Table of Contents

ABBREVIATIONS

BMW	:	Bio Medical Waste Management
AIDS	:	Acquired Immuno Deficiency Syndrome
OPD	:	Out Patient Department
OT	:	Operation Theatre
CT	:	Computed Tomography
USG	:	Ultra Sonography
HCF	:	Health Care Facilities
WHO	:	World Health Organization
HIV	:	Human Immunodeficiency Virus
NACO	:	National AIDS Control Organisation
pH	:	Potential Hydrogen
BOD	:	Biochemical Oxygen Demand
COD	:	Co-occuring Disorders
CBMWTF	:	Common Bio Medical Waste Treatment Facility
HBV	:	Hepatitis B Virus
HCV	:	Hepatitis C Virus

SYNOPSIS: QUALITY ASSURANCE IN BIO MEDICAL WASTE(BMW) MANAGEMENT

AT

RANJAN HOSPITAL, VAISHALI

1. Management of waste is one of the prime public health measures. Since ancient times, prior to discovery of bacteria as cause of disease, the main focus of prevention from sewage and refuse were taken as the main factors in prevention of epidemics.

2. In present scenario, with the presence of dreaded diseases like Hepatitis-B and Acquired Immuno Deficiency Syndrome(AIDS), it is of prime importance to save the persons from disaster and cater for proper disposal of the infected and hazardous waste. The hospital facilities which are responsible for care of the population are generating immense quantity of BMW matters each day from wards, OT (operation theatre) and other wards. Proper management of hospital waste is essential to maintain hygiene, aesthetics, cleanliness and prevention of environmental pollution.

3. Ranjan Hospital is a 15 bedded secondary health centre in Vaishali, where facility exist for Out Patient Department(OPD), surgery, eye surgery, regular check-up, guidance and consultation to pregnant ladies and delivery including caesarean section.

4. The aim of this dissertation is to find out various measures of BMW Management being performed in the hospital as well as the awareness of staff regarding the same (as per BMW Management and Handling Rules, 2016).

5. Objectives of this dissertation would be:

(a) To assess the awareness about BMW management amongst the employees.

(b) To study the existing process of the BMW management:

- To study the isolation of waste at the different points of occurrence of waste.
- To find out the collection of biomedical waste in the Hospital as per Biomedical Waste Rules.

6. The methodology would be Observational study and Questionnaire given to the staff.

7. The quality assurance would be checked from the staff. Any observation noticed during the period of study would be communicated to the Hospital Administrator/Owner for rectification.

8. The ultimate aim of this dissertation is to ensure that proper quality assurance measures are being followed in the Hospital ensuring no hospital associated infection occur to the patients & staff as also proper disposal of the waste is done so that the community does not suffer.

RANJAN HOSPITAL PROFILE

Ranjan Hospital was established in the year 2010 at Vaishali, Ghaziabad. The location of the hospital is immediately near Delhi border which caters for the residents of Delhi as well as Ghaziabad.

This is a 15- bedded hospital, which is a secondary health centre, where facilities exist for OPD, surgery, eye surgery, regular check-up, consultation & guidance to pregnant ladies and delivery including caesarean section. The staff in the hospital are well trained to cater for all the requirements of the OPD, Operation Theatre(OT) as well as patients admitted in it.

Vision, Mission & Core values

Vision

To create a functional and affordable healthcare system with care and compassion. Best class medical practice with '**Feel at Home'** gestures. Restoration of health by personal care of the doctors. To have a long-lasting relationship with the patients and their wards.

Mission

- Deliver best patient care services.
- Excel in medical care supported by research and education.
- Be the preferred choice among host of other hospitals around.
- Apply and share new technology.

Core Values

The core value system at Ranjan Hospital is based on- Customer Care, Dedication and Integrity.

- Care for customer.
- Faith on associates.
- Teamwork.
- Mutual trust
- Honest and ethical practices.

Quality Policy at Ranjan Hospital

- Best patient care through medical excellence.
- Adhere to a patient-centric environment.
- Safety of treatment with high standards during the patient's stay.
- Implementation of robust clinical and non-clinical process and protocols.
- Utilize highly skilled employees.
- Comply with statutory regulations.

Specialities

- Gynaecology.
- Ophthalmology.
- Physician, Surgeon and Paediatrician are available on call.
- Laboratory facility, X-ray, Computed Tomography(CT) scan and Ultra Sonography(USG) facility exist within the hospital which is outsourced to Kumar Diagnostics, New Delhi.
- Fully functional OT exist.
- Adequate space for Reception, OPD, consultation rooms, Emergency room, super deluxe rooms and normal rooms with single, double and triple occupancy for patients admitted exist.
- A well-stocked kitchen facility exists on the same floor of patient's room for attendants to warm up milk and prepare meal.

PROJECT REPORT

Introduction

In ancient times when medical facilities were not prevalent easily and treatment were given by "Vaidyas", people asked the Maharshi Ved Vyas, as to why do people get sick. He replied that people get sick, if the colon organ of the body is not clean and all the diseases start occurring from there only. Therefore, one must keep the colon organ clean not to have diseases. It is evident that the origin of cleanliness for prevention of diseases is prevalent since ages.

The Origin of BMW in Foreign countries

The prime concern in waste management is one of the important factors in public health measures. The main focus of public health has been on cleanliness and sanitation. For prevention of epidemics, the provision of clean water; proper treatment of sewage and refuse were used. John Harrington (1561-1612) facilitated flushing away the human waste and helped dwelling units clean, but inside flow under the ground went into waterways and wells. During Roman times, clean and proper water supply and the sanitation system were of utmost importance when hygiene was given due importance. Public health remained the prime responsibility of the inhabitants in several areas of Europe, and laws were enforced for strict implementation.

At Harappa, in the Indian sub-continent, it was found out that the dead were buried in an extended posture with pottery and personal belongings, which indicated that proper regard to the departed souls were also given. It also suggests that proper cleanliness, hygiene and sanitation were followed by people.

Present Scenario

In the present scenario, when due to complex level of living and prevalence of of dreaded disease like Hepatitis – B and AIDS, it is of main importance to cater for the infected and hazardous waste to save the population from peril. The HCF (Health Care Facilities) which are caring for the large population are emitting great quantity of infected waste matters every day from their facilities. It is of prime importance that correct management of infected waste should be mandatory so that proper maintenance of hygiene, sanitation and cleanliness id carried out for the benefit of the population. The infected wastes

should have correct collection, segregation, treatment and disposal in a safe manner so that the infection is not spread to the general population. Important rules and regulations should be promulgated and implemented so that various communicable diseases do not spread over to normal population.

The initiative by, the Prime Minister of India who introduced the Swachh Bharat Abhiyan on 2nd of October, 2014 to promote hygiene and cleanliness in public domain. For hospitals cleanliness and hygiene, it becomes a mandatory requirement. Hygiene and cleanliness prevents the spread of disease but also provides a positive experience to the patients and staff. On 15th of May, 2015 to promote cleanliness and enhance the quality of public health facilities Ministry of Health and Family Welfare, Government of India, has launched a nation wise initiative. The prime concern of this initiative is to recognize various measures for population to stay in a healthy and clean atmosphere. "Kayakalp" is the name of this initiative. Various Swachhta guidelines for health facilities have also been issued.

Objectives of Kayakalp

1. Health Care Facilities(HCF) to cater for promotion of cleanliness, hygiene and Infection Control Practices in public.
2. Standard protocols of cleanliness and infection control to be maintained and adhered by public HCF.
3. A culture to be inculcated and continuous assessment of performance to be carried out for cleanliness, hygiene and sanitation.
4. Public health facilities to adhere to sustainable practices related to improvement in cleanliness which would inculcate positive health outcomes.

Parameters in Kayakalp Checklist

The performance of the facility would be taken as under:

- Upkeep of Hospital/Facility.
- Adherence of sanitation and hygiene.
- Proper waste Management.
- Correct infection control.
- Good Support Services.

- Promotion of hygiene.

BMW management is one of the prime importance not only related to HCF but to the overall environment also. There are various reasons for generation of BMW wastes from HCF. The proper management of BMW has become a point of humanitarian concern all over the world with due importance being given by WHO. Improper management of BMW have caused so many diseases in the population of the world especially in underdeveloped countries.

Hospital wastes occurring due to patient care have caused many harmful effects to the atmosphere. It can be a potential safety threat for hospital staff. Correct and proper disposal of hospital waste is of great concern.

BMW Management

In HCF, infected waste is produced which if not disposed correctly, causes risk to patients and general environment. The other names of BMW are clinical waste, medical waste and health-care waste as called in other parts of globe. According to **Biomedical Waste Management and Handling Rules, 2016 of India** any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or research activities pertaining thereto or in the production or testing of biological or in health camps. BMW is mainly classified as biological and non-biological waste, some waste may infectious or non-infectious.

As per WHO, 85% of hospital wastes are non-hazardous, 10% are infectious and 5% are non-infectious. The global scenario of BMW management is shocking as it is reported 18 to 64 percent of health care settings have unsatisfactory BMW management system. The hospital waste has a high potential for 25 infection and risk of injuries putting in danger the healthcare workers, the patients, the community and the environment.

The burden of the problem varies for developed and developing countries. In developed countries the problem lies in the increasing volume of waste produced by increasing use of disposable items and in developing countries, where the supplies for waste disposal are limited, the problems are more related to segregation and disposal of the healthcare waste.

Hospital waste is an important hazardous waste which comes after Radio-active waste. Proper handling, treatment and disposal of BMW is essential as they may cause serious infectious diseases like Hepatitis,

Tuberculosis and Human Immunodeficiency Virus(HIV)/AIDS. The use of disposable items has reduced the rate of infection but at the same time has increased the volume of the waste which needs to be disposed of properly.

Hospital Waste is 15-20 % of the general waste. The problem arises when that 15-20% gets mixed with the balance 80% and the whole thing becomes BMW. Proper hospital planning and designing should be carried out to ensure correct waste disposal, which would not affect the persons.

At the point of generation only proper segregation of waste should be carried out in various categories. Pre-treatment of waste through disinfection/sterilization is to be carried out to prevent the possible microbial contamination.

Secondary stoppage of pilferage of recyclables or poor scattering or discharge by animals is to be prevented. This is to be ensured by direct disposal of the BMW from the health care facility to the common BMW treatment facility. Making people aware, by motivation and training and use of correct procedures in separation of waste separation will improve the correct waste management systems in the HCFs.

Implementation post the notification of the new and stringent rules, require an attitudinal change, greater levels of awareness & knowledge. New things have been added like phasing out of plastic bags, improvement in the emission levels by including Dioxins & Furans, which are carcinogens, reduction in the levels of suspended particulate matter from 150mg/ Nm^3 to 50mg/ Nm^3. These are major steps for a country like India but still not as stringent as some developed countries.

With the new clause of not having any BMW treatment facility within each HCF if a common BMW Treatment facility exists within 75 kms, is a good step. This would lead to lesser environmental degradation in the vicinity of residential areas as majority hospitals are located close to residential areas.

Legislative aspect in relation to BMW

In our country various central legislation related to BMW management are existing:

- The water (prevention and control of pollution) Act, 1974.
- The Air (prevention and control of pollution) Act, 1981.
- The Environment (Protection) Act, 1986.

- The hazardous waste (management and handling) rules, 1998.
- The BMW (management and handling) rules, 1998.
- Municipal Solid waste (management and handling) rules, 2000.
- The BMW (Management and Handling) Rules Amendment, 2000 and 2003.
- The BMW (Management and Handling) Rules, 2011 [Draft].
- The BMW (Management and Handling) Rules, 2016.

The BMW (Management and Handling) Rules, 1998

Govt of India, Ministry of Environment and Forests published, The BMW (Management and Handling) Rules, 1998. These rules gave a regulation for management of BMW generated in HCF. It also tried to implement these rules more effectively and to improve the collection, segregation, processing, treatment and disposal of these BMW and to ensure reduction of BMW generation and its impact on the area. The Rules are attached as **Annexure I**.

Salient points of BMW Management and Handling Rules, 2016

1. All types of healthcare camps like vaccination/blood donation/surgical camps and any other activities related with healthcare.

2. Phasing out of use of chlorinated plastic bags, gloves and blood bags within two years.

3. On-site disinfection or sterilization and pre-treatment of wastes of laboratory and microbiological to be carried out as per WHO or NACO guidelines.

4. Regular training to be imparted to all its health care workers as well as their immunization.

5. A Bar-Code System to be established for bags or containers containing Bio-medical waste for disposal.

6. Report major accidents.

7. Proper retention time in secondary chamber of incinerators to be achieved in two years.

8. From 10 categories it is reduced to 4 categories for improvement in the segregation of waste at source.

9. Procedure to get authorization has been simplified. Automatic authorization for bedded hospitals. For Non-bedded HCFs only one-time authorisation.

10. For reduction in emission of pollutants very stringent standards for incinerator has been introduced.

11. Dioxin and furans emissions limits is included.

12. State Govt to provide land for setting up a common BMW treatment and disposal facility.

13. If `common BMW treatment facility is available within a distance of 75 kilometres, there is no requirement by the occupier to establish on-site treatment and disposal facility.

14. Timely collection of BMW and disposal facility should be provided by the occupier. Conduct of the training to be carried out.

15. Hepatitis B and Tetanus immunization to be carried out for all the staff handling of BMW.

Category of BMW

The Govt of India Ministry of Environment, Forest and Climate has classified BMW into four categories under **BMW Management and Handling Rules, 2016**. These categories are further divided into sub categories under type of waste i.e. Yellow, Red, White and Blue. The details are attached as **Annexure II.**

Definition of BMW Management

BMW is defined as any solid or liquid waste which may present a threat of infection to humans. It includes various wastes from human bodies containing disease causing agents and discarded sharps. Also included are the following:

Used absorbent materials saturated with blood, blood products, body fluids or excretions or secretions contaminated with visible blood. The materials which are saturated with blood or blood products as also various devices which are contaminated with blood, body fluids or secretions or excretions contaminated with blood. The main producers of BMW include all the HCF. The protection of hospital staff who are frequently exposed to BMW due to occupational hazard should be strictly ensured.

Problems relating to BMW Management

Air, water and land pollution would be more prevalent if proper BMW management is not carried out. The pollutants could be biological or chemical. For proper BMW management there are various legislations and guidelines in India.

The risk of impact of air and land pollution on health is given as under:

 Air Pollution: - Air pollution can be created both by indoors and outdoors environment. Due to air pollution two types of BMW can be generated, namely -Biological and Chemical.

  In-door air pollution: - Pathogens in the waste or spores can enter air easily and remain in the air for a long period of time. It can cause diseases like Sick Building Syndrome. Preventive measures can be done by proper segregation of waste, pre-treatment at source, sterilizing the rooms, proper building design and well-maintained air conditioners.

  Out-door air pollution: - If BMW waste is transported without a pre-treatment, or if it is left in open areas, then pathogens can easily enter into the atmosphere. Open burning and incinerators are two major causes of chemical pollutants, which can cause outdoor air pollution. Open burning of BMW is the most harmful practice. Respiratory diseases occur if it is inhaled. Dioxins and furans are organic gases which are carcinogenic. It can be prevented by following the prescribed standards.

 Water Pollution: - liquid waste is generated and when it is left into sewers without proper treatment can cause water pollution. Due to water pollution the parameters such as Potential Hydrogen(pH), Biochemical Oxygen Demand(BOD), Co-occurring Disorders(COD) could be changed.

 Land Pollution: - Improper treatment of infectious waste, discarded medicine, chemicals if mixed with soil causes soil pollution. In the waste if heavy metals like cadmium, lead, mercury etc are present, then they will be absorbed by the plants and would enter human body by food chain. The other pollutants are nitrates and phosphates which are present in landfills.

Rationale of the Study

BMW management has been in focus in India since 1998. Prior to 1998, there was no separate formal notification of BMW Management rules in India. It was only in 1998 that the Union Ministry of Environment and Forests under the provision of Environment (Protection) Act, 1986 published the BMW (Management and Handling) rules.

The rationale for the study to be undertaken was warranted by the introduction of the Bio Medical Waste Management and Handling Rules, 2016, which has brought about significant change to the guidelines of handling and disposal of BMW in India.

The previous BMW (Management and Handling) rules, 1998 (as amended in 2011), was notified by the erstwhile Union Ministry of Environment & Forests. In 2014, the Union Ministry has been renamed to include Climate Change. The Ministry now actively monitors the factors polluting the Environment which adversely affects the climate and also undertakes remedial measures by means of passing strict legislation & its enforcement.

The Union Ministry of Environment, Forests & Climate Change has been highly proactive and in keeping in tune with WHO/International standards notified the BMW Management and Handling Rules 2016, which was very much required and is a step in the right direction.

Improper and incorrect management and handling of BMW would create a difficult public health consequence and a great effect on the environment. Environment pollution and emergence of vectors would occur due to incorrect segregation and improper method of waste disposal, which may take its toll on population by transmission of diseases like typhoid, cholera, hepatitis etc. Poor infection control practices and improper waste management would lead to nosocomial infections in patients. There is risk of infection to persons outside hospital as well as common population living near the hospitals if proper BMW management is not carried out.

For ensuring the proper management and handling of the BMW, the Government of India has provided a regulatory framework as BMW Management and Handling Rules 2016.

This study of "**Quality Assurance in Bio-Medical Waste Management in Ranjan Hospital, Vaishali**" is an attempt to find out the gaps in the implementation of the BMW (Management and

Handling) Rules, 2016 in the Hospitals so that this study will provide valuable information and opportunity to improve current practices of BMW management.

Need of BMW Management in hospitals

To prevent infection to patients and staff of the hospitals there is great requirement of management of hospitals waste which are as under:

- Prevention of injuries from sharps which may lead to infection.
- To avoid nosocomial infections in patients.
- To prevent risk of infection outside hospital.
- To avoid risk associated with hazardous chemicals, drugs to persons handling wastes at all levels.
- Strict check on disposed off drugs being repacked and sold to buyers.
- Avoidance of risk by stricter measures due to defective incineration emissions and ash.

People at risk

The doctors, hospital staff, support and utility staff including house-keeping staff, disposal staff, patients and visitors as well as people staying nearby hospitals are the people under risk.

Impact of Infectious Agents on Human Health and Environment

The environment including human beings are badly affected due to improper disposal of BMW generated during the patient care. This waste is a very important health risk to the hospital staff as well as other people. It is a matter of great concern that proper treatment and disposal of BMW should be carried out so that infections do not occur to common healthy people.

Impacts of infectious waste and sharps

Due care has to be taken to avoid disease occurring due to BMW. Out of 40 pathogens which transmit disease by BMW, the 3 main pathogens are Human Immunodeficiency Virus (HIV), Hepatitis B Virus (HBV) and Hepatitis C Virus (HCV). It is pertinent that extreme care is exercised while handling and disposing it. Due to sharp injuries, in 2000, approximately 66000 hepatitis B (HBV), 16000 hepatitis C (HCV) and 200–5000 HIV infections occurred to hospital staff. It is estimated that every year, due to sharps more than two million hospital staff are exposed to percutaneous injuries.

Due to reuse of injection in 2009, 240 persons lost their lives who got hepatitis B in Gujarat. Black market was found out where used needles and syringes were repackaged and resold.

Impacts of chemical and pharmaceutical waste

Though there is no evidence of illnesses among the population due to chemical or pharmaceutical waste from hospitals. However, excreted pharmaceuticals from patients do find their way into waterways, which may contribute disease. The wildlife may be affected and it may create antibiotic resistance in bacteria.

REVIEW OF LITERATURE

1. **A case study to review compliance to BMW management rules in a tertiary care hospital by Dipika Shrestha*, Seema Bansode Gokhe, Anurag Dhoundiyal, Prashant Bothe published in International Journal of Community Medicine and Public Health | February 2017|Vol 4 | Issue 2**

An observational study was carried out in an 1800 bedded Tertiary care hospital in a metropolitan city of Mumbai. Sampling method used was complete enumeration method to select the study sites. A total of 64 sites were observed for compliance to BMW handling and management rules with help of a validated checklist.

Out of 64 wards that were observed for compliance to BMW handling and Management rule, 42.18% disinfected the biomedical waste bins daily. Mixing of contents in the red bag, yellow bag and black bag was found to be 20.31%, 12.5% and 10.93% respectively. None of the wards observed cutting of gloves and saline bottles prior to disposal.

The tertiary care hospital where the study was carried out was compliant with most rules with respect to BMW management. Segregation, mutilation and disinfection practices were not performed strictly at all waste generating sites. Due to patient overload and lack of staffing mutilation and disinfection practices were overlooked at many sites. Day to day collection of waste from all sites was not carried out due to which record books were not properly maintained. False reporting was noted on records at various sites.

2. **Biomedical waste management in India: Critical appraisal by Priya Datta, Gursimran Kaur Mohi, Jagdish Chander published in Journal of Laboratory Physicians - Volume 10, Issue 1, January-March 2018**

One of the biggest challenges the government hospitals and small HCFs will face, during the implementation of BMW 2016 rules will be due to the lack of funds. To phase out chlorinated plastic bags, gloves, blood bags and to establish a bar code system for bags/ containers the cost will be high and time span for doing this i.e. two years is too short.

Currently, in India, there are 198 Common Bio Medical Waste Treatment Facility(CBMWTF) in operation and 28 are under construction. There is a great need for rapid development of many more

CBMWTF to fulfil the need of treatment and disposal of all BMW generated in India. Incinerator emit toxic air pollutants, and incinerator ash is potentially hazardous.

The new rules are meant to improve the segregation, transportation, and disposal methods, to decrease environmental pollution so as to change the dynamic of BMW disposal and treatment in India. For effective disposal of BMW management, there should be a collective teamwork with committed government support in terms of finance and infrastructure development, dedicated health-care workers and health-care facilities, continuous monitoring of BMW practices, tough legislature, and strong regulatory bodies.

The basic principle of BMW management is segregation at source and waste reduction. Besides, a lot of research and development need to be in the field of developing environmental friendly medical devices and BMW disposal systems for a greener and cleaner environment.

3. **Management of BMW Waste in Himachal Pradesh: A Case Study of Indira Gandhi Medical College and Hospital, Shimla, HP, India by Ravinder ST published in. Environ Sci Ind J. 2017;13(4):146**

The hospital wastes get segregated at source of production. These wastes undergo stages of waste management before final disposal. The procedure was in place as per BMW Management and Handling Rules 2016. Awareness of the staff in relation to waste handling policies can be enhanced. Due to use of outstation staff who are changed regularly some mistakes were noticed while collection, segregation and packing of wastes. Wrong colour coded bins were used and non-infectious waste was mixed with infectious waste.

All the staff were in agreement of correct procedure of BMW guidelines. The instructions were followed carefully. There is a requirement of more allocation of resources for BMW management procedures.

4. **Assessment of knowledge and practice of BMW management among health care personnel in a rural tertiary care hospital of Darjeeling District, West Bengal, India by Rishav Bakshi, Nilanjana Ghosh, Risheen Mukherjee, Sumanta Chakraborty published in Journal of Comprehensive Health, Volume 6, Issue 1, January 2018.**

BMW management remains an important but a neglected issue in few health sectors, especially if located in remote settings. Trainings were insufficient and they often lacked clarity regarding the segregation and waste categorization. The health care personnel were reluctant to follow the guidelines and were unaware of the occupational hazards and its toxic potential.

The present study findings are in agreement with other study where huge gaps were identified regarding the knowledge of the colour coding of bags and bins and their skill in appropriate waste disposal. Waste segregation at source was lacking in most of the cases as reflected by present study as well. Reasons ascertained however varied as majority of health care personnel in other places cited that lack of designated people for BMW management at workplace led to the non-compliance of guidelines.

Though monitoring officers were present and they had received training, fear of handling wastes and lack of proper handouts and charts in the wards led to inappropriate disposal. Workload was another issue as cited by our present study as well. Similar to present study, other studies revealed that emphasis on good quality training of health care personnel working in hospital at regular time interval would help in improvement of the situation further.

The study concludes that infrastructural support needed for appropriate BMW disposal is inadequate in North Bengal Medical College & Hospital. Knowledge & practice regarding concerning issues varies among different personnel depending on their working status and other factors. Inadequate practice and inability to comply with the guidelines occurs in few cases and the reasons elicited were increased workload, improper training, lack of communication and other logistic constraints. Administrative support in the due matter, workshops and trainings organised on a regular basis, awareness generation, finding solutions for the identified gaps in BMW management may help the situation further.

5. **BMW Management In Different Hospitals of Guwahati And Its Effect On Environment by Arabinda Changmai*, Tofiqul Islam, Dibarlan Nongsiang, Manoj Kumar Deka, Bhargab Jyoti Saharia, Ananta Choudhury, Biplab Kumar Dey A published in Journal of Applied Pharmaceutical Research Volume 6, Issue 1, Year of Publication 2018.**

Based on the survey, it was found that most of the hospitals store and segregate the BMW without using incinerator. Autoclave is done only by 46% of hospitals. As there is only segregation process and storage are done in most of the hospitals so there is a chance of causing infection from the waste if they are not properly stored or if the waste is kept for a longer period.

Mostly, the medical wastes are incinerated emitting toxic air pollutants & ash residues. This in turn gives rise to high level of dioxins in the environment. The toxic ash residues sent to landfills for disposal used to percolate to groundwater and thereby resulting in polluting it.

Though there are various laws, standards, rules and regulations prescribed for medical waste management but there is still a lack of compliance of medical waste management rules and regulations in the practical field.

As the segregation of waste at the time of generation is not done properly or efficiently this leads to the risk of infections to the patients as well as for the other people and staff in the hospital premises and environment also. The waste disposal bins are sometimes kept near to the waiting areas in the hospital due to which there is a high risk to the people who visited in the hospital or worked in the hospital of getting infected from diseases.

6. **An analytical study on medical waste management in selected hospitals located in Chennai city by Sutha Irin A, published in Environ Waste Management and Recycling 2018 Volume 1 Issue 1.**

The present paper aims to study the Medical Waste Management assessment, the process of managing the medical waste to include its segregation, storage, and disposal in govt and corporate hospitals in Chennai.

The results reveal that the HCF in private and Govt hospitals still struggle with unsuitable BMW management which has not received enough concern. Training on waste management was not adequate.

Various improvements on BMW handling and treatment was suggested to cater for proper waste management system in HCF.

RESEARCH QUESTIONS

1. What are the existing practices of BMW management in Ranjan Hospital, Vaishali?
2. What is the level of compliance of BMW management rules 2016 in Ranjan Hospital?
3. What should be the measures for the improvement of BMW management in Ranjan Hospital?

RESEARCH OBJECTIVE

General Objective

- To assess the implementation status of BMW management rules 2016 in Ranjan Hospital.

Specific Objectives

- To ascertain the existing practices of BMW management in Ranjan Hospital.
- To find the extent to which this BMW management is in compliance with BMW Management and Handling Rules 2016.
- To suggest measures for the improvement of BMW management in Ranjan Hospital.

METHODOLOGY OF THE STUDY

The dissertation study would be carried out by Observational analysis as well as by Questionnaire method to all the staff to judge their level of understanding of BMW Management Rules and procedures. A total of 26 questions would be in the questionnaire to assimilate their knowledge.

FINDINGS BY OBSERVATION: BMW MANAGEMENT IN

RANJAN HOSPITAL, VAISHALI

1. Over the period of three months, it was noticed that BMW procedures were in place as per BMW (Management & Handling) Rules, 2016.
2. There is a doctor in charge that monitors the BMW management in the facility of hospital.
3. A record is maintained of the waste generated in the wards.
4. Autoclaves facility is existing in the hospital.
5. Bar Coding of bags have not been carried out in the hospital.
6. The segregation of BMW is done as per BMW Management and Handling Rule 2016. Work charts for segregation and handling of BMW is existing in the hospital and they are displayed prominently at each and every point of use.
7. The transportation of BMW collected from the hospital is done in a closed trolley.
8. According to Sharp Management the hospital has fared excellent as needle destruction is being carried out correctly.
9. In Ranjan hospital waste is discarded next day in the morning.
10. The staff uses needle cutters for cutting the syringe and then the same puncture proof container is sealed and disposed of.
11. All staff was aware of needle stick injuries and what needed to be done i.e., first aid measures.
12. Post-exposure prophylaxis kits were available in the hospital and were being used by the staff.
13. Dedicated storage facility was available for BMW. Both the storage facility is secured against pilferage and reach of animal and rodents and the waste storage place is cleaned every day and waste storage area is locked.
14. Disposal of BMW was mainly outsourced and the waste is cleared from the facility every day in the morning next day.
15. Disposal of expired or discarded medicine is done by sending back medicines to the manufacturer. Discarded linen, mattresses & bedding contaminated with blood or body fluid are disinfected by autoclave.

16. The staff of the hospital takes efforts to educate patients and visitors about segregation of recyclable and biodegradable wastes.
17. Sometimes general waste is mixed with infected waste by patients due to poor knowledge.
18. Solid waste is disposed through Municipal agency on a regular basis.
19. Laboratory samples, body fluids, secretions in suction apparatus, blood and other exudates in OT and Dressing room are treated with sodium hypochlorite solution before disposal into effluent treatment plant and then runoff is drained into the municipal drain.
20. Closed trolleys were available for the transport of waste from the workstation to the storage area.
21. A record is maintained of the waste generated in the wards.
22. The hospital has a valid authorization for Bio-medical waste.
23. An annual report is submitted to Pollution Control board.
24. **Collection & Segregation of Waste.** Proper briefing of staff and correct placement of various colour bags made segregation of waste efficiently. The bags were kept at the place of generation of waste and hence were correctly segregated. In OPD, OT, surgical room and wards where wastes are generated proper placement of bags were existing which eased out collection and segregation of waste.
25. **Transportation of Waste.** The wastes were transported in covered trolleys in the evening and kept in the waste store room.
26. **Disposal of Waste.** The disposal of waste is outsourced to Synergy Waste Management Private Limited, which collects it from the hospital in the morning next day and disposed of as per BMW Management and Handling Rules 2016. Renewal of Agreement with Synergy Waste Management Private Limited is attached as **Annexure III.**
27. Form III for Authorisation from UP Pollution Control Board, Ghaziabad is attached as **Annexure IV.**

FINDINGS BY QUESTIONNAIRE: BMW MANAGEMENT IN RANJAN HOSPITAL VAISHALI

The staff was put through a series of 26 questions testing their Knowledge, Attitude and Practice questions including Multiple Answer questions. The analysis of answers is being carried out to judge the staff's compatibility with BMW Management Rules. The Questionnaire is attached as **Annexure V.**

Knowledge Questionnaire

1. Is there any Existence of rules/Act for BMW Management?

The answers to the question by the staff indicated that they are aware about the BMW Management Rules.

2. Is Colour coding available for BMW?

All the staff were aware about the various colour coding as per BMW Management and Handling Rules 2016.

3. Disposal of Anatomical waste into which colour bag?

The answer Yellow was correctly given by the staff as they were using it.

4. Sharps disposal has to be in which colour bag?

The analysis of answers indicated that all the staff were aware about it that it has to be kept in White(Translucent) bags.

5. What is meant by Incinerator?

82% of the staff were aware about it.

6. Is it necessary to have Biohazard symbol on BMW bag?

80% of staff were aware about it, however the newly inducted nurses were not aware about it.

Attitude Questionnaire

1. Is there any necessity of BMW management rules?

The staff were aware about the various diseases occurring due to BMW if not handled properly and they were in knowledge of BMW Management and Handling Rules 2016.

2. Do you feel that BMW management is compulsorily needed for healthcare delivery?

The entire staff were having strong conviction regarding proper BMW management so as to avoid any risk originating from it.

3. Do you follow colour coding for waste disposal?

Yes, it was being followed and they were in the correct knowledge of it.

4. Do you think your knowledge regarding BMW management is adequate?

The answer given was yes by most of the staff, however the housekeeping staff needs further training as well as the newly inducted nurses.

5. Do you think any further training is required on BMW management?

Though the staff had good knowledge about BMW management, however regular tri-monthly update/training is required to make them 100% perfect in it.

6. Do you suggest segregation of waste?

The answer given was yes by most of the staff so that it can be segregated and disposed off correctly.

Practice Questionnaire

1. Soiled linen should keep in which colour bag?

The answer given was correct as it was being followed correctly, ie soiled linen were kept in Yellow Bags.

2. Are you using PPE while handling linen?

Yes, answer was given by all staff once they were handling soiled linen.

3. Are you practicing hand hygiene in between every activity?

78% of staff answered yes, however 22% of newly inducted staff said no as they had cleaned the hand some time ago.

4. Are you using sharps destructor/sharp destroyer?

Yes, needle destroyers are being used.

5. Non-infectious waste should put in which colour code?

The staff answered that non-infectious waste is to be put in Black colour bags.

6. Are you practicing the segregation of infectious waste and Non-infectious waste?

The answer given was yes by the staff and they were doing it also sincerely.

Multiple Answer Questions (Tick the appropriate answer)

1. Biomedical waste includes

- Infectious waste and Non-infectious waste of patient
- Waste due to wear and tear of equipment

2. Do you know about the colour coding segregation of biomedical waste

- Yes
- No

3. Human anatomical waste and soiled dressing has to be disposed into which Baggage?

- Yellow
- Puncture proof container
- Red

4. Blue bins for syringes contains which type of solution

- 1% Sodium hypochlorite
- 1% Magnesium chloride
- 5% Sodium hypochlorite

5. Waste sharps has to be disposed into which baggage

- Orange
- Puncture proof container
- Red

6. Major risk and Diseases associated with hospital waste handling

- AIDS, Hepatitis, Typhoid fever, TB
- Malaria, Psoriasis, Diabetes mellitus
- Hypertension, Sinusitis

7. The colour code for disposal of general waste from the hospital is:

- Red
- Blue
- Black

8. Is needle stick injury is a concern?

- Yes
- No
- Do not know

The analysis of answers given to multiple choice answers indicated that 84% of the staff gave correct answers.

As per the analysis of Observation and Questionnaires, overall the **Quality Assurance in BMW Management in Ranjan Hospital** was found to be correct and was effectively implemented. All the procedures of BMW management were followed correctly by the staff and proper guidance were being given to the patients also, so that once they are discharged from the hospital, they keep it in mind that cleanliness is going to be beneficial not only to them but for the entire society as such. However certain measures which if implemented would make the BMW management in the hospital more effective.

RECOMMENDATIONS

My recommendations to the owner of the Ranjan Hospital would be the following:

1. Bar coding of Waste bags need to be carried out so that correct segregation and disposal is carried out. However, since the waste items are not much and are easily identifiable being a smaller hospital, even then if it is implemented, it would follow the BMW guidelines as per BMW Management and Handling Rules 2016.
2. Every three months a one day, capsule of BMW Management Rules 2016 should be carried out as a refreshment training for all, especially to the newly inducted staff.
3. The staff of the hospital should be trained from accredited training centres. These training sessions should not become merely a one –time activity but should be a continuous process regularly.
4. The training should be done according to new rules and regulations as in force at that time, presently as per BMW Management and Handling Rules 2016.
5. Proper BMW disposal practices could be carried out by the staff and they should be kept under direct supervision and surveillance while handling infectious wastes. Those who are found doing incorrect practice should be given additional attention and training.

6. There should be an inspecting body in hospital itself to check the violation of BMW rules.
7. There should be a time to time informative session about newer way of scientific, safe and cost-effective management of the waste and to sensitize them to the needs of BMW management in the hospital.
8. Annual health check-up of all the staff should be carried out.
9. Last but not the least, Bio-Medical Waste Management programme cannot successfully be implemented without the willingness, devotion, self- motivation, cooperation and participation of all the staff of the hospital.

CONCLUSION

For implementation of various clauses of the BMW Management and Handling Rules, 2016, a time period from one to two years, has been notified by the Government. Existing incinerators need to be upgraded/ retrofitted, each HCF has to have its own website, bar coded bags/ containers have to be procured, these are some of the additional points for implementation. The HCFs should not wait for the deadlines to expire but take forthwith proactive steps to save the environment from hastened degradation.

Passing of notification/legislation is one thing but implementation on ground is another. The gap between the implementation and monitoring needs to be narrowed.

Biomedical waste management programme cannot be successfully implemented without the willingness, devotion, motivation, cooperation and participation of all sections of employees of any health care establishment and responsible citizens in general. Therefore, it becomes the responsibility of each and every individual to segregate and manage the waste in such a way, that it is no longer a hazard for them, the public and the environment. The most imperative component of the waste management plan is to develop a system and culture through education, training and persistent motivation of the healthcare staff.

Waste management has to be of prime concern to everyone right from doctor up to all the support staff. Waste management is so precious that it has to be given due importance. All out efforts should be made to make the HCF area and environment clean, healthy and free from infection.