	16	19	10	268	
6.	06	14	20	18	14	274	
7.	07	16	17	20	13	216	
8.	08	15	18	22	12	277	
9.	09	13	20	23	15	263	
10.	10	17	25	27	13	227	
11.	11	16	18	26	13	226	
12.	12	16	15	25	12	248	
13.	13	17	22	23	14	237	
14.	14	18	25	18	15	248	
15.	15	17	23	26	12	237	
16.	16	16	20	19	10	229	
17.	17	17	21	23	11	257	
18.	18	16	25	18	14	268	
19.	19	15	26	24	15	265	
20.	20	14	24	22	12	264	
21.	21	14	22	21	14	264	
22.	22	15	20	20	17	237	
23.	23	13	18	21	15	283	
24.	24	16	16	26	14	286	
25.	25	18	22	25	10	288	
26.	26	17	25	19	11	249	
27.	27	14	15	24	14	264	
28.	28	18	14	23	14	268	
29.	29	15	20	23	15	255	
30.	30	17	23	27	17	247	
	Total	460 kg.	615 kg.	672 kg.	404 kg.	7635 kg.	9786 kg/ month

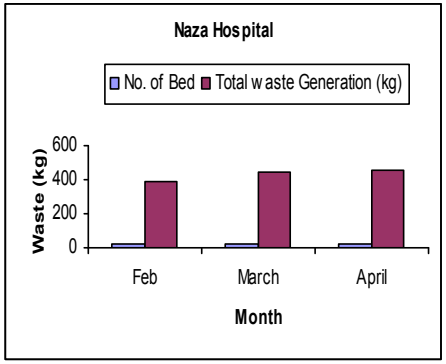
of storage and segregation at the departmental level in selected hospitals where activities like internal transportation, kerb side storage, external-transportation, on-site and off-site disposal were studied by direct observations and their infrastructural facilities. Informal discussion with others hospital functionaries was carried out. Common central facility for final disposal of infections waste with suitable technologies was also studies with the degree of adaptation rules.

RESULTS AND DISCUSSION

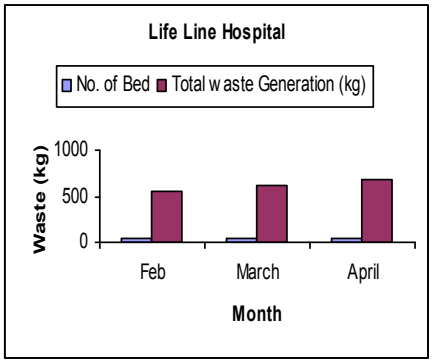
In Bundelkhand region, Biomedical wastes generation data in selected five hospitals mentioned above of the Jhansi city of Uttar Pradesh, India, on daily basis collection under present study have been carried out in the three months from February to April, 2010 given below in Table 2. For the first time in India , the Union Ministry of Environment and Forest (MoEF)issued a notification (1998)to regulate disposal of hospital waste and also not only lay down the frame -work for safe disposal of hospital

Table 5: Shows the data of the total numbers of biomedical waste generation of the red and yellow polythencs in the months of February, March and April (2010)

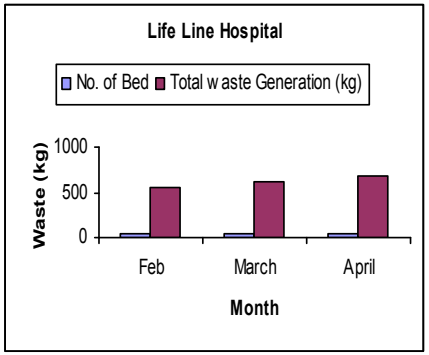
S. No.	Month	No. of Red bags	No. of Yellow bags	Total No. of bages	Total No. of bags ×10	Total weight (kg)	Incineration Ash (Kg)
1.	February	1341	1284	2625	2625×10	26250	499.50
2.	March	1505	1356	2861	2861×10	28610	534.50
3.	April	1431	1329	2760	2760×10	27600	541.50
Total		4277	3969	8246	8246x10	82460	1575.50
Average (Kg)		1426	1323	2749	2749x10	27486	525.16



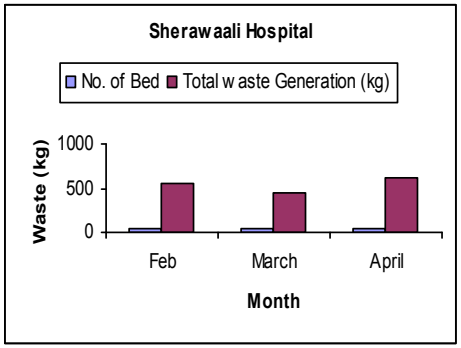
A. Naza Hospital



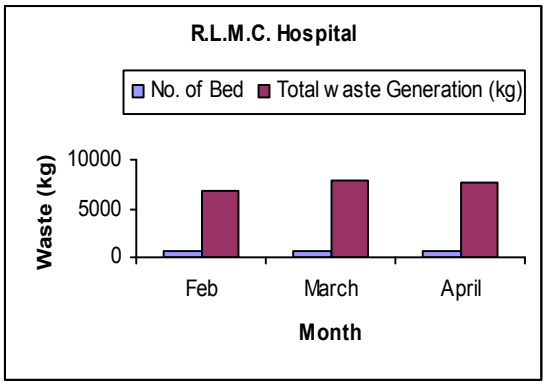
B. lifeline Hospital



C. Shree Ji Hospital



D. Sherawaa li Hospital



E. R.L.M.C. Hospital

waste but also regulate waste disposal technologies. In Jhansi city (India), no regulatory minimum temperatures standards are followed for incineration because, there is no available incineration facility setup. Based on survey, the total generated biomedical wastes in the months of February, March and April about 8788kg, 9750kg and 9786 (per month)respectively (total,28324kg).The different bio medical wastes have not been segregate properly works out. Only red and yellow bags used and stored improper ways. it was found that the 30% of biomedical wastes are using incineration in the bhattis and rest of wastes are dumping in the open space and some of which dumped into landfills by
the open dumping of the dangerous biomedical wastes, where found to be contaminated with disease carrying pathogens spreads infection in the dumping site Bijauli as well as affecting in their satellite areas of the Jhansi city. Due to burning of biomedical waste at open dumping site, creating toxic elements and compounds and contaminating the environment with lethal chemical dioxin where materials containing chlorine burned. Another major probem is the disposal of incineration ash as well as fly ash having toxic because of heavy metals, dioxins and furan in it affecting ground water regime also it is suggested that the proper segregation, labelling and appropriate treatment of wastes would go as long way in reducing the problem caused by the medical wastes.

Controlling measures and recommendatory management

For the five hospitals in the terms of direct observation functionaries and their infrastructures in Jhansi city of biomedical wastes should be transported within hospital by means of wheeled trolley with respective containers or carts with specified colour coding used strictly for any other purposes in accordance with the legislation The trolley have to be properly cleaned with suitable anti-infectional chemicals. Temporary storage of wastes generated within the hospitals, should be performed in special place and their storage time not exceeds 48 hours and also not exceeds 24 hours for transport and final disposal. Off site transportation vehicle is carried out only by authorized companies and it should be marked with the name, address, biohazard symbol having the specific biomedical waste types and their specific designated routes from origin to destination site. Some of the important recommendations for the systemic approach to waste management in Jhansi city's hospitals it should followed the waste audit inventory control, accountability, categorization medical wastes, specific air emission standards for biomedical wastes and awareness ,education and training of individuals. In fact we have to be more accountability for the waste generated and adopt cleaner technologies as well as adapted the polluter pays principals rules directed by Supreme Court of India.

CONCLUSION

From the above surveying data indicate that these selected five hospitals including Govt. hospital comparing in terms of bed strength and waste generations and their incineration ash has been carried out. It is observed that the most of the private and Govt. hospitals both have not been properly implementing their biomedical wastes as per BMW 1998 rules. These hospitals have not been segregating the biomedical wastes every day, in accordance with the biomedical waste categories and also not collected in the appropriate type of container which specified various colour coded bags and plastic drums at generation levels.

REFERENCES

Acharya, D.B. and Singh Meeta, 2000. The book of Hospital waste management . Minerva press New Delhi, 15-47.

Cole,E.C. 1995. Internal Medical waste management, Durham, North Carolina.

Daschner, F.D. and Dettenkofer, M. 1997. Protecting the patient and the environment-new aspects and challenges in hospital infection control. *Jounral of Hospital Infection*.Vol.36,No.1,pp.7-15.

Diaz,L.F. and Savage,G.M;(2003): Risks and costs Associated with management of infectious wastes, WHO/WPRO , Manil, Philippines.

Doucet, L.G. 1989. Infectious waste treatment and disposal alternatives, Peekskill, NY: Doucet and Mainka, P.C.

HCWH, 2001. NonIncineration medical waste treatment technologies. Health-care without Harm, Washington, D.C 2009,pp.01-90

MoEF, GoI, the Gazette of India, 1998. Extraordinary, Notification of the Biomedical waste (management and Handling) Rule,[Part II- Sec.3 (ii), No. 460, Ministry of Environment and Forest, New Delhi.pp.01-20

Pruss. A., Giroult, E. and Rushbrook, P, 1999. Safe Management of waste from Health-care Activities. World health organization, Gevena, pp.77-128.

Singh, I.B. and Sharma, R.K.1996. Hospital Waste Disposal system and technology. *Jounral of Academy of Hospital Administration*, 8 (2): 44-48.

Srisvastava, J.N. 2000 .Hospital waste management project at command hospital, Air force, Bangalore (India). National Seminar on hospital waste management: a report 27th may, 2000.

Sulmer,P. 1989. Defining and managing Infectious waste, Plant, technology and Safety Series. The joint commission on Accreditation of health care organization, 4:17-23.

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