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Col Jeetendra Singh Chauhan

In recognition of having successfully completed his Internship **at**

Artemis Hospital, Dwarka, New Delhi

on

"Assessment of Knowledge, Attitude and Practice of Healthcare Waste Management among health care Professionals in Artemis Hospital in Dwarka, New Delhi

Date:

Artemis Hospital Dwarka, New Delhi

He comes across as a committed, sincere & diligent person who has a strong drive & zeal for learning

We wish him all the best for future endeavors

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TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Col Jeetendra Singh Chauhan**, student of Post Graduate Diploma in Hospital and Health Management (PGDHM) from International Institute of Health Management Research, New Delhi had undergone training at **Artemis Hospital, Dwarka, New Delhi,** from **18.02.2016** to **18.05.2016**.

The candidate has successfully carried out the study designated to him during dissertation training and his approach to the study has been sincere, scientific and analytical.

The Dissertation is in fulfillment of the course requirements.

I wish him all success in all his future endeavors.

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Director
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Certificate of Approval

The Following dissertation titled "**"Assessment of Knowledge, Attitude and Practice of Healthcare Waste Management among health care Professionals in Artemis Hospital" Dwarka, New Delhi"**is hereby approved as a certified study in management carried out and presented in a manner satisfactorily to warrant its acceptance as a prerequisite for the award of **Post Graduate Diploma in Health and Hospital Management** for which it has been submitted. It is understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein but approve the dissertation only for the purpose it is submitted.

Dissertation Examination Committee for evaluation of Dissertation

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19/5/16

Certificate from Dissertation Advisory Committee

This is to certify that **Col Jeetendra Singh Chauhan**, a graduate student of the Post Graduate Diploma in Health and Hospital Management has worked under our guidance and supervision. He is submitting this dissertation titled **"Assessment of Knowledge, Attitude and Practice of Healthcare Waste Management among health care Professionals in Artemis Hospital in Dwarka, New Delhi"** in partial fulfillment of the requirement for the award of the Post Graduate Diploma in Health and Hospital Management.

This Dissertation has the requisite standard and to the best of our knowledge no part of it has been reproduced from any other dissertation, monograph, report or book.

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INTERNATIONAL INSTITUTE OF HEALTH MANAGEMENT RESEARCH, NEW DELHI

CERTIFICATE BY SCHOLAR

This is to certify that the Dissertation titled **"Assessment of Knowledge, Attitude and Practice of Healthcare Waste Management among health care Professionals in Artemis Hospital in Dwarka, New Delhi"** has been submitted by **Col Jeetendra Singh Chauhan**, Enrollment No. **PG/14/023** under the supervision of **Dr A K Khokhar, Director, IIHMR, New Delhi**, for award of Postgraduate Diploma in Hospital and Health Management of the Institute carried out during the period from **18.02.2016** to **18.05.2016** embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other Institute or other similar institution of higher learning.

Signature

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Name of the Student: **Col Jeetendra Singh Chauhan**

Dissertation Organization: **Artemis Hospital Dwarka, New Delhi**

Area of Dissertation: **"Assessment of Knowledge, Attitude and Practice of Healthcare Waste Management among health care Professionals in Artemis Hospital in Dwarka, New Delhi.**

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Objectives Achieved:

Deliverables:

Strengths:

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Suggestions for Improvements:

Dr. Anjana David, Medical Superintendent

Date:

Signature of the Officer-in-charge/
Organization Mentor

Place: Artemis Hospital, Dwarka New Delhi

Dr. ANJANA DAVID
Medi...
Arte...

Abstract

Background: Studies in India and other developing countries has shown lack of knowledge and poor practice of biomedical waste management (BMW). Hence this study was undertaken to know the KAP of BMW in Artemis hospital,Dwarka New Delhi to identify the gaps and to take necessary steps for rectification.

Materials & Methods: This was an observational descriptive hospital based cross sectional study. The study group included the 52 healthcare personnel which included doctors (residents), nurses, Waste Care Handlers. The study was done using a pre-tested pre-structured questionnaire. The data was analysed using software SPSS 22 version. Proportions were used for interpretation.

Results: It showed that more than 75% of the doctors 85% of nursing staff and 70% of WCHs had the knowledge of colour coding and segregation. There was good knowledge regarding disposal of sharps among Doctors,Nurses and WCHs. Maximum Nursing staff and WCHs have undergone training in BMW management, however doctors have not been quite consistent in training. In-spite of the above, all are of the opinion that further training should be given to them at constant interval. They had good knowledge regarding reporting of needle stick injury and had no hesitation in reporting the same on occurrence.They are also quite concerning about proper segregation, colour coding and disposal of bio medical waste.

Conclusion: This study revealed that there is the necessity to continue the training programme for BMW and to include doctorsin such a programme. It also shows that the administration has left no stone unturned to manage BMW, however, administration needs further protocols put in place; provide PPE and other resources for better compliance of BMW rules.

Keywords: KAP, Bio-medical waste, health care workers

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1. I write this to place on record my deep sense of gratitude and appreciation for the valuable guidance, constructive comments and constant encouragement provided by my research guide Prof.Dr. AK Khokhar, Director, IIHMR, Dwarka, New Delhi**.** The successful completion of the research study would never have been possible but for his whole hearted support.

2. I would also like to record my appreciation for the invaluable support I received from Dr. A.K. AgarwalDean, MD,DNB,DHSA (UK),Academics and Student AffairsIIHMR,who is expert in the subject and is also the President of Indian Society of Hospital Waste Management (ISHWM). I am also grateful to MrVivek, Faculty IIHMR for helping me in processing the data on SPSS 22. They took time off their busy schedule to guide and offer their comments and suggestions to improve the quality of the report. Without their guidance this report would never have reached near perfection.

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Colonel Jeetendra Singh Chauhan

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List of Symbols and Abbreviaions

Abbreviation	Full acronym
BMW	Biomedical Waste
WCHs	Waste Care Handlers

INTRODUCTION ABOUT THE ARTEMIS HOSPITAL

FIG 1

Hospital Overview

1. Artemis Hospital, established in 2007, spread across 9 acres, is a 380 bed; state-of-the-art multi-speciality hospital located in Gurgaon, India. Artemis Hospital is the first JCI and NABH accredited hospital in Gurgaon.

Designed as one of the most advanced in India, Artemis provides a depth of expertise in the spectrum of advanced medical & surgical interventions, comprehensive mix of inpatient and outpatient services. Artemis has put modern technology in the hands of renowned from across the country and abroad to set new standards in healthcare. The medical practices and procedures followed in the hospital are research oriented and benchmarked against the best in the world. Top-notch services, in a warm, open centric environment, clubbed with affordability, have made us one of the most revered hospitals in the country.

Artemis Hospital, Dwarkais a part of Artemis Hospital Gurgoan,located at sector 20 Dwarka. It is a 50 bed, state-of-the-art multi-specialty hospital designed as one of most advanced in India. Artemis provides depth of expertise in the spectrum of advanced medical & surgical interventions comprehensive mix of inpatient and outpatient services. Artemis has put modern technology in the hands of renowned from across the country and abroad to set new standards healthcare. The medical practices and procedures followed hospital are research oriented and benchmarked against in the world. World class services in a warm open centric environment clubbed with affordability has made as one of the most revered hospital in the country. It acts as an independent unit providing healthcare facilities and also as a referral unit for its main hospital located at Gurgoan which is a multi-specialty 350

Bed Hospital, spread across 9 acres, in the Capital Region, India. Artemis Hospital is the first JCI and NABH accredited hospital in Gurgaon.

Organisation

2. The Hospital has a full time Medial Superintendence in location for effective command and control and ensue the smooth functioning of hospital. However the hospital is governed by the boards of directors located at Artemis,Gurgoan.

Board of Directors

Mr. Onkar S. Kanwar, Chairman, Artemis Health Sciences

Ms. ShaliniKanwar Chand

Mr. NeerajKanwar

Dr. Devlina Chakravarty,Executive Director, Artemis Hospitals

Dr. S. Narayan

Dr. SanjayaBaru

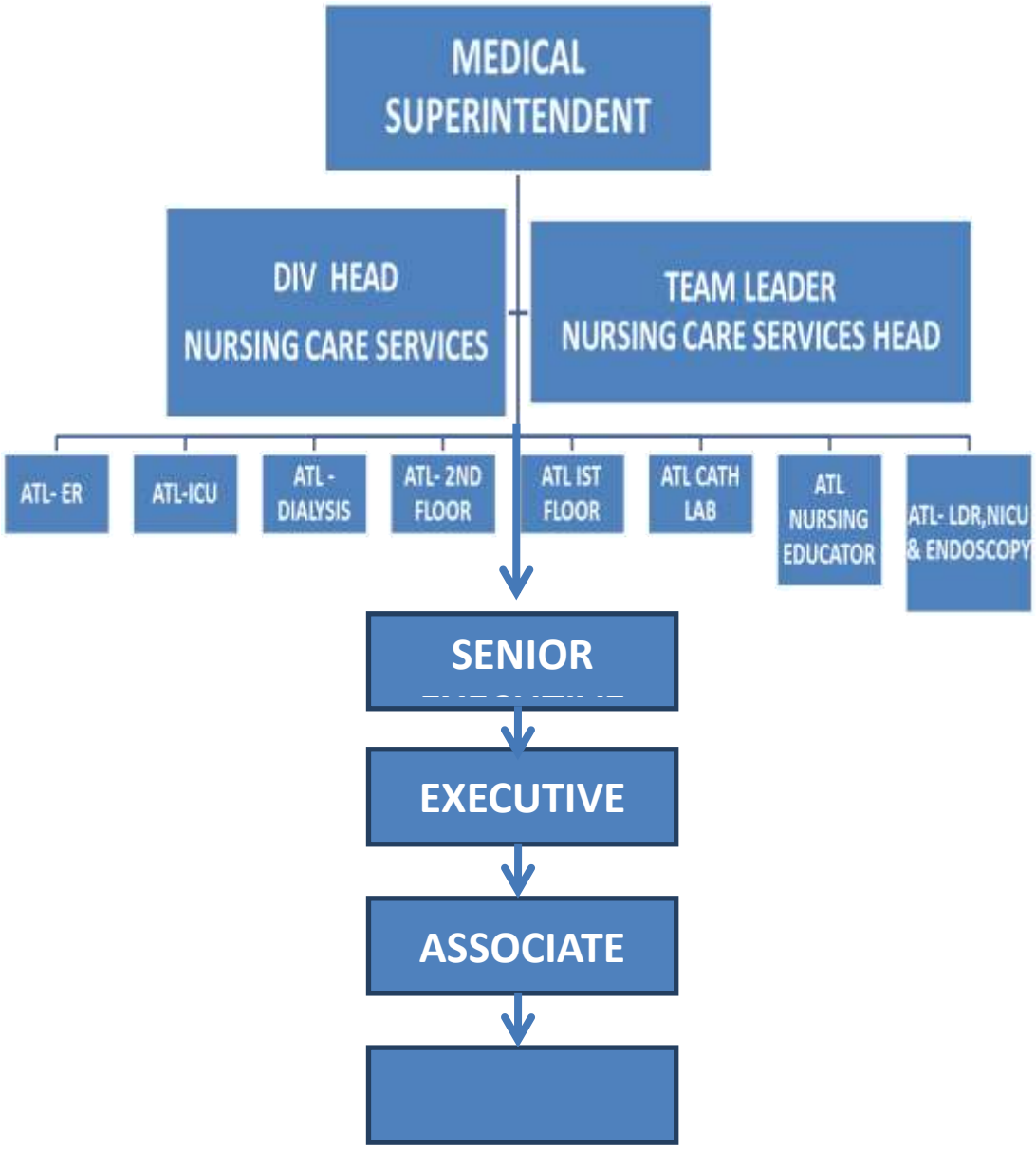
Dr. Nirmal K. Ganguly

Mr. Naveen Kapur

Mr. PremNarainWahal

Mr. Akshay Kumar Chudasama

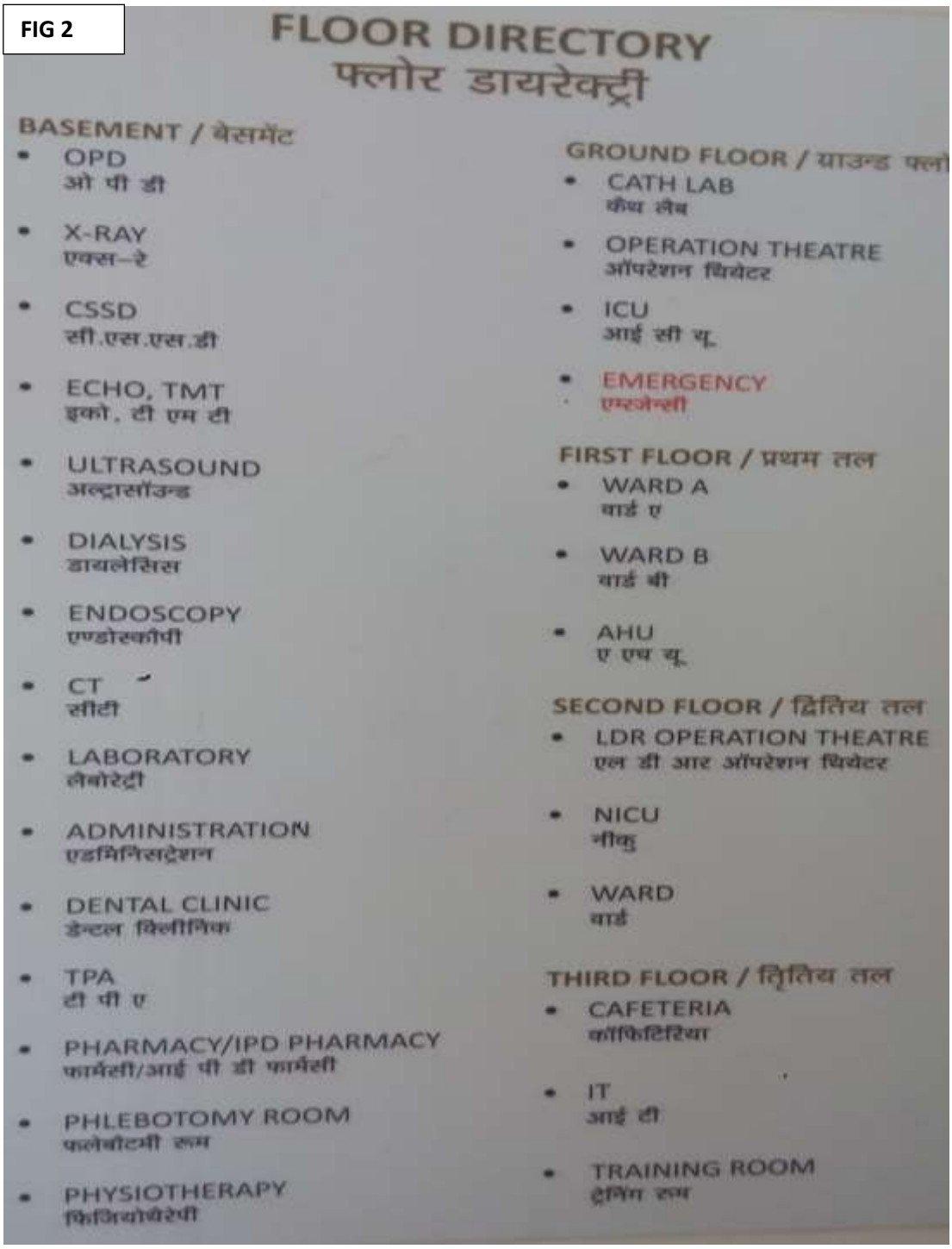
ORGANOGRAM (CHART 1)



INFRASTRUCTURE:

3. The Artemis hospital, Dwarka has a compact building consisting of three floors. The floor directory pasted under illustrates the facilities on each floor.

FIG 2



VISION, MISSION AND CORE VALUES

FIG 3

VISION

"To create an Integrated World Class Healthcare System, Fostering, Protecting, Sustaining and Restoring Health through Best in Class Medical Practices and Cutting Edge Technology developed through in depth Research carried out by the World's Best Scientific Minds."

FIG 4

Mission

- ✓ Deliver world class patient care services
- ✓ Excel in the delivery of specialized medical care supported by comprehensive research and education
- ✓ Be the preferred choice for the world ' s leading medical professionals and scientific minds
- ✓ Develop, apply, evaluate and share new technology
- ✓ Be an active partner in local community initiatives and contribute to its well-being and development

Core Values FIG 5

The corporate value system at Artemis is founded on three pillars – Service, Compassion and Integrity.

- ✓ Care for customer
- ✓ Respect for Associates
- ✓ Excellence through Teamwork
- ✓ Always Learning
- ✓ Trust Mutually
- ✓ Ethical Practices

QUALITY POLICY AT ARTEMIS

FIG 6

- ✓ Deliver world class patient care through medical excellence.
- ✓ Create a patient-centric environment
- ✓ Ensure high standards and safety of treatment during the patient's stay.
- ✓ Continuous Quality Improvement through implementation of robust clinical and non-clinical process and protocols.
- ✓ Having world-class infrastructure and cutting edge technology utilized by highly skilled employees.
- ✓ Complying with statutory regulations.

HR Vision & Philosophy

HR Vision

- We are the ‘Employer of Choice’ for people with professional talent and drive
- We aspire to provide excellent opportunities for professional and personal growth
- We believe in a paradigm shift from ‘People Management’ to ‘Aspiration Management’
- We encourage collaboration, creativity continuous learning and fun based work environment

HR Philosophy

- Recruit best of the talent
- Develop an environment of trust and respect for each other
- Empower employees with adequate resources
- Recognize and appreciate innovative effort and accomplishments
- Facilitate fun at work place and ensure that employee’s efficiency
- Treat all employees uniformly, honestly and with dignity
- Create an environment where teamwork and team goals are encouraged
- Create an open forum to address employee grievances

FACILITIES AT ARTEMIS HOSPITAL, DWARKA

FIG 7

List of Specialities

Anaesthesia & Pain Medicine	Neurosurgery
Artemis Special Child Centre	Obstetrics & Gynaecology
Blood Bank & Transfusion medicine	Oncology
Cardio Thoracic and Vascular Surgery	Opthalmology
Cardiology	Organ Transplant
Cosmetic & Plastic Surgery	Orthopaedics
Critical Care & ICU	Paediatric
Dentistry	Paediatric Cardiology & Cardiac Surgery
Dermatology & Cosmetology	Paediatric Surgery
Emergency & Trauma Services	Radiology
Endocrinology	Reproductive Medicine
ENT	Respiratory Critical Care & Sleep medicine
Fetal Medicine	Rheumatology & Clinical Immunology
Gastroenterology Unit I	Scoliosis Surgery
Gastroenterology Unit II	Spine Surgery
General & MI Surgery	Stem Cell Transplantation
Nuclear Medicine	Urology
Hematology	Laboratory Services
Holistic Medicine/Psychology	Nephrology
Internal Medicine	
Neurology	

COST AND INSURANCE

Artemis Hospitals is dedicated to ensuring patients understanding of the hospital's billing and insurance policies.

CORPORATE

Artemis Hospitals is the preferred healthcare destination for the employees of various businesses. They get access to quality healthcare with extra personal care, minimal formalities during admission and a variety of corporate offers. In order to ensure better health for employees & their families, Artemis Hospitals actively partners with various corporates by getting empanelled as their favored healthcare service provider.

The following services are provided to the business houses:

Executive Health Checks | Workplace clinics for counseling | Outpatient and hospitalisation services | Healthcare education and awareness programs | First Aid and BLS Training | Emergency Services | Organisational Healthcare Audit

PART II

DISSERTATION

ON

"ASSESSMENT OF KNOWLEDGE, ATTITUDE AND PRACTICE OF HEALTHCARE WASTE MANAGEMENT AMONG HEALTH CARE PROFESSIONALS AT ARTEMIS HOSPITAL, DWARKA, NEW DELHI"

Biomedical Waste Management: Indian Perspective

"Prevention is better than cure".

The importance of this topic cannot be over emphasized by any stretch of ourimagination. In today's context the issue of biomedical waste management hasassumed great significance particularly in view of the rapid upsurge of HIV andHepatitis B infections.

Safe handling of bio-medical waste continues to be a matter of serious concern for health authorities in India. Thousands of tons of biomedicalwaste originating from hospitals, nursing homes and clinics in the form of cotton swabs and bandages infected with blood, IV fluid bags, needles, catheters, human tissues, body parts etc which continue to be dumped in open garbage bins on theroads in most parts of the country. With apparently no machinery for grantingpermission to new nursing homes in any of the states, the problem is expected toincrease manifold in the days to come

All human activities produce waste. Such waste may be dangerous and needs safe disposal. Industrial waste, sewage and agricultural waste pollute water, soil and air; it can also be dangerous to human beings and environment. Similarly, hospitals and other health care facilities generate lots of waste which can transmit infections, particularly HIV, Hepatitis B & C and Tetanus, to the people who handle it or come in contact with it.1

Until fairly recently, medical waste management was not generally considered an issue. In the 1980s and 1990s, concerns about exposure to human immunodeficiency virus (HIV) and hepatitis B virus (HBV) led to questions about potential risks inherent in medical waste. Thus hospital waste generation has become a prime concern due to its multidimensional ramifications as a risk factor to the health of patients, hospital staff and extending beyond the boundaries of the medical establishment to the general population.2

Hospital waste refers to all waste, biologic or non-biologic that is discarded and not intended for further use. Medical waste is a subset of hospital waste; it refers to the material generated as a result of diagnosis, treatment or immunization of patients and associated Health care research. Health care waste (HWM) is generated in hospitals, research institutions, health care teaching institutes, clinics, laboratories, blood banks, animal houses and veterinary institutes.

The waste generated in these institutions essentially consists of solids and liquid, which may be hazardous, infectious and non-infectious. It has been estimated that up to 85% to 90% of the waste generated in hospitals is non-infectious (free with any body fluids, which is similar to domestic waste). It is the remaining 10% to 20% of waste that is of concern because it is hazardous and infectious. Proper handling, treatment and disposal of Health care wastes are important elements of health care office infection control programme. Correct procedure will help protect health care workers, patients and the local community. If properly designed and applied, waste management can be a relatively effective and an efficient compliance-related practice.

Proper collection and segregation of Health care waste are important. At the same time, the quantity of waste generated is equally important. A lesser amount of Health care waste means a lesser burden on waste disposal work, cost saving and a more efficient waste disposal system. Hence, health care providers should always try to reduce the waste generation in day-to-day work in the clinic or at the hospital.

To protect the environment and community health, the Ministry of Environment and Forest has notified, "BIO MEDICAL WASTE (Management and Handling) Rules 1998/ 2000 under the Environment (Protection) Act, 1986 that compel all hospitals, clinics, nursing homes, slaughter houses and laboratories to ensure safe and environmentally sound management of waste produced by them.

Safe and effective management of waste is not only a legal necessity but also a social responsibility. Lack of knowledge, attitude and practice may lead to serious consequences. Clearly there is a need for education as to the hazards associated with improper waste disposal. Lack of apathy to the concept of waste management is a major stymie to the practice of waste disposal. An effective communication strategy is imperative keeping in view the low awareness level among different category of staff in the health care establishments regarding Health care waste management.

Biomedical Waste Management in Delhi

Delhi generates approximately 7,000 metric tonnes of waste out every day out of which 70 tonnes/day is the biomedical waste. According to a Government report (2010), only about 10.125 tonnes/day of biomedical waste gets properly treated in Delhi. This is concerning and

we will have to much more than what we are doing at present to ensure minimum exposure to the health risks posed by inadequate handling of biomedical waste. Fortunately, a recent case in the National Green Tribunal has helped mainstream the issue and make the authorities more pro-active.

Current Status of Biomedical Waste Management in Delhi

According to the Annual Report of DPCC, 10.7 tonnes/day BMW waste is treated in Delhi. However, in Delhi, the hospitals and nursing homes are found to generate 70 tonnes/day of BMW. According to media reports, various multi-speciality hospitals generate BMW but are not following the rules to treat this waste. Government hospitals are also reported to be turning a blind eye to the hazards of BMW by either casually dumping the untreated waste. This is despite the fact that they have expensive incinerators installed at the hospital or have provisions to outsource the work to private agencies. A report released by the Directorate of Health Services has revealed that the BMW treatment facilities at hospitals lie unused or underutilised with little or no monitoring of how the hazardous waste is being handled. The same report reveals that major hospitals like LokNayak, Guru Teg Bahadur, G.B. Pant and DeenDayalUpadhyay have failed to comply with the waste management norms despite expensive incinerators installed in these hospitals.

The report also reveals that in the past five years, five major government hospitals: Rao Tula Ram Hospital, RajanBabu Institute for Pulmonary Medicine and Tuberculosis, Palika Maternity Hospital Lodhi Colony, International Centre for Genetic Engineering and Biotechnology and National Institute of Immunology have shut down their incinerators owing to technical reasons. Media reports suggest that these hospitals are dumping needles, syringes, glucose bottles and blood bags inside the premises of the hospitals, in areas where the entry is restricted to the employees.

Segregation of hospital waste according to the available disposal technology is the need of the hour. Employment of cost-effective and available relevant technology can do the trick. The possibilities of recycling should be explored in a scientific and hygienic manner for permissible items. Setting up of common medical waste treatment facilities for/by different hospitals such as transportation of the hazardous waste to the common disposal system to reduce expenditure will motivate the hospitals towards adopting better BMW management practices. Safety of medical staff/rag-pickers, by the use of gloves and masks and

housekeeping aspects (drinking water, sewage system of the hospitals) should be immediately addressed. Training of municipality workers by medical personnel in handling of medical waste to avoid risks and health hazards should also be practiced to minimize occupational hazards.

With a 16+ million population figure in Delhi, and limited land availability, the density of population in Delhi is always on the rise. Exposure to BMW could only prove fatal to such large number of people living so closely packed together. It is therefore very important that the civic authorities take all possible measures to minimize the risks associated with bio-medical waste by ensuring complete and safe disposal of total BMW generated.

Legislation on BMW in India

With increasing awareness in general population regarding hazards of hospital waste, public interest litigations were filed against erring officials. Some landmark decisions to streamline hospital waste management have been made in the recent past. These are:

Supreme Court judgment dated 1st March 1996 in connection with safe disposal of hospital waste ordered that

(a) All hospitals with 50 beds and above should install either their own incinerator or an

equally effective alternative method before 30th November 1996.

(b) The incinerator or the alternative method should be installed with a necessary pollution control mechanism conforming to the standard laid down by Central Pollution Control Board (CPCB).

(c) Hazardous medical waste should be segregated as source and disinfected before finaldisposal.

2. Ministry of Environment & Forest, Govt. of India issued a notification for Biomedical Waste(Management & Handling) Rules 1998 in exercise of powers conferred by Section 6, 8 & 25 of the Environment (Protection) Act, 1986 that was published in The Gazette of India Extraordinary, Part-II, Section 3-Sub-Section (ii) New Delhi, July 27, 1998 .

3. The Delhi Pollution Control Committee has been designated as Prescribed Authority toimplement these rules in the National Capital Territory of Delhi. The Financial Commissioner has been designated as appellate authority in Delhi.

4. In exercise of the Powers conferred by Rule 9 of the Bio-Medical Waste (Management & Handling) Rules, 1998 the Lt. Governor of Delhi has constituted an Advisory Committee Vide No. F. 23 (322)/95/EN/99 to act such authority under the said Rules. The composition of the Advisory Committee has 10 members with Pr. Secretary (Health), Govt. of Delhi as Chairman and Director Health Services as Member Secretary / Convener. Under Chairmanship of Principal Secretary (Health & Family Welfare) this Committee meets from time to time to discuss and decide about various issues connected with these rules. It is primary responsibility of the government to implement the recommendations and directions of the Supreme Court and Biomedical Waste (Management & Handling) Rules 1998 in public interest, so that Bio-medical waste does not cause any harm to men, animal and environment.

5. Bio-medical waste management in hospitals- An overview of bio-medical waste (management and handling) rules, 1998.

6. The Hazardous Waste Management Rules, 2016 have been released by the Environment Minister Shri Prakash Javadekar. And for the first time, the Hazardous Waste Management Rules have been made to distinguish between hazardous waste and other waste. Other waste includes waste tyre, paper waste, metal scrap, used electronic items, etc. and are recognized as a resource for Recycling and Reuse.

In the words of the Environment Minister, “The new Hazardous Waste Rules will ensure resource recovery and disposal of hazardous waste in environmentally sound manner. The Rules are environment and industry-friendly. The provisions of the new Rules are in line with this Government’s priority for Ease of Doing Business and Make in India, but with responsible concerns for sustainable development.”

The new Rules also focus on scientific ways of managing hazardous waste and completely stopping unscientific disposal of hazardous and other waste such as burning or using incineration methods. What is also interesting is that these new rules have been made through ayearlong public consultation and after discussions with experts. The Rules are largely based on the recommendations made by the aforementioned and are now called the **Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016.**

Salient features of the New Policy BMW 2016

Definition of BMW-"bio-medical waste" means any waste, which is generated during the diagnosis, treatment or immunisation of human beings or animals or research activities pertaining thereto or in the production or testing of biological or in health camps, including the categories mentioned in Schedule I appended to these rules;

"Management"includes all steps required to ensure that bio- medical waste is managed in such amanner as to protect health and environment against any adverse effects due to handling of such waste.

"Handling"in relation to bio-medical waste includes the generation, sorting, segregation, collection, use, storage, packaging, loading, transportation, unloading, processing, treatment, destruction, conversion, or offering for sale, transfer, disposal of such waste.

- Duties of the Occupier, Duties of the operator of a common bio-medical waste treatment and disposal facility, Duties of authorities, Treatment and disposal, Segregation, packaging, transportation and storage, Procedure for authorisation, Monitoring of implementation of the rules in health care facilities andLiability of the occupier, operator of a facility

These rules shall not apply to,-

(a) Radioactive wastes as covered under the provisions of the Atomic Energy Act, 1962(33 of 1962)

(b) Hazardous chemicals covered under the Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989 made under the Act;

(c) Solid wastes covered under the Municipal Solid Waste (Management and Handling) Rules, 2000 made under the Act;

(d) The lead acid batteries covered under the Batteries (Management and Handling) Rules, 2001 made under the Act;

(e) Hazardous wastes covered under the Hazardous Wastes Management, Handling and transboundary Movement) Rules, 2008 made under the Act;

(f) Waste covered under the e-Waste (Management and Handling) Rules, 2011 made under the Act;

(g) Hazardous microorganisms, genetically engineered microorganisms and cells covered under the Manufacture, Use, Import, Export and Storage of Hazardous Microorganisms, Genetically Engineered Microorganisms or Cells Rules, 1989 made under the Act.

SCHEDULE I

[See rules 3 (e), 4(b), 7(1), 7(2), 7(5), 7 (6) and 8(2)]

Part-1 Biomedical wastes categories and their segregation, collection, treatment, processing anddisposal options

Category	Type of Waste	Type of Bag or Container to be used	Treatment and Disposal options
(1)	(2)	(3)	(4)
Yellow	**(a) Human Anatomical Waste:** Human tissues, organs, body parts and fetus below the viability period (as per the Medical Termination of Pregnancy Act 1971, amended from time to time).	Yellow coloured non-chlorinated plastic bags	Incineration or Plasma Pyrolysis or deep burial*
	(b)Animal Anatomical Waste : Experimental animal carcasses, body parts, organs, tissues, including the waste generated from animals used in experiments or testing in veterinary hospitals or colleges or animal houses.		
	(c) Soiled Waste: Items contaminated with blood, body fluids like dressings, plaster casts, cotton swabs and		Incineration or Plasma Pyrolysis or deep burial* In absence of above facilities, autoclaving or micro-waving/

	bags containing residual or discarded blood and blood components.		hydroclaving followed by shredding or mutilation or combination of sterilization and shredding. Treated waste to be sent for energy recovery.
	(d) Expired or Discarded Medicines: Pharmaceutical waste like antibiotics, cytotoxic drugs including all items contaminated with cytotoxic drugs along with glass or plastic ampoules, vials etc.	Yellow coloured non-chlorinated plastic bags or containers	Expired `cytotoxic drugs and items contaminated with cytotoxic drugs to be returned back to the manufacturer or supplier for incineration at temperature >1200 ^{0}C or to common bio-medical waste treatment facility or hazardous waste treatment, storage and disposal facility for incineration at >1200^{0}C Or Encapsulation or Plasma Pyrolysis at >1200^{0}C. All other discarded medicines shall be either sent back to manufacturer or disposed by incineration.
	(e) Chemical Waste: Chemicals used in production of biological and used or discarded disinfectants.	Yellow coloured containers or non-chlorinated plastic bags	Disposed of by incineration or Plasma Pyrolysis or Encapsulation in hazardous waste treatment, storage and disposal facility.
	(f) Chemical Liquid Waste : Liquid waste generated due to use of chemicals in production of biological and used or discarded disinfectants, Silver X-ray film developing liquid, discarded Formalin, infected secretions, aspirated body fluids, liquid from laboratories and floor washings, cleaning, house-keeping and disinfecting activities etc.	Separate collection system leading to effluent treatment system	After resource recovery, the chemical liquid waste shall be pre-treated before mixing with other wastewater. The combined discharge shall conform to the discharge norms given in Schedule-III.
	(g) Discarded linen, mattresses, beddings contaminated with blood or body fluid.	Non-chlorinated yellow plastic bags or suitable packing material	Non- chlorinated chemical disinfection followed by incineration or Plazma Pyrolysis or for energy recovery. In absence of above facilities, shredding or mutilation or combination of sterilization and shredding. Treated waste to be sent for energy recovery or incineration or Plazma Pyrolysis.

	(h) Microbiology, Biotechnology and other clinical laboratory waste: Blood bags, Laboratory cultures, stocks or specimens of micro-organisms, live or attenuated vaccines, human and animal cell cultures used in research, industrial laboratories, production of biological, residual toxins, dishes and devices used for cultures.	Autoclave safe plastic bags or containers	Pre-treat to sterilize with non-chlorinated chemicals on-site as per National AIDS Control Organisation or World Health Organisation guidelines thereafter for Incineration.
Red	**Contaminated Waste (Recyclable)** (a) Wastes generated from disposable items such as tubing, bottles, intravenous tubes and sets, catheters, urine bags, syringes (without needles and *fixed needle syringes*) and vaccutainers with their needles cut) and gloves.	Red coloured non-chlorinated plastic bags or containers	Autoclaving or micro-waving/ hydroclaving followed by shredding or mutilation or combination of sterilization and shredding. Treated waste to be sent to registered or authorized recyclers or for energy recovery or plastics to diesel or fuel oil or for road making, whichever is possible. Plastic waste should not be sent to landfill sites.
White (Translucent)	**Waste sharps including Metals:** Needles, syringes with fixed needles, needles from needle tip cutter or burner, scalpels, blades, or any other contaminated sharp object that may cause puncture and cuts. This includes both used, discarded and contaminated metal sharps	Puncture proof, Leak proof, tamper proof containers	Autoclaving or Dry Heat Sterilization followed by shredding or mutilation or encapsulation in metal container or cement concrete; combination of shredding cum autoclaving; and sent for final disposal to iron foundries (having consent to operate from the State Pollution Control Boards or Pollution Control Committees) or sanitary landfill or designated concrete waste sharp pit.
Blue	**(a) Glassware:** Broken or discarded and contaminated glass including medicine vials and ampoules except those contaminated with cytotoxic wastes.	Cardboard boxes with blue colored marking	Disinfection (by soaking the washed glass waste after cleaning with detergent and Sodium Hypochlorite treatment) or through autoclaving or microwaving or hydroclaving and then sent for recycling.
	(b) Metallic Body Implants	Cardboard boxes with blue colored marking	

Comparison of BMW Rules 1998 and 2016

Major changes proposed in the Bio- Medical Waste Management Rules, 2016 and its likely implication

Bio- Medical Waste (Management and Handling) Rules, 2011	Bio- Medical Waste Management Rules, 2016	Reasons and likely implications
Title Bio- Medical Waste (Management and Handling) Rules, 2011	Bio- Medical Waste Management Rules, 2016.	The word 'Management' includes Handling.
Application		
These rules apply to all persons who generate, collect, receive, store, transport, treat, dispose, or handle bio medical waste in any form.	These rules shall apply to all persons who generate, collect, receive, store, transport, treat, dispose, or handle bio-medical waste in any form and shall not apply to: • radioactive wastes, • wastes covered under the MSW Rules, 2000, • lead acid batteries, • hazardous wastes, • E- waste, • hazardous microorganisms.	Modified to bring more clarity in the application. Clarified that vaccination camps, blood donation camps, surgical camps or any other healthcare activity undertaken outside the healthcare facility, will be covered.
Duties of the Health care facilities		
Every occupier of an institution generating bio-medical waste which includes a hospital, nursing home, clinic, dispensary, veterinary institution, animal house, pathological laboratory, blood bank to take all steps to ensure that such waste is handled without any adverse effect to human health and the environment.	Additions: Health care facilities (HCF) shall make a provision within the premises for a safe, ventilated and secured location for storage of segregated biomedical waste pre-treat the laboratory waste, microbiological waste, blood samples and blood bags through disinfection or sterilisation on-site in the manner as prescribed by the World Health Organisation (WHO) or National AIDs Control Organisation (NACO) guidelines and then sent to the common bio-medical waste treatment facility for final disposal. phase out use of chlorinated plastic bags, gloves and blood bags within two years from the date of notification of these rules provide training to all its health care workers and others involved in handling of bio medical waste at the time of induction and thereafter at least once every year immunise all its health care workers and others involved in handling of bio-medical waste for protection against diseases including Hepatitis B and Tetanus that are likely to be transmitted by handling of bio-medical waste,	To ensure that there shall be no secondary handling, pilferage of recyclables or inadvertent scattering or spillage by animals and the bio-medical waste from such place or premises can be directly transported in to the common bio-medical waste treatment facility. This is to prevent the possible microbial contamination. Will eliminate the emission of dioxin and furans from burning of such wastes. Will improve the management of BMW including collection, segregation. To protect the health of workers

	establish a Bar- Code System for bags or containers containing bio-medical waste to be sent out of the premises report major accidents including accidents caused by fire hazards, blasts during handling of bio-medical waste and the remedial action taken to SPCB existing incinerators shall achieve the standards for retention time in secondary chamber and Dioxin and Furans within two years from the date of this notification	Will improve the segregation, transportation and disposal system. Also will eliminate pilferage on the way of BMW to disposal facility. Help to monitor and improve the management Will improve the environment in the vicinity treatment facility.
Duties of the operator of a common bio-medical waste treatment and disposal facility		
..Nil..	Same as the duties of HCFs and additionally they shall ensure timely collection of bio-medical waste from the HCFs, assist the HCFs in conduct of training	Specific responsibility on the operator of a common bio-medical waste treatment and disposal facility will be make them clear to their duties
Treatment and disposal		
Every HCFs, where required, shall set requisite bio-medical waste treatment facilities like incinerator, autoclave, microwave system for the treatment of waste, or, ensure requisite	No occupier shall establish on-site treatment and disposal facility, if a service of ` common bio-medical waste treatment facility is available at a distance of **seventy-five kilometer**.	This is to make the installation and operation of common treatment facility a viable one.

treatment of waste at a common waste treatment facility or any other waste treatment facility.	In cases where service of the common bio-medical waste treatment facility is not available, the Occupiers shall set up requisite biomedical waste treatment equipment like incinerator, autoclave or microwave, shredder prior to commencement of its operation, as per the authorisation given by the prescribed authority.	
Segregation, packaging, transportation and storage		
Bio-medical waste classified in to 10 categories based on treatment options. No untreated bio-medical waste shall be kept stored beyond a period of 48 hours Provided that if for any reason it becomes necessary to store the waste beyond such period, the authorised person must take permission of the prescribed authority and take measures to ensure that the waste does not adversely affect human health and the environment.	Bio-medical waste classified in to 4 categories based on treatment options. Untreated human anatomical waste, animal anatomical waste, soiled waste and, biotechnology waste shall not be stored beyond a period of forty – eight hours: In case for any reason it becomes necessary to store such waste beyond such a period, the occupier shall take appropriate measures to ensure that the waste does not adversely affect human health and the environment and inform the SPCB along with the reasons.	Will improve the segregation of waste at source channelize proper treatment and disposal Will eliminate obtaining permission within 48 hours which is not practically feasible.

Authorisation		
Hospitals treating 1000 or more patients per month to obtain authorization from SPCBs/PCCs	One time Authorisation for Non-bedded HCFs. The validity of authorization shall be synchronised with validity of consent orders for Bedded HCFs	HCFs can make application along with consent and hence getting authorisation will not be additional burden for HCFs. and operator of treatment facility. It will also help to SPCB in making single inspection / monitoring to consider both the consent and authorisation.
Advisory Committee		
The Government of every State/Union Territory shall constitute an advisory committee with the experts in the field of medical and health, animal husbandry and veterinary sciences, environmental management, municipal administration, and any other related department or organisation including non-governmental organisations. Ministry of Defence shall constitute, an Advisory Committee under Additional Director General of Armed Forces Medical Services with representative of Ministry of Defence, MoEFCC, for HCFs under Armed forces under the Ministry of Defence.	No change in the concept except additional members. Shall meet once in Six Months.	Advisory Committee has strengthened suitably with additional members.
	Standards for emission from incinerators	
SPM in the Incinerator's Emission 150 mg/nm3 Residence Time in Secondary chamber of incinerators is 1 second ...Nil..	50 mg/nm3 2 second Standards for Dioxin and furans prescribed.	The proposed stringent standards for emission from Incinerator (reduction of permissible limit for particulate matter, introduction of standards for Dioxin and Furans and increasing the residence time in the Incinerator Chambers) will improve the operation of incinerator and reduce the emission of pollutants in environment.
Site for common bio-medical waste treatment and disposal facility		
--Nil..	The department dealing the allocation of land shall be responsible for providing suitable site for setting up of common biomedical waste treatment and disposal facility in the State Government	Getting suitable land is the problem in many States for establishment of waste management facility. Making the responsibility to provide land by the Department dealing the allotment of land would eliminate the issue of getting land for the waste management facility.

Monitoring of implementation		
..Nil..	Ministry of Environment, Forest and Climate Change shall review the implementation of the rules in the country once in a year through the State Health Secretaries and CPCB.SPCBs State Government shall constitute District Level Monitoring Committee under the chairmanship of District Collector or District Magistrate or Deputy Commissioner or Additional District Magistrate to monitor the compliance of the provisions of these rules in the health care facilities. The District Level Monitoring Committee shall submit its report once in six months to the State Advisory Committee, State Pollution Control Board for taking further necessary action. The District Level Monitoring Committee shall comprise of District Medical Officer or District Health Officer, representatives from SPCB, Public Health Engineering Department, local bodies or municipal corporation, Indian Medical Association, common bio-medical waste treatment facility registered NGO working in the field of bio-medical waste management. District Medical Officer shall be the Member Secretary of this Committee.	The monitoring of the implementation was earlier only with SPCBs and review of implementation through the District Committee is likely to improve the implementations.

Policy of Artemis Hospital on Biomedical Waste Management

Hospital is authorized by Delhi Pollution Control Committee (DPCC) for the management and handling of Bio Medical Waste.

Proper segregation and collection of Bio- medical waste from all patient care areas of the hospital is implemented and monitored.

Bio medical waste is handled at the site of generation e.g. – all Patient activity areas, diagnostic services areas, Operation Theaters, Labour Room etc.

The responsibility of the segregation is with the generator of bio medical waste – Doctors, Nurses and Technicians.

Housekeeping attendant in a particular area performs the following jobs--

Garbage bins in Public areas/Lab/ICUs/OTs/Procedure rooms are emptied at the end of each shift or whenever they are ¾ full.

Garbage bag is tied up & transferred to the dirty utility area carefully without any spillage.

Garbage is temporarily stored in the respective bin as per color coding:

Color coding of Bags	**Type of garbage:**
Yellow	Human anatomical wastes, Infected/ soiled Items
Red-	Infected Plastics and Rubber items
Blue	Broken / Un-broken glass Items
Black	Cytotoxic Drugs

At the end of every shift, garbage from every area is transported by designated trolley to garbage central collection area. The Bags to be tied and labeled with Sticker mentioning designated area & date.

The garbage bags are kept as per color coding in the correct place.

The garbage movement is done through lift only at the end of every shift. Timings – Morning shift 3 - 4 pm, Evening shift 8 – 9 pm and Night shift 6- 7am. Garbage is also removed during the shift and also whenever the bins are full.In case any bag is torn, it is ensured that double bagging is done before moving it to avoid any spillages.

The organization ensures that Bio medical waste is stored and transported to the site of treatment and disposal in proper covered vehicles within stipulated time limits in a secure manner.

There is a proper Bio medical garbage collection room with compartments made to store Red, Yellow, Blue& Black with bags. This garbage room is present in the outer area. All Bio Medical garbage from various areas in the hospital is stored in this garbage room.

SMS Watergrace, which is the authorized vendor, will pick up the Bio-Medical garbage from the pre-designated area. Each category of waste is measured and the weight is documented in the sheets. The same is signed by the Housekeeping representative, Vendor representative and the Security personnel.

BMW collection Vendor's collection time

Morning - 10:00am – 12:00pm

Bio medical waste is not stored beyond 48 hrs.

Bio medical waste is not picked up on Sundays and Holidays. On Monday and day after the holiday, Bio Medical garbage is picked up during morning hours between 8am to10am and during evening hours if required. In case Sunday and Holiday fall together, Bio Medical waste is collected on holiday during morning hours.

Bio-Medical waste treatment is done by SMS Watergrace as per statutory provisions. Bio-medical liquid waste thrown in the dirty utility drainages finally goes to the STP – Sewage Treatment Plant.

Requisite fees, documents and reports are submitted to competent authorities on stipulated dates.

The following documents are generated & maintained:

Daily Bio-medical collection sheets: It contains the weightage of the waste collected on a particular date. The same is signed by the Housekeeping supervisor, the Bio-Medical waste representative and the Security personnel.

Monthly Bio-medical waste report File

It contains the total quantity of waste collected date wise on a particular month.

Yearly Bio-Medical Reports:

* Provides the annual report of the total Bio Medical waste Generated /collected by the Bio-Medical waste vendor from the Hospital.

*Three year charges to the Delhi Pollution Control Committee (DPCC).

*Contract agreement and Form-1.

Accident form is filled for any kind of bio medical waste spillage in the hospital. This states the area of the accident, personnel involved and corrective action taken.

Appropriate personal protective measures are used by all housekeeping staff handling Bio-medical waste.

Personal Protective Measures are used (PPE):

Face Masks and Hand Gloves

Staff handling garbage use rubber gloves & masks to ensure safety.On completion of garbage disposal process removal of personal protective equipment is followed by hand washing as per the standard protocol.

BMW treatment plant site visit is done once in three months. The report is documented.

COLOUR CODES FOR WASTE MANAGEMENT (CHART 2)

RED BAG	YELLOW BAG	BLUE BAG	BLACK BAG
Infected Plastics & Rubber Materials All Types Of Catheters Urobags I/V Tubing/Iv Bottles [After Mutilation] Vacutainers Gloves Urine & Stool Container Disposable Drapes ESR Pipettes Yellow/Blue Tips Disposable Plastic Pipettes Syringes Glucose Strips Used ECG Electrodes	Blood Stained Cotton Dressings Used Medicine Anatomical Waste Vaccines OT Sponge Cloths Caps, Masks Soiled Plaster Casts Soiled Papers With Blood / Body Fluid	All Glass Items Empty Vials All Discarded Vials **SHARP CONTAINERS** Puncture Proof Sharp Collector Surgical Blades Lancets Vacutainer Broken Ampoules & Glass Bottles Needles All Metallic Sharps Discarded Slides Large Glucose Bottles	Cytotoxic Drugs Expired Medicines Wastes Comprising Of Outdated, Contaminated And Discarded Medicines Chemicals Used In Production Of Biologicals, Chemicals Used In Chemical Treatment@@ Anddisinfection, As Insecticides **BLACK BAG** General Waste Non Infected Plastics Tea Bags Papers Kitchen Waste Medicine Wrappers

Protocol for Monitoring House-keeping Activities

1. The house keeping activities are monitored on day to day basis by the supervisors with a check list. The infection control personnel monitors once in month.

2. The house keeping activity inside the room is monitored randomly [not documented] by the infection control personnel in respective area.

3. Biomedical waste disposal is also monitored by ICN periodically.

Practices on ground

During the period of dissertation it was observed that the BMW is segregated, collected, stored and transported in a professional manneras laid down in the policy. The entire BMW is managed in three steps.

First- BMW is segregated at the place of origin. All departments have the colourcoded bins where the waste is put till the bin is ¾ filled.

Schedule of Transfer

Morning	Afternoon	Evening
6-7am	3-4 pm	8-9 pm

FIG 8

FIG 9

SEGREGATION AT PLACE OF ORIGIN

Second- Once the bins in the department is filled, the waste care handlers tie the plastic bag and transfer the complete bag to the bin placed at the exit of each floor. All the floors has bigger bins which is moved in trolleys. These bins are placed at the exit of each floor.

FIG 10

ALL THE THREE FLOORS HAVE THE TEMPORARY COLLECTION AREA

FIG 11

ALL THE THREE FLOORS HAVE THE TEMPORARY COLLECTION AREA

Third- All the bigger bins are then transported to the central storage area the ground level with the help of trolley. Complete bags are transferred to the temporary storage area.

FIG 12

CENTRAL STORAGE AREA

FIG 13

CENTRAL STORAGE AREA

FIG 14

COLLECTION FROM CENTRAL STORAGE AREA BY REP OF VENDOR

FIG 15

TRANSPORT TO AUTHORISED VEHICLE FOR TREATMENT AT CWTF

FIG 16

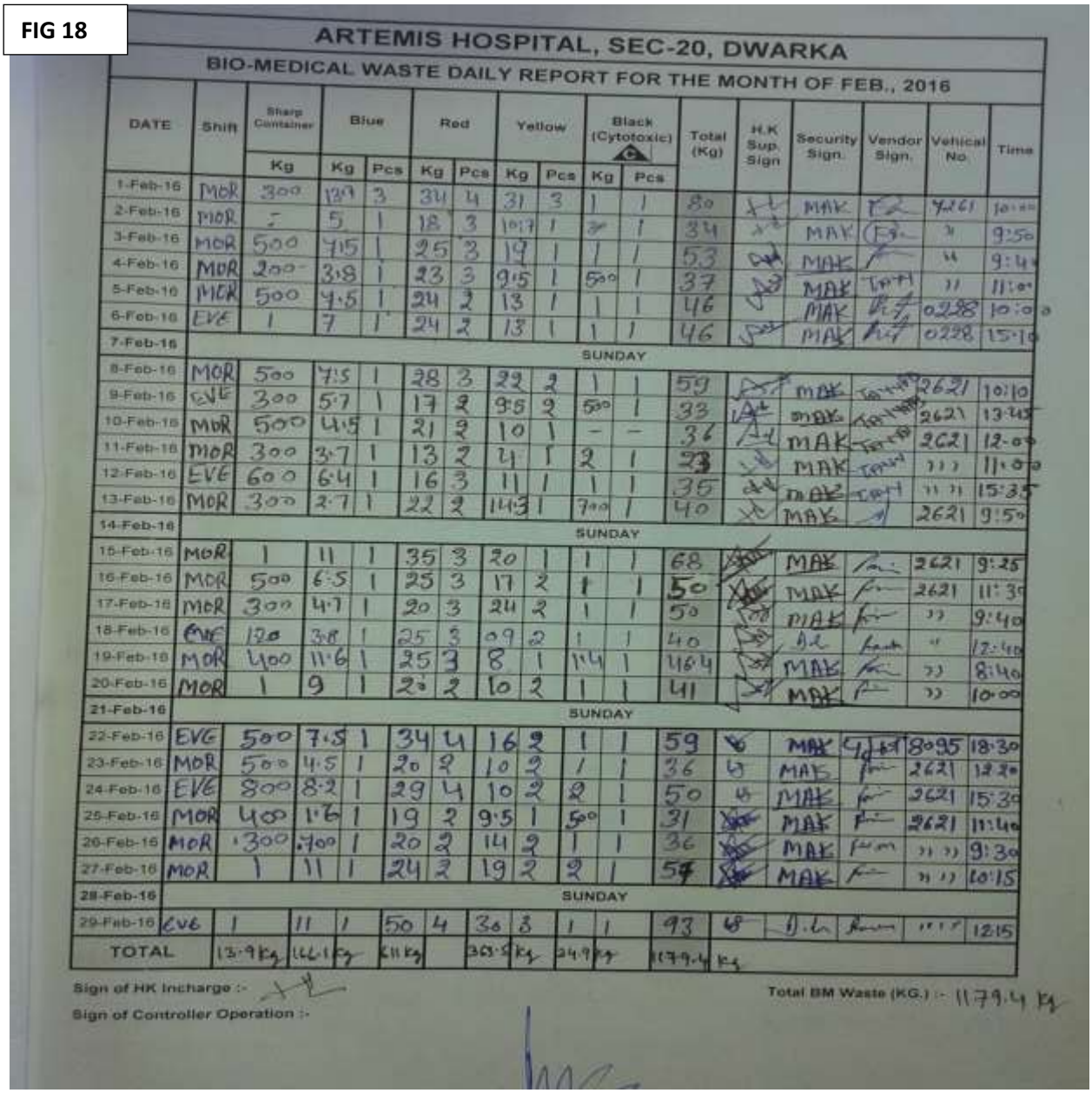
DISPLAY BOARDS INSIDE CENTRAL STORAGE AREA

FIG 17

Double Monitoring System

The waste is collected by Common Bio-medical Waste Treatment Facility (CBMWTF) from the hospital premises at the designated time in a vehicle meant for the purpose. The handing over of waste is carried out in the presence of Housekeeping In charge, Security supervisor and the vendor taking the waste. A proper record is maintained and signed by all the three responsible persons. The same is periodically checked by the Medical Superintendent. Specimen document is shown bel

FIG 18



ARTEMIS HOSPITAL, SEC-20, DWARKA

BIO-MEDICAL WASTE DAILY REPORT FOR THE MONTH OF FEB., 2016

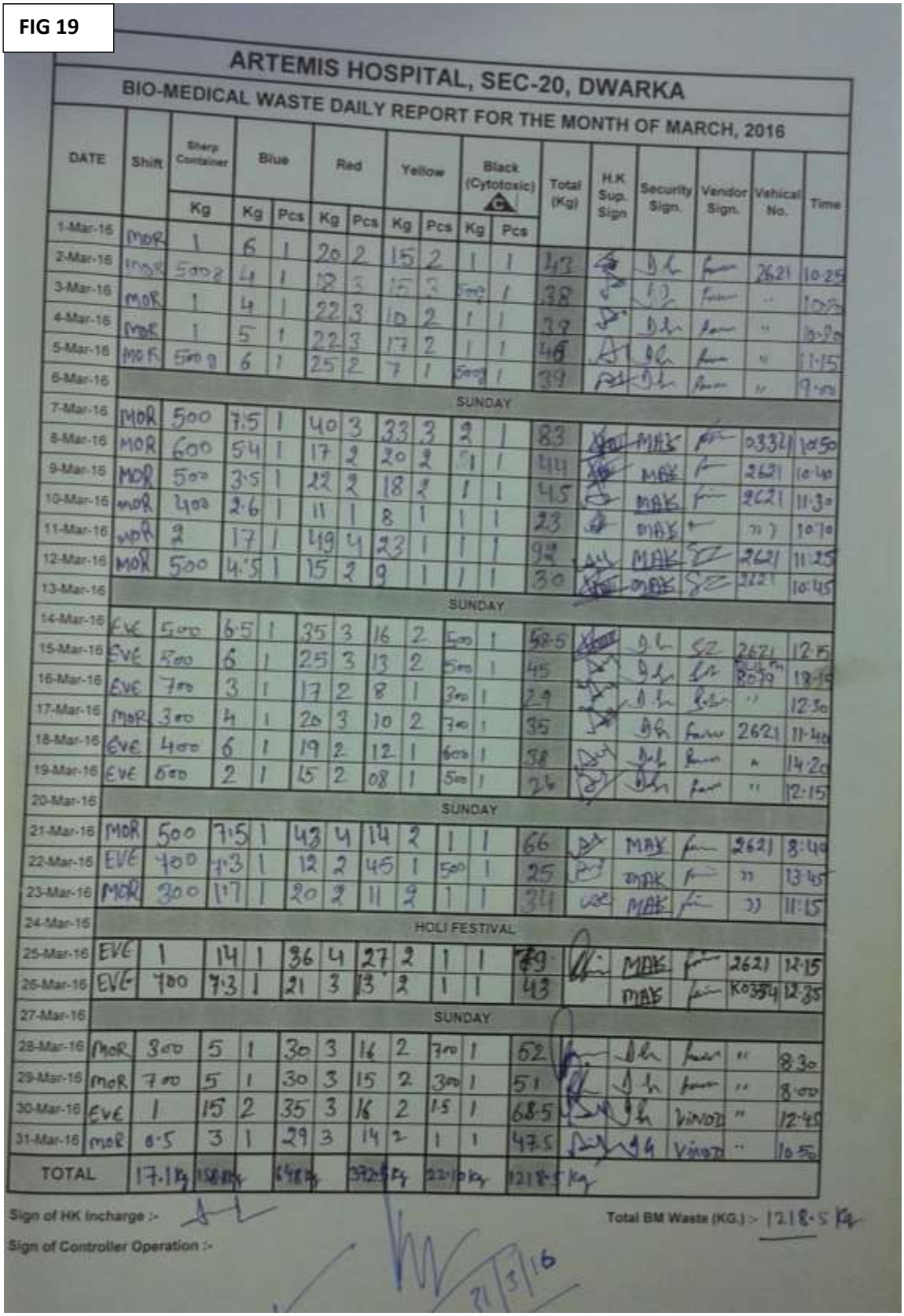
DATE	Shift	Sharp Container	Blue		Red		Yellow		Black (Cytotoxic)		Total (Kg)	H.K Sup. Sign	Security Sign.	Vendor Sign.	Vehical No.	Time
		Kg	Kg	Pcs	Kg	Pcs	Kg	Pcs	Kg	Pcs						
1-Feb-16	MOR	300	12.9	3	34	4	31	3	1	1	80		MAK		4261	
2-Feb-16	MOR	-	5	1	18	3	10.7	1	3	1	34		MAK		"	9:50
3-Feb-16	MOR	500	7.5	1	25	3	19	1	1	1	53		MAK		"	9:45
4-Feb-16	MOR	200	3.8	1	23	3	9.5	1	500	1	37		MAK		"	11:00
5-Feb-16	MOR	500	4.5	1	24	2	13	1	1	1	46		MAK		0228	10:00
6-Feb-16	EVE	1	7	1	24	2	13	1	1	1	46		MAK		0228	15:10
7-Feb-16	SUNDAY															
8-Feb-16	MOR	500	7.5	1	28	3	22	2	1	1	59		MAK		2621	10:10
9-Feb-16	EVE	300	5.7	1	17	2	9.5	2	500	1	33		MAK		2621	13:45
10-Feb-16	MOR	500	4.5	1	21	2	10	1	-	-	36		MAK		2621	12:00
11-Feb-16	MOR	300	3.7	1	13	2	4	1	2	1	23		MAK		"	11:00
12-Feb-16	EVE	600	6.4	1	16	3	11	1	1	1	35		MAK		"	15:35
13-Feb-16	MOR	300	2.7	1	22	2	14.3	1	700	1	40		MAK		2621	9:50
14-Feb-16	SUNDAY															
15-Feb-16	MOR	1	11	1	35	3	20	1	1	1	68		MAK		2621	9:25
16-Feb-16	MOR	500	6.5	1	25	3	17	2	1	1	50		MAK		2621	11:35
17-Feb-16	MOR	300	4.7	1	20	3	24	2	1	1	50		MAK		"	9:40
18-Feb-16	EVE	120	3.8	1	25	3	09	2	1	1	40		AK		"	12:40
19-Feb-16	MOR	400	11.6	1	25	3	8	1	11.4	1	46.4		MAK		"	8:40
20-Feb-16	MOR	1	9	1	20	2	10	2	1	1	41		MAK		"	10:00
21-Feb-16	SUNDAY															
22-Feb-16	EVE	500	7.5	1	34	4	16	2	1	1	59		MAK		8095	18:30
23-Feb-16	MOR	500	4.5	1	20	2	10	2	1	1	36		MAK		2621	12:20
24-Feb-16	EVE	800	8.2	1	29	4	10	2	2	1	50		MAK		2621	15:30
25-Feb-16	MOR	400	1.6	1	19	2	9.5	1	500	1	31		MAK		2621	11:40
26-Feb-16	MOR	1300	700	1	20	2	14	2	1	1	36		MAK		" "	9:30
27-Feb-16	MOR	1	11	1	24	2	19	2	2	1	57		MAK		" "	10:15
28-Feb-16	SUNDAY															
29-Feb-16	EVE	1	11	1	50	4	36	3	1	1	93					12:15
TOTAL		13.9 Kg	146.1 Kg		411 Kg		303.5 Kg		24.9 Kg		1179.4 Kg					

Sign of HK Incharge :-

Sign of Controller Operation :-

Total BM Waste (KG.) :- 1179.4 Kg

FIG 19



ARTEMIS HOSPITAL, SEC-20, DWARKA

BIO-MEDICAL WASTE DAILY REPORT FOR THE MONTH OF MARCH, 2016

DATE	Shift	Sharp Container	Blue		Red		Yellow		Black (Cytotoxic)		Total (Kg)	H.K Sup. Sign	Security Sign.	Vendor Sign.	Vehical No.	Time
		Kg	Kg	Pcs	Kg	Pcs	Kg	Pcs	Kg	Pcs						
1-Mar-16	MOR	1	6	1	20	2	15	2	1	1	43				2621	10.25
2-Mar-16	MOR	500g	4	1	12	3	15	3	500g	1	38				"	10.25
3-Mar-16	MOR	1	4	1	22	3	10	2	1	1	39				"	10.25
4-Mar-16	MOR	1	5	1	22	3	17	2	1	1	48				"	11.15
5-Mar-16	MOR	500g	6	1	25	2	7	1	500g	1	39				"	9.55
6-Mar-16	SUNDAY															
7-Mar-16	MOR	500	7.5	1	40	3	23	3	2	1	83		MAK		0334	10.50
8-Mar-16	MOR	600	5.4	1	17	2	20	2	1	1	44		MAK		2621	10.40
9-Mar-16	MOR	500	3.5	1	22	2	18	2	1	1	45		MAK		2621	11.30
10-Mar-16	MOR	400	2.6	1	11	1	8	1	1	1	23		MAK		"	10.10
11-Mar-16	MOR	2	17	1	49	4	23	1	1	1	92		MAK		2621	11.25
12-Mar-16	MOR	500	4.5	1	15	2	9	1	1	1	30		MAK		2621	10.45
13-Mar-16	SUNDAY															
14-Mar-16	EVE	500	6.5	1	35	3	16	2	500	1	58.5		D.L	SZ	2621	12.5
15-Mar-16	EVE	500	6	1	25	3	13	2	500	1	45		D.L	SZ	R079	18.15
16-Mar-16	EVE	700	3	1	17	2	8	1	300	1	29		D.L	SZ	"	12.30
17-Mar-16	MOR	300	4	1	20	3	10	2	700	1	35		DK	Faiz	2621	11.40
18-Mar-16	EVE	400	6	1	19	2	12	1	600	1	38		D.L	SZ	"	14.20
19-Mar-16	EVE	500	2	1	15	2	08	1	500	1	26		D.L	SZ	"	12.15
20-Mar-16	SUNDAY															
21-Mar-16	MOR	500	7.5	1	43	4	14	2	1	1	66		MAK	Faiz	2621	8.40
22-Mar-16	EVE	700	4.3	1	12	2	45	1	500	1	25		MAK	Faiz	"	13.45
23-Mar-16	MOR	300	1.7	1	20	2	11	2	1	1	34		MAK	Faiz	"	11.15
24-Mar-16	HOLI FESTIVAL															
25-Mar-16	EVE	1	14	1	36	4	27	2	1	1	89		MAK	Faiz	2621	12.15
26-Mar-16	EVE	700	7.3	1	21	3	13	2	1	1	43		MAK	Faiz	K0354	12.35
27-Mar-16	SUNDAY															
28-Mar-16	MOR	300	5	1	30	3	16	2	700	1	62				"	8.30
29-Mar-16	MOR	700	5	1	30	3	15	2	300	1	51				"	8.00
30-Mar-16	EVE	1	15	2	35	3	16	2	15	1	68.5			VINOD	"	12.45
31-Mar-16	MOR	0.5	3	1	29	3	14	2	1	1	47.5			VINOD	"	10.50
TOTAL		17.1Kg	158Kg		648Kg		329.5Kg		221.9Kg		1218.5 Kg					

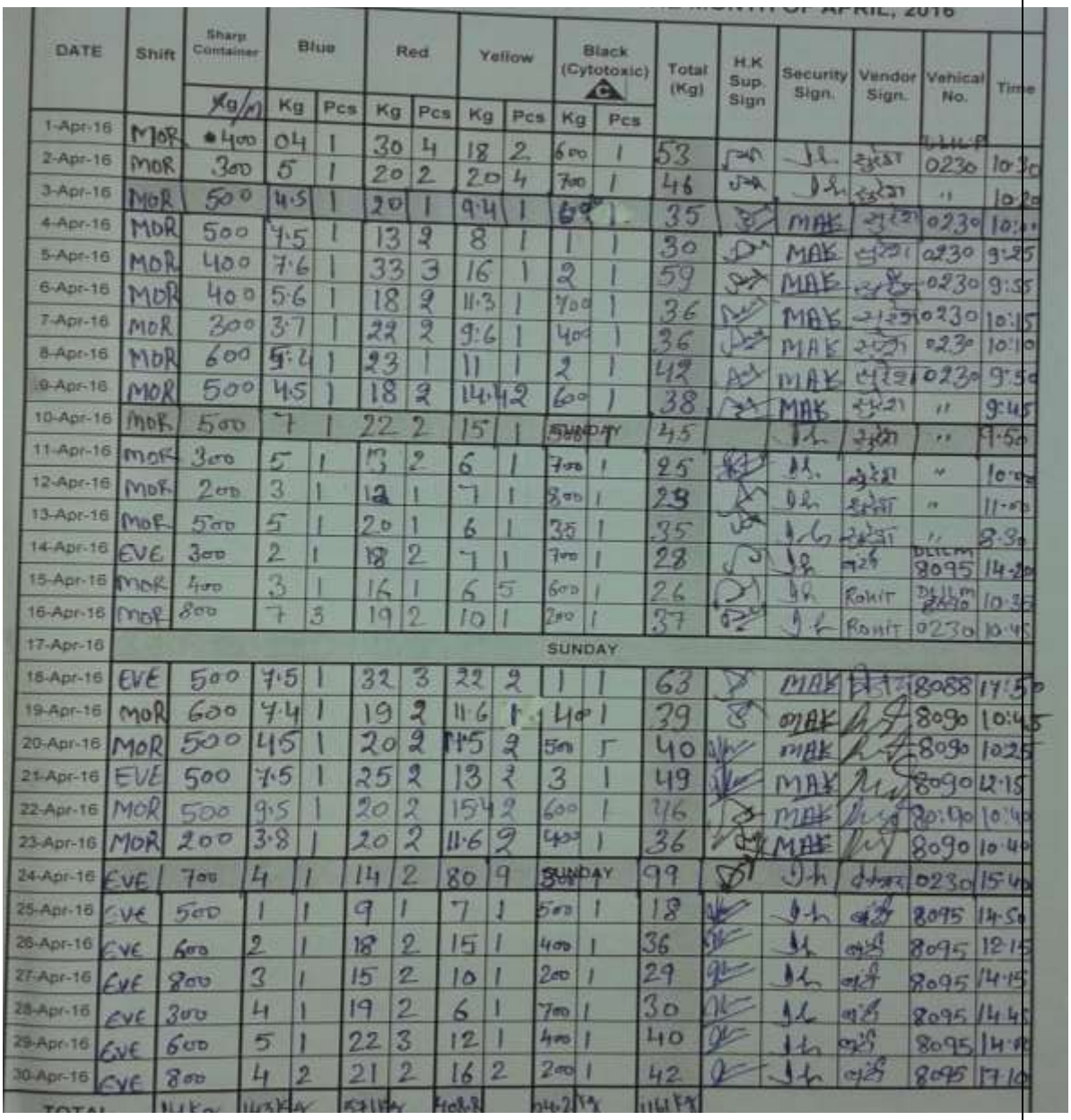
Sign of HK Incharge :-

Total BM Waste (KG.) :- 1218.5 Kg

Sign of Controller Operation :-

31/3/16

FIG 20



DATE	Shift	Sharp Container	Blue		Red		Yellow		Black (Cytotoxic)		Total (Kg)	H.K Sup. Sign	Security Sign.	Vendor Sign.	Vehical No.	Time
		Kg/Pcs	Kg	Pcs	Kg	Pcs	Kg	Pcs	Kg	Pcs						
1-Apr-16	MOR	400	04	1	30	4	18	2	600	1	53					
2-Apr-16	MOR	300	5	1	20	2	20	4	700	1	46				0230	10:30
3-Apr-16	MOR	500	4.5	1	20	1	9.4	1	600	1	35		MAK		0230	10:20
4-Apr-16	MOR	500	7.5	1	13	2	8	1	1	1	30		MAK		0230	9:25
5-Apr-16	MOR	400	7.6	1	33	3	16	1	2	1	59		MAK		0230	9:35
6-Apr-16	MOR	400	5.6	1	18	2	11.3	1	400	1	36		MAK		0230	10:15
7-Apr-16	MOR	300	3.7	1	22	2	9.6	1	400	1	36		MAK		0230	10:10
8-Apr-16	MOR	600	5.4	1	23	1	11	1	2	1	42		MAK		0230	9:50
9-Apr-16	MOR	500	4.5	1	18	2	14.42		600	1	38		MAK		0230	9:45
10-Apr-16	MOR	500	7	1	22	2	15	1	SUNDAY		45					9:50
11-Apr-16	MOR	300	5	1	13	2	6	1	700	1	25					10:00
12-Apr-16	MOR	200	3	1	12	1	7	1	800	1	23					11:00
13-Apr-16	MOR	500	5	1	20	1	6	1	35	1	35					8:30
14-Apr-16	EVE	300	2	1	18	2	7	1	700	1	28				8095	14:20
15-Apr-16	MOR	400	3	1	16	1	6	5	600	1	26			ROHIT		10:30
16-Apr-16	MOR	800	7	3	19	2	10	1	200	1	37			ROHIT	0230	10:45
17-Apr-16	SUNDAY															
18-Apr-16	EVE	500	7.5	1	32	3	22	2	1	1	63		MAK		8088	17:50
19-Apr-16	MOR	600	7.4	1	19	2	11.6	1	400	1	39		MAK		8090	10:45
20-Apr-16	MOR	500	4.5	1	20	2	11.5	2	500	1	40		MAK		8090	10:25
21-Apr-16	EVE	500	7.5	1	25	2	13	2	3	1	49		MAK		8090	12:15
22-Apr-16	MOR	500	9.5	1	20	2	15.42		600	1	46		MAK		8090	10:40
23-Apr-16	MOR	200	3.8	1	20	2	11.6	2	400	1	36		MAK		8090	10:40
24-Apr-16	EVE	700	4	1	14	2	80	9	SUNDAY		99				0230	15:40
25-Apr-16	EVE	500	1	1	9	1	7	1	500	1	18				8095	14:50
26-Apr-16	EVE	600	2	1	18	2	15	1	400	1	36				8095	12:15
27-Apr-16	EVE	800	3	1	15	2	10	1	200	1	29				8095	14:15
28-Apr-16	EVE	300	4	1	19	2	6	1	700	1	30				8095	14:45
29-Apr-16	EVE	600	5	1	22	3	12	1	400	1	40				8095	14:00
30-Apr-16	EVE	800	4	2	21	2	16	2	200	1	42				8095	17:10

INTRODUCTION TO THE TOPIC

Bio Medical Waste means any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals, or in research activities pertaining thereto or in the production or testing of biologicals. It is the duty of every person working in a health care institution to take all steps to ensure segregation, safe handling & disposal of bio-medical waste (BMW), without causing any adverse effect to human health and the environment. It is

estimated that 10-25% of the healthcare waste generated is hazardous & causes serious health problems. The waste generated in the hospital has significant health impact not only on the healthcare workers but also on the general public. Improper handling of waste not only poses significant risk of infection due to pathogens like HIV, Hepatitis B & C virus but also carries the risk of water, air & soil pollution thereby adversely affecting the environment and community at large.[

BMW management is currently a burning issue more so with the increasing health care facilities and increasing waste generation. Therefore knowledge regarding the segregation & disposal of BMW is essential for the health care workers(HCW). Government of India has notified the Biomedical Waste (Management and Handling) rules 1998 with subsequent amendments (June 2nd 2000, September 2003 and 2011 and final rules in 2016). India generates around three million tonnes of medical wastes every year and the amount is expected to grow at eight per cent annually. Increasing population and increasing health awareness has led to increase in the number of health care facilities and increased generation of health care waste. The purpose of BMW is mainly to reduce waste generation, to ensure its efficient collection, handling, as well as safe disposal. Lack of awareness and inadequate knowledge has led to the hospitals becoming the hub for spreading illness. Our hospital is a tertiary care centre functional since four years where the protocols & policies are in a budding stage and yet to be put in place. Hence this study was undertaken with the objective to assess the knowledge regarding the BMW, to identify gaps in the practice of effective BMW management by the healthcare workers in our hospital, so that training of the HCW can be planned and necessary steps can be taken to put protocols in place.

At the global level, 18 to 64 per cent of healthcare institutions are reported to have unsatisfactory Bio-Medical Waste Management (BMWM) facilities; predictors include lack of awareness, insufficient resources and poor disposal mechanisms. Many countries lack documented government rules related to BMWM. India was one of the first countries to implement BMWM rules. Even after a decade of its implementation, most Indian hospitals are yet to achieve the desired standards for BMWM practices. Though some Indian studies have identified gaps at local levels, there is no systematic effort to collect data from different parts of the country. The hepatitis outbreak in Modassa, Gujarat (India) 2009, pointed towards the core issue of poor biomedical waste management in the country.

During 2002-2004, INCLEN (International Clinical Epidemiology Network) Program Evaluation Network (IPEN)11conducted a comprehensive study on the assessment of injection practices in India that included mapping the status of biomedical waste management. The study indicated the existence of inappropriate and hazardous BMWM practices across the country especially in rural areas. Recognizing the urgent need for a nationwide situational analysis to generate evidence for gaps in BMWM and identify appropriate measures, an assessment of biomedical waste management was taken up by the IPEN study group in 2009, in 25 project districts located in 20 States. The primary objective was to document existing resources, infrastructure and practices related to biomedical waste management in primary, secondary and tertiary care health facilities across the study districts. The study design was cross-sectional, expected to identify gaps in the BMWM practices and to recommend appropriate interventions at public and private health care facilities, in rural and urban settings.

REVIEW OF LITERATURE

Government of India reacted towards the global concern and notified the Biomedical waste management rules1998 (MINISTRY OF ENVIRONMENT & FORESTS, Notification, New Delhi 20th July 1998 and latest in 2016). These rules have been framed, in exercise of the powers conferred by sections 6, 8 and 25 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government published the draft rules in the Gazette vide number G.S.R. 450 (E), dated the 3rd June, 2015 inviting objections or suggestions from the public within sixty days from the date on which copies of the Gazette containing the said notification were made available to the public. This is applicable to every hospital and nursing home, veterinary institutions, animal houses or slaughterhouses, which generate, Biomedical waste within a time frame. The Objectives and rationale of BMW management are mainly to reduce waste generation, efficient collection, handling and disposal in such a way that it controls infection and provides safety to employees working in the system and ensure cost effectiveness by avoiding penalties and fines imposed by regulatory authorities. Accordingly, waste is required to be treated and disposed of in accordance with schedules prescribed. The basic elements is to recognize the waste, identify where waste is generated and determine the cause of generation, plan disposal of the waste in a scientific manner so as to render it environmentally non-hazardous and eliminate the source of infection.

When the concern is so much about the medical waste there is a need for such a ruling, the health care workers ought to understand what is actually Biomedical waste and the waste connected with the hospital. Hospital waste refers to all waste, biological or non-biological that is discarded, and is not intended for further use in a hospital. According to a WHO report around 85% of the hospital wastes are actually nonhazardous, 10% are infective (hence, hazardous), and the remaining 5% are non infectious but hazardous (chemical), pharmaceutical and radioactive.

Bio-medical waste differs from hospital waste in the sense that it is "any solid, fluid or liquid waste, including its container and any intermediate product. These products could be generated during the diagnosis, treatment of immunization of human beings or animals, in research pertaining there to, or in the production or testing of biological and the animal waste from slaughter houses or any other like establishments.

Safe Management of Wastes from Health Care Activities World Health OrganisationSecond Edition 2014.

SUMMARY: Considered as the most comprehensive guidebook for health care waste management this publication covers almost all the aspects of the subject.

1. Definition and characterization of health-care waste
2. Risks associated with health-care waste
3. Legislative, regulatory and policy aspects of health-care waste
4. Health care waste management planning
5. Health-care waste minimization, reuse and recycling
6. Segregation, storage and transport of health-care waste
7. Treatment and disposal methods
8. Application of treatment and disposal methods for specific waste categories
9. Collection and disposal of wastewater
10. Economics of health-care waste management
11. Health and safety practices for health-care personnel and waste workers
12. Hospital hygiene and infection control
14. Training,Education and Public Awareness
15. Health care Waste management in emergencies
16. Future issues

The second edition of the World Health Organization (WHO) handbook on the safe, sustainable and affordable management of health-care waste – commonly known as “the Blue Book”. The original Blue Book was a comprehensive publication used widely in health-care centres and government agencies to assist in the adoption of national guidance. It also provided support to committed medical directors and managers to make improvements and presented practical information on waste-management techniques for medical staff and waste workers. The first edition in 1999 was published at an influential point in time. Public interest in emerging and developing countries to improve health services was growing, and poor waste practices within health-care facilities were being challenged increasingly by interest groups and communities. In the more developed countries, there was a renewed concern about consumption of resources and impacts on global changes to climate and the environment.

Chapters 2 and 3 explain the various types of waste produced from health-care facilities, their typical characteristics and the hazards these wastes pose to patients, staff and the general environment. Chapters 4 and 5 introduce the guiding regulatory principles for developing local or national approaches to tackling health-care waste management and transposing these into practical plans for regions and individual health-care facilities. Specific methods and technologies are described for waste minimisation, segregation and treatment of health-care wastes in Chapters 6, 7 and 8. These chapters introduce the basic features of each technology and the operational and environmental characteristics required to be achieved, followed by information on the potential advantages and disadvantages of each system. To reflect concerns about the difficulties of handling health-care wastewaters, Chapter 9 is an expanded chapter with new guidance on the various sources of wastewater and wastewater treatment options for places not connected to central sewerage systems. Further chapters address issues on economics (Chapter 10), occupational safety (Chapter 11), hygiene and infection control (Chapter 12), and staff training and public awareness (Chapter 13).

A wider range of information has been incorporated into this edition of the Blue Book, with the addition of two new chapters on health-care waste management in emergencies (Chapter 14) and an overview of the emerging issues of pandemics, drug-resistant pathogens, climate change and technology advances in medical techniques that will have to be accommodated by health-care waste systems in the future (Chapter 15).

Safe Management of Bio-medical Sharp Waste in India World Health Organisation South-East Asia 2005

SUMMARY: The study documents successful sharp management systems in urban areas and evaluates non-burn treatment and disposal technologies. In view of the nationwide introduction of Auto Disable (AD) syringes for immunisationprogramme the study analyses the implications linked to their use and the possibilities of material recovery of these syringes. Thirteen case studies have been conducted on bio-medical waste management and disposal covering health care and waste treatment facilities in different parts of the country. Areas under focus are: waste management within the health care facility, sharps collection and transportation, treatment of sharps waste, evaluation of waste treatment technologies including costs and options for final disposal. Cost comparison of treatment options has been provided. Sharps waste management flow charts for all the 13 facilities have been provided. The study took up material (metal & plastic) recovery from waste syringes and needles with special reference to AD syringes. Views of the recycling industry have been noted. The findings of the study indicate recycling possibilities at all the sites. Autoclaves have been recommended as most affordable effective treatment option. Wide practice of chemical disinfection of sharps has been noted. Designs of disposal facilities and standards of treatment facilities have also been appended.

Bio-Medical Waste (Management and Handling) Rules, 2016 Ministry of Environment and Climate Change New Delhi – 2016

SUMMARY: These rules provide for the legal and binding instrument for management and handling of biomedical waste in Indian Territory.

These rules:-

Bring BMW Management within Legal Ambit

Indicate Authorities, Responsibilities, Procedures & Standards

Fix Datelines for Implementation

They apply to all persons who – Generate, Collect, Receive, Store, Transport, Treat, Dispose, Handle bio-medical waste in any form.

Guidelines for Common Bio-Medical Waste Treatment Facility & Incineration Central Pollution Control Board New Delhi

SUMMARY: Central Pollution Control Board laid down these guidelines to meet regulatory needs thrown up by new situations involving establishment of Common Treatment Facilities and Incinerators. For Common Bio-Medical Waste Treatment Facility (CBWTF) the guidelines have been

provided regarding: Location, Land Requirement, Coverage Area, Treatment Equipment, Infrastructure, Record Keeping, Collection and Transportation, Disposal of Treated BMW, Cost to be Charged from the HCUs, Setting Up and Operation Checklist. For Incinerator guidelines have been provided regarding: General Applicability & Installation, Design, Air Pollution Control Device, Incinerator & Waste Storage Rooms, Operator of Incinerator.

Managing Hospital Waste At CHC Daulatpur : Basic Health Project Himachal Pradesh Indo-German Cooperation 2004

SUMMARY: A comprehensive plan for bio-medical waste (bmw) management has been developed. The plan has the following features: B. Segregated collection of different categories of BMW in coloured bins and bags according to disposal options exercised. C. Placements of Bins & Bags of appropriate size have been indicated. D. Bulk of the waste: Anatomical (cat 1), Microbiological Waste (cat 3) & Soiled Waste (6) to be collected in Yellow bag-bin to be disposed through deep burial. E. Solid (Plastic) Waste (cat 7 to be collected in Red bag-bin after mutilation and treated chemically. F. Sharp Waste (cat 4) to be collected in blue puncture proof container and treated chemically. G. Chemical disinfection prescribed for liquid waste. H. Recommendation for a bio-medical waste management committee with responsibilities. I. Material requirements and costs.

Standards for Hospital National Accreditation Board for Hospitals and Healthcare Providers Quality Council of India 2005

SUMMARY: Quality Council of India is an autonomous body, set up jointly by GOI and industry, to establish and operate accreditation structure in the area of conformity assessment covering bodies offering certification, inspection, testing, registration services etc. The present edition of standards has been drafted by Technical Committee of National Accreditation Board for Hospitals and Health Care Providers (NABH), a constituent board of QCI. It has taken up the following areas relevant to hospital waste management for hospital accreditation purpose:

1. Hospital Infection Control that includes compliance of Statutory Provisions with regard to BMW management and infection control programme supported by the organization's management inclusive of staff training and employees' health.

2. Facility management and safety that ensures safe and congenial environment for patients, visitors and employees.

Other reviews include the following:-

Knowledge, Attitude and Practice of Biomedical waste management among health care personnel in a tertiary care hospital in Puducherry Malini A* and BalaEshwar.

An observational descriptive hospital based cross sectional study. The study group included the 337 healthcare personnel which included doctors (residents), nurses, laboratory technicians and multi-purpose workers. The study was done using a pre-tested semi-structured questionnaire. The data was analysed using software SPSS 20 version. Proportions were used for interpretation. **Results:** It showed that <50% of nursing staff and <25% of MPWs had the knowledge of colour coding and segregation. There was also poor knowledge regarding disposal of sharps among technicians and MPWs. It also brought to our notice that only 50% of the doctors (residents) and nursing staff and 26% of the laboratory technicians have undergone training in BMW management. None of the MPWs had received training regarding BMW management. They had good knowledge regarding the diseases transmitted through improper bio medical waste handling.

Conclusion: This study revealed that there is the need to continue the training programme for BMW and to include technicians and MPWs in the programme. It also shows that the administration needs to put protocols, provide PPE and other resources for better compliance of BMW rules.

Knowledge, Attitude and Practices of Bio-Medical Waste Management Amongst Staff of a Tertiary Level Hospital in India. Author(s): S. Saini, S.S. Nagarajan, R.K. Sarma. Vol. 17, No. 2 (2005-01 - 2005-12)

Despite the statutory provision of Biomedical Waste Management, practice in Indian Hospitals has not achieved the desired standard even after seven years of enforcement of the law. In view of this, the present study on Knowledge, Attitude and Practice (KAP) on the subject was carried out in a tertiary level teaching hospital. The hospital under scrutiny for KAP is a 1600 bedded super specialty teaching hospital and research centre with latest facilities. The Institute has a work force of 800 doctors, 1600 nurses and 6000 other support staff. The study is based on a questionnaire designed to understand the KAP of the staff involved in direct patient care facility regarding the Biomedical waste management practices. The KAP study enrolled 156 respondents, representing doctors and nurses from selected patient care areas; here, a significant gap was observed in the knowledge, attitude and practice of the consultants, residents and scientists with regard to biomedical waste disposal, to their knowledge/understanding on the subject.

Knowledge The results of questionnaire analysis shows that Consultants, Residents and the Scientists respectively have 85%, 81 % and 86% knowledge about the biomedical waste

management rule (set-I) Table -1. The knowledge component among the nurses have shown to be 60% and that of Sanitary staff, Operation theatre and Laboratory staff have respectively 14%, 14% and 12% awareness of the subject. (Fig.- 1) This shows that the people with higher education have more awareness about the environmental issues, national and international activities on Biomedical waste management and the rules prescribed there in.

AttitudeIn regard to attitude towards the scientific process Nurses had scored 100% in set- I, 100% in set-II and 95% in set- III in response to the questions on the subject. Similarly, Consultants have scored 80%, 85% and 90%, Residents rated 85%, 96% and 63% and the Scientists rated 55%, 95% and 59% in regards to attitude towards the scientific practice. O.T. staff scored 90%, 95%, 86% whereas sanitary staff have 81 , 81, 76% and Laboratory staff have the rate of 56%,88% and 32% employees on the same count

PracticeIn the group of three sets of questionnaire, the findings shown that consultantswere practicing according to BMW rules in the tune of 75%, 80% and 65%. Residents were rated 89%, 81 % and 78% and scientists were at the rate of 82%, 73% and 82% respectively practicing as per rules. In regards to the Nurses it is shown to be the best i.e. 100% of them are practicing according to the rules. O.T staff has 90%, 90% and 95% and sanitary staff with 67%, 48% and 90%, Similar, to the earlier findings in regard to the practice also the laboratory staff has only 44%, 32% and 64% complied with the guidelines and norms listed down in the hospital in regard to Bio-Medical Waste rules.

Relevance of the Study

Global figures based on statistical data of Environmental Protection Agency of America and Japan, Ministry of Health suggested a volume of 1 to 1.5 kg/day/bed bio medical waste for hospitals. However, waste produced has been quoted up to 5.24kg/day/bed in developed countries. The average quantity of hospital solid waste produced in India ranges from 1.5 to 2.2kg/day/bed. As quoted by Pruthvish S. Bangalore generates 1,32,500 kg of health care waste per day while the health care facilities generate 5,100 kg of refuse daily.

In December 1996 a study by the Centres for Disease Control (CDC), Atlanta, U.S., reported 163 U.S. healthcare workers with documented or possible occupational transmission of HIV, among the eight lakh needle stick injuries that occur annually.

Health-care waste management in India is receiving greater attention due to recent regulations (the BIOMEDICAL WASTE (Management & Handling) Rules, 1998). The prevailing situation is analyzed covering various issues like quantities and proportion of different constituents of wastes, handling, treatment and disposal methods in various health-care units (HCUs). The waste generation rate ranges between 0.5 and 2.0 kg bed-1 day-1. It is estimated that annually about 0.33 million tones of waste are generated in India. The solid waste from the hospitals consists of bandages, linen and other infectious waste (30-35%), plastics (7-10%), disposable syringes (0.3-0.5%), glass (3-5%) and other general wastes including food (40-45%). In general, the wastes are collected in a mixed form, transported and disposed of along with municipal solid wastes.

In a study conducted by WHO in 1996, revealed that more than 50,000 people die every day from infectious diseases. One of the causes for the increase in infectious diseases is improper waste management. Blood, body fluids, and body secretions which are the constituents of bio medical waste harbor most of the viruses, bacteria's, and parasites that cause infection. Human immune deficiency virus HIV and hepatitis viruses spearhead an extensive list of infections and diseases documented to have spread through bio medical waste. Tuberculosis, pneumonia, diarrheal diseases, tetanus, whooping cough etc. is other common diseases spread due to improper waste management.

The nurses spend maximum time with patients in the ward than any other member of the health team, increases their exposure and risk to the hazards present in hospital environment, mainly Health care waste. They need to be well equipped with latest information, skills and practices in managing this waste besides reducing hospital-acquired infections to protect their own health. They are also responsible for preventing risk due to waste to the other members of health team and community at large.

Statement of the Problem

"A study to assess the Knowledge, Attitude and Practice of HEALTHCARE waste management among healthcare professional at Artemis hospital, Dwarka, New Delhi".

Objectives of the Study

1. To study the existing situation of Health care Waste Management.

2. To assess knowledge, attitude, and practices of doctors, nurses and waste handlers regarding Health care waste management.)

3. To suggest measures for improvement in handling Health Care Waste in the hospital.

Materials and Methods

This study was an observational descriptive hospital based cross sectional study, among health care workers in different category. The hospital is a corporate hospital in Delhi, a more than 50 bedded tertiary care centre. The study was done for a period of three months 18 Feb to 18 May 2016. The study group included the healthcare workers who were grouped into three strata/subgroups as doctors(residents), nursing staff, and Waste Care Handlers.All the HCW working in the institution were included in the study and those who were not willing to participate or on leave during the study were excluded. The study population included 12 doctors (residents), 53 nursing staff, and 19Waste Care Handlers (WCHs). Simple random sampling method was used and the criterion was to use a minimum of 50% of the staff in each stratum for the study. The study was done by using a pre tested, semi-structured questionnaire.

The questionnaire containedin three parts.

Part I The first part will contain questions regarding the assessment of knowledge.

Part II Thesecond part will contain questions regarding assessment of practice(s).

Part III Finally the last part had the questions for the assessment of attitude.

The questionnaire so designed will be pretested for its authenticity and validity. In case of lower group of staffs those were unable to read English were explained the questions in hindi and were assisted in marking the answers as replied by the respondents.Ethical clearance was obtained from the institute ethics committee. Data compilation and analysis was done using software SPSS 22 version. Proportions and percentage were used to interpret the result.

Observations and Results

The study was conducted for three months 18 Feb to 18 May 2016. A total of 7 doctors, 35 nurses, 10 Waste Care Handlers (n=52) took part in the study, which represented >50% in each strata/sub group. Their knowledge, attitude & practice regarding BMW were assessed by using structured questionnaire. The data was analysed using proportions and percentages.

Table no 3

Statistics

		Designation of Respondant	Gender	Experience of Respondant	Education Qualification
N	Valid	52	52	52	52
	Missing	0	0	0	0

Frequency Table

Designation of Respondant

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Waste Care Handlers	10	19.2	19.2	19.2
	Nursing Staff	35	67.3	67.3	86.5
	Doctors	7	13.5	13.5	100.0
	Total	52	100.0	100.0	

Gender

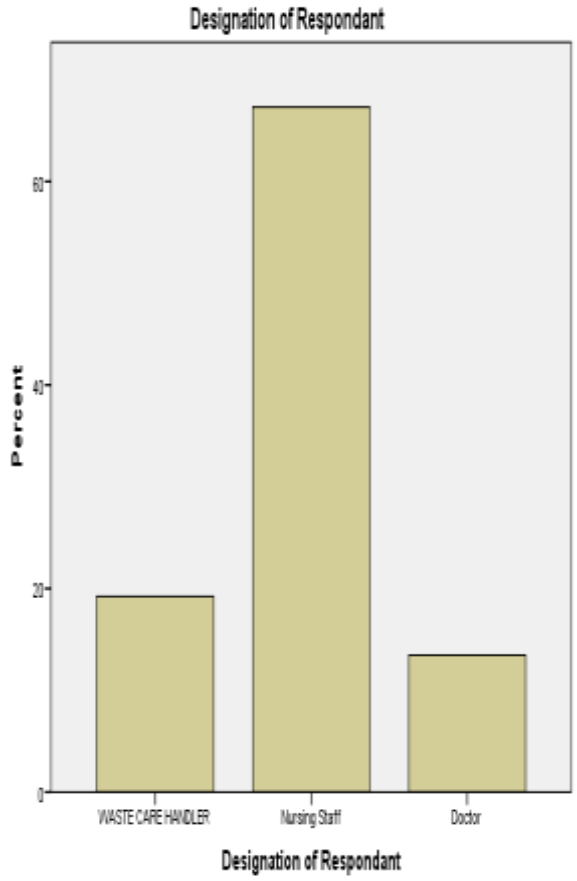
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	21	40.4	40.4	40.4
	Female	31	59.6	59.6	100.0
	Total	52	100.0	100.0	

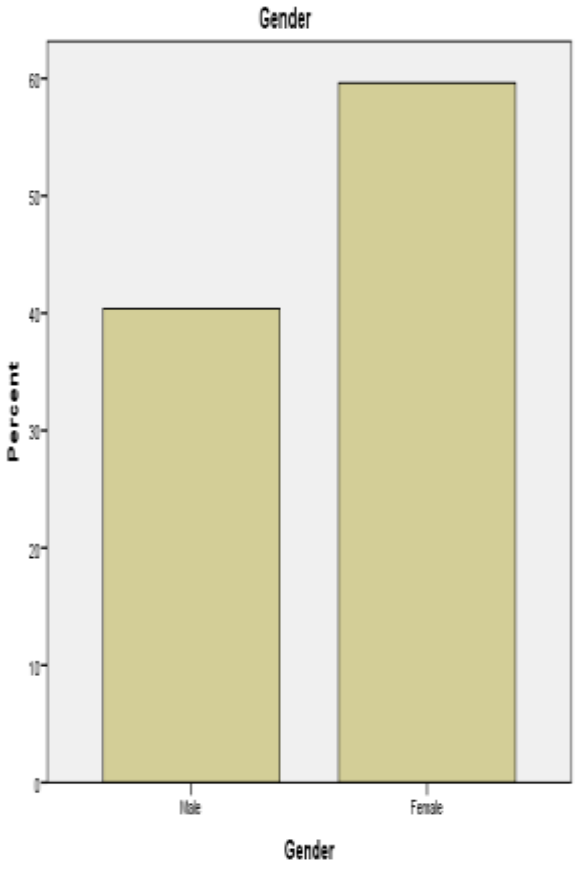
Experience of Respondant

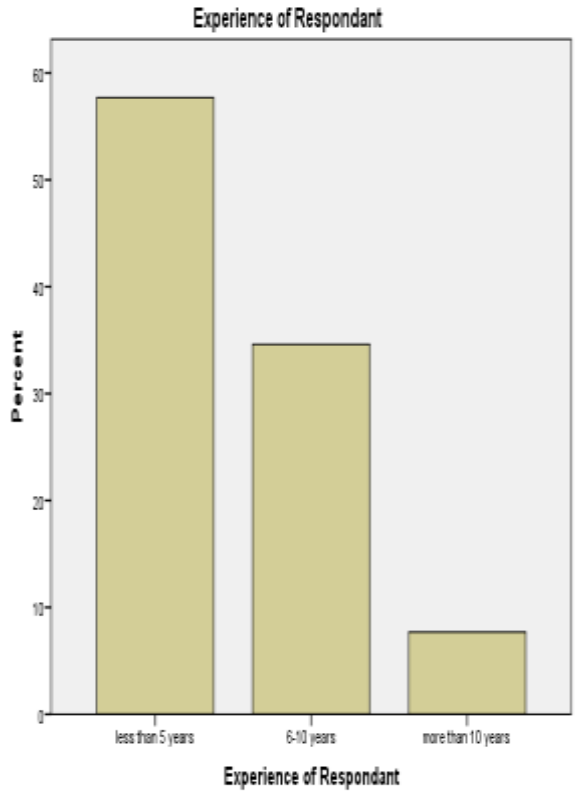
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 5 years	30	57.7	57.7	57.7
	6-10 years	18	34.6	34.6	92.3
	More than 10 years	4	7.7	7.7	100.0
	Total	52	100.0	100.0	

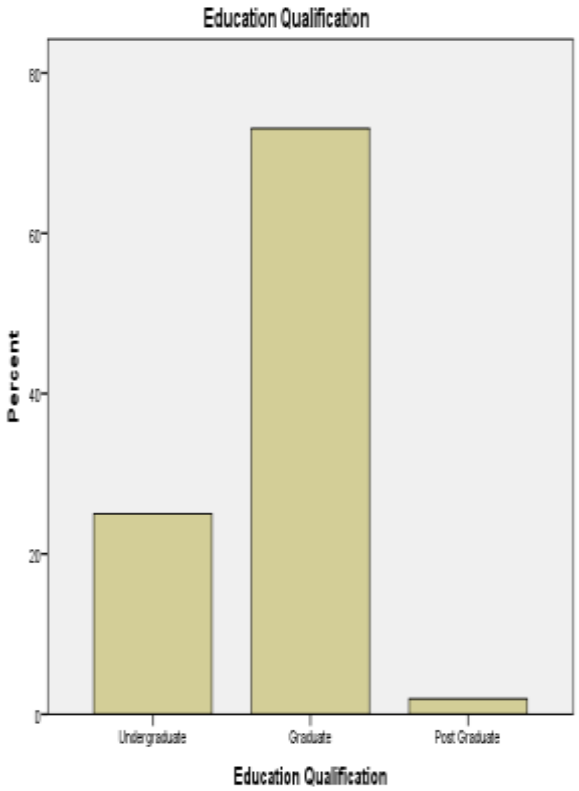
Education Qualification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Undergraduate	13	25.0	25.0	25.0
	Graduate	38	73.1	73.1	98.1
	Post Graduate	1	1.9	1.9	100.0
	Total	52	100.0	100.0	






Experience of Respondant
Percent
60
50
40
30
20
10
0
less than 5 years
6-10 years
more than 10 years
Experience of Respondant


Education Qualification
Percent
80
60
40
20
0
Undergraduate
Graduate
Post Graduate
Education Qualification

Designation of Respondant * Experience of RespondantCrosstabulation

Count

		Experience of Respondant		
		less than 5 years	6-10 years	more than 10 years
Designation of Respondant	WASTE CARE HANDLER	8	2	0
	Nursing Staff	19	16	0
	Doctor	3	0	4
Total		30	18	4

Designation of Respondant * Education Qualification Crosstabulation

Count

		Education Qualification		
		Undergraduate	Graduate	Post Graduate
Designation of Respondant	WASTE CARE HANDLER	10	0	0
	Nursing Staff	3	31	1
	Doctor	0	7	0
Total		13	38	1

Ser No	**Questions regarding Knowledge on biomedical waste management**	Doctors (n=7)	Nursing staff (n=35)	Waste care Handlers (n=10)
		n(%)	n(%)	n(%)
1	Health care waste management legislation in India	5 (71.4)	29(82.9)	7 (70.0)
2	Which Ministry regulates the Waste Management Rules	5 (71.4)	30 (85.7)	2 (20.0)
3	Latest rules on Waste Management recently passed	5 (71.4)	31 (88.6)	5 (50.0)
4	Biomedical Waste storage	4(57.1)	31 (88.6))	7 (70.0)
5	Who regulates for safe transport of Biomedical Waste	5 (71.4)	34 (97.1)	10 (100.0)
6	Correct identification of Bio-hazard symbol	6(85.7)	35 (100.0)	10 (100.0)
7	Correct colour coding	4(57.1)	33 (94.3)	10 (100.0)
8	Latest categorization of Biomedical waste	5 (71.4)	29 (82.9)	10 (100.0)

Analysis

Doctors: The above table is a clear indicator that Doctors (71.4%)and WCHs (70%)have less Knowledge regarding new BMW rules 2016 as compared to Nurses (82%). Only 57.1% of the Doctors are aware of correct coding, storage andlatest categorization as specified in BMW rules 2016. Average awareness of Doctors is around 65% in Knowledge.

Nurses: So far as the nursing staffs are concerned, their knowledge regarding legislation is good. Almost 80% staffs are aware of latest BMW rules 2016. It is only 20% who are not abreast with the latest rules on BMW. Also 20% are not aware of correct categorisation into various categories which has now changed from earlier 10 categories to only 4 categories i.e, Red, Yellow, Blue and White.

Waste Care Handlers: Their knowledge on legislation, transportation storage, categorization and colour coding is quite sound as compared to Doctors and Nursing staff.

Only 20% are not aware that these rules (BMW-2016) are formulated by Ministry of Environment, Forest and Climate change. Notwithstanding the above, this does not affect their day to day functioning and handling of BMW. It may be because most of them are undergraduate and lack ability to read so as to keep them updated.

Ser No	**Questions regarding Attitude on biomedical waste management**	Doctors (n=7)	Nursing staff (n=35)	Waste care Handlers (n=10)
		n (%)	n (%)	n (%)
1	Waste Management is a team work	6 (85.7)	23 (65.7)	10 (100.0)
2	Safe management of healthcare waste has increased the work load on staff	5 (71.4)	31 (88.6)	1 (10.0)
3	Waste management is part of your responsibility	7 (100.0)	35 (100.0)	10 (100.0)
4	Who is responsible for incorrect segregation	4 (57.1)All	23 (65.7)All	7 (70.0) All
5	Segregation of waste at the point of origin increases the risk of injury	6 (85.7)	31 (88.6)	7 (70.0)
6	The reporting of needle stick injury is an extra burden on work	7 (100.0)	33 (94.3)	6 (60.0)
7	Hepatitis-B immunization is must for all	7 (100.0)	35 (100.0)	10 (100.0)
8	Rectify the incorrect handling of Health care waste	7 (100.0)	35 (100.0)	10 (100.0)
9	Safe management efforts by the hospital increase the financial burden on management	1 (14.3)	6 (17.1)	0 (00.0)
10	Health care waste should be handled by separate class of people	4 (57.1)	9 (26.5)	6 (60.0)
11	Need for training on biomedical waste management	5 (71.4)	9 (26.5)	10 (100.0)
12	Biomedical waste management should compulsorily be made a part of curriculum for all health care professionals	7 (100.0)	35 (100.0)	10 (100.0)

Analysis

Doctors: Doctors feel that handling of waste is a team work and all the three i.e. Doctors, Nursing staff and WCH are equally responsible for incorrect segregation andproper management of BMW. However 40% of the doctors feel that there should be a separate class of people to handle the BMW. They felt it is their responsibility to ensure correct procedures are being followed by all the incumbents. They are also of the opinion that handling of BMW has not increased the financial burden on the hospital.

Nursing Staff: 65% of the Nursing staff feels that it is not the team work; however one of the responses is suggestive that Doctors, Nursing staff and WCH are equally responsible for proper management of BMW. Like Doctors they are also of the opinion that BMW should be handled by separate class of people. 25% of the nursing staff feels that they do not require further training on handling of BMW. Neither has the handling of BMW increased the financial burden on the hospital.

Waste Care Handlers: Best of the response were received from this category of respondents. They have taken 100% onus that it is their responsibility to handle BMW. They feel it is their part of job to ensure correct handling of hospital waste and it has not increased their workload. None of the WCH is of the opinion that handling of BMW increased the financial burden on the hospital.

Cumulated Analysis:

1. All three categories of respondents disagree that segregation at origin increases risk of Injury.

2. It is team work.

3. Positive attitude towards training.

4. All share responsibility of correct segregation.

Ser No	**Questions regarding Practice of biomedical waste management**	Doctors (n=7)	Nursing staff (n=35)	Waste care Handlers (n=10)
		n(%)	n(%)	n(%)
1	Disposal of all kinds of waste into general garbage	7 (100.0)	30 (85.7)	10 (100.0)
2	Disposal of cotton, gauze and other items contaminated by blood	7 (100.0)	35 (100.0)	10 (100.0)
3	Initiative to train your subordinates	5 (71.4)	34 (97.1)	10 (100.0)
4	Conducted of classes regarding BMW are in hospital	4 (57.1)	35 (100.0)	10 (100.0)
5	When last attended the BMW class	4 (57.1)	32 (91.4)	10 (100.0)
6	Last carried out the surprise check	4 (57.1)	35 (100.0)	10 (100.0)
7	Segregation of biomedical waste according to different categories	7 (100.0)	34 (97.1)	10 (100.0)
8	Disposal of sharps waste	7 (100.0)	35 (100.0)	10 (100.0)
9	Suffered a needle stick injury	4 (57.1)	30 (85.7)	3 (30.0)
10	Do hospital have adequate measures to comply with the BMW rules	7 (100.0)	35 (100.0)	10 (100.0)

Analysis

Doctors: Handling of BMW in practice by doctors is indicative of the fact that they have been not regular in attending the classes conducted by the hospital. Only 40% have undergone formal training. They feel that frequent classes are organized by the health care institute to keep them abreast with the latest happening. Only 40% have taken initiative to train their subordinates, it appears that it is not part of their job. However 100% believe that their health care institutions have adequate facilities in dealing with BMW. 42% of Doctors have suffered needle stick injury more than once. Since the sample population is small, it may not be representative of study population.

Nursing Staff: In practical aspect nursing staff is more effective in segregation of waste, attending training classes and carrying out surprise check regarding correct segregation and disposal of BMW. They have also taken initiative more than once to train their subordinates(97.1%). 30 % of nursing staff have suffered needle stick injury in their life time. 100% believe that their health care institutions have adequate facilities in dealing with BMW.

Waste Care Handlers: In practice, WCH are far ahead of others. They are aware of correct disposal of BMW, segregation and attending regular training classes, though 30% of them have suffered with needle stick injury in their life time. Like doctors and nursing staff they are also of the opinion that their health care institutions have adequate facilities (100%) in dealing with BMW.

Discussion: This study was conducted in a tertiary care hospital in Delhi (Artemis Hospital, Dwarka) among health care personnel. A total of 52 respondents participated in the study (07 residents, 35 nursing staff, 10 WCHs). The waste generated during the delivery of health care services carries a high potential of infection and injury than any other type of waste and 10-25% of them are infectious in nature. The BMW is generated by various sources. The major sources are Govt. hospitals and private hospitals, primary health centres, medical colleges and veterinary colleges and animal research centres. There is particular concern about infection with human immunodeficiency virus (HIV) and hepatitis viruses B and C, for which there is strong evidence of transmission via health-care waste, especially sharp injuries. The study showed that 57% of the doctors had knowledge regarding BMW managementguidelines & segregation. However most of the nursing staff (85%) and WCHs(80%) havegood knowledge regarding the colour coding, segregation of waste, transportation and storage. They believe that segregation had to be done at the point of generation. The study also revealed that the Doctors, Nursing staff and WCHs were aware about the reporting of needle stick injury.With respect to the attitude regarding the waste management, majority felt that it was a team work and all were responsible for safe disposal. About 100% of doctors, 94% of nursing staff and 80% of WCHs felt that it has not increased their workload. The study showed that nearly 80% of the nursing staff and WCHs had received all kind of training in BMW management. This study has also made us realize that such training programmes should be conducted regularly and make it compulsory for all to attend.

A multi-centric study conducted in 20 states across India showed that most of the healthcare centres had unsatisfactory practices with respect to BMW management. At the global level 16-84% of the hospitals did not stick to norms. This has been attributed to lack of awareness, inadequate resources and poor disposal mechanisms.Around 82 per cent of primary, 60 per cent of secondary and 54 per cent of tertiary care health facilities were in the 'RED' category which meant that there was no credible BMW management system in place.

While most of the studies have shown poor knowledge & practices, few studies like that of Yadannanavar et al in Bijapur, Karnataka has shown that HCWs have good knowledge & practices of BMW and also a report submitted by Rao.Our study showed that 80% of HCWs including the WCHs had the knowledge of health hazards due to improper waste management. With the findings in our study, the BMW management needs to be further improved in the hospital. This can be achieved by conducting regular training programmes for all the HCWs and updating them, providing the necessary resources like PPE, coloured bags for disposal, having enough supply of disinfectants and to develop protocols for disinfection, transportation & disposal of waste. This can also be achieved by displaying posters of colour coding & segregation of waste at various points of generation of waste in the hospital. Regular surveillance and monitoring of the practices is also needed.

The limitations of the study were structured questionnaire andsmall sample size. Every aspect of KAP could not be assessed and not much detail on problems faced by HCWs and their suggestions could be obtained.

Measures for Improvement

1. Reiteration of training on regular basis to update the knowledge of all the three respondents.
2. Structured training programme
3. Compulsory attendance and recording.
4. Frequent surprise checks to be carried out.
5. Training towards leadership and inculcation of culture to train subordinates.
6. Conscious effort to appraise the seriousness of needle sticks injury.
7. With the introduction of new rules, all health care workers need to be sensitized towards change of practice with special reference to amended provisions in the rules e.g, instead of black, white colour has been introduced. Needle prick injury and mercury spills has been excluded from the classification of "Major accident".

8. Pre-treat the laboratory waste, microbiological waste, blood samples and blood bags throughdisinfection or sterilisation on-site.

9. Phase out use of chlorinated plastic bags, gloves and blood bags within two years from the date of notification of these rules.

10. Establish a Bar- Code System for bags or containers containing bio-medical waste to be sent out of the premises or place for any purpose within one year from the date of the notification of theserules.

11. Ensure segregation of liquid chemical waste at source and ensure pre-treatment or neutralisationprior to mixing with other effluent generated from health care facilities.

12. Provided that the lab and highly infectious bio-medical waste generated shall be pre-treated by equipment like autoclave or microwave.

13. No occupier shall establish on-site treatment and disposal facility, if a service of ` common biomedical waste treatment facility is available at a distance of seventy-five kilometer.

Conclusion This study shows that there is good knowledge regarding segregation & colour coding of waste among nurses and WCHs. It also reveals that enough precautions are being taken for proper handling of waste care. The nurses and WCHs have undergone all types of training in BMW handling & disposal. The doctors, nurses and WCHs have got positive attitude and good practice of handling biomedical waste due to frequent training. Further intervention can be done by providing training programmes and practical's so that 100% knowledge on the bio-medical waste management can be achieved. Constant supervision and implementation at each level of waste management should be supervised regularly. Doctors need frequent updating in their knowledge.

INSTRUMENTATION

ASSESSMENT OF KNOWLEGDGE, ATTITUDE AND PRACTICE OF HEALTHCARE PROFESSIONALS IN HEALTHCARE WASTE MANAGEMENT IN ARTEMIS HOSPITAL IN DWARKA, NEW DELHI

QUESTIONNAIRE

Your Name **Researcher Code_____**

a. Your position/designation. Doctor ☐ Nurse ☐ Waste handler ☐

b. Experience. (i) Less than5 years. (ii) 6-10 years (iii) More than 10 years

c. Qualification (i) Undergraduate (ii) Graduate (iii) Post graduate & higher

d. Gender Male ☐ Female ☐

Questions on Knowledge

1. Do you know about Health care waste management legislation in India?
(a) Yes (b) No (c) Partially Know

2. Which Ministry regulates the Waste Management Rules?
(a) Ministry of Health (b) Ministry of Environment (c) Ministry of Defence

3. Latest rules on Waste Management were passed in which year?
(a) 1998 (b) 2014 (c) 2016

4. According to Biomedical Waste Management Rules waste should not be stored beyond?
(a) 12 hours (b) 24 hours (c) 48 hours

5. Who regulates the safe transport of Biomedical Waste?
(a) Pollution Control Board (b) Hospital Administrator (c) House Keeping In-charge

6. Which is the correct identification of Bio-hazard symbol?
(a)  (b)  (c) 

7. Which is the correct colour coding?
(a) Red, Yellow, Blue and White (b) Red, Yellow, Green and Black (c) Grey, Yellow, Blue and Black

8. According to the latest Waste Management Rules Biomedical waste is categorized into?
(a) 10 Categories (b) 4 Categories (c) 8 Categories

Questions on Attitude

9. Waste Management is a team work or no classes of people are responsible for the safe management?
(a) Agree (b) Disagree (c) Can't say

10. Safe management of healthcare waste has increased the work load on staff?
(a) Yes (b) No (c) Somewhat

11. Do you feel waste management is part of your responsibility?
(a) Yes (b) No (c) Somewhat

12. Who should be held responsible for incorrect segregation?
(a) Doctor (b) Nurse (c) Waste care handler

13. Segregation of waste at the point of origin increases the risk of injury.
(a) Agree (b) Disagree (c) Can't say

14. Do you feel the reporting of needle stick injury is an extra burden on work?
(a) Yes (b) No (c) Somewhat

15. Hepatitis-B immunization is must for all those handling health care waste?
(a) Yes (b) No (c) Somewhat

16. Whenever you see incorrect handling of Health care waste you generally?
(a) Ignore (b) take corrective action (c) leave it for other

17. Safe management efforts by the hospital increase the financial burden on management?
(a) Yes (b) No (c) Can't say

18. Do you feel that health care waste should be handled by separate class of people?
(a) Yes (b) No (c) probably

19. Do you feel you require any further training on biomedical waste management?
(a) Yes (b) No (c) May be

20. Do you feel that biomedical waste management should compulsorily be made a part of curriculum for all health care professionals?
(a) Yes (b) No (c) Somewhat

Questions on Practice

21. Do you dispose all kinds of waste into general garbage?
(a) Yes (b) No (c) Somewhat

22. Where do you dispose cotton, gauze and other items contaminated by blood?
(a) Red plastic bag (b) Yellow plastic bag (c) Blue plastic bag

23. How often you have taken initiative to train your subordinates about correct practices of BMW management?
(a) Once (b) More than once (c) Never

24. How often classes regarding BMW are conducted in your hospital?
(a) Quite often (b) Periodically (c) Never

25. When did you last attend the BMW class?
(a) One month back (b) Two months back (c) More than two months

26. When did you last carry out the surprise check regarding the correct disposal of Bio-medical waste in your hospital/dept?
(a) In the last 15 days (b) Month back (c) Two months back

27. Do you segregate the biomedical waste according to different categories?
(a) Yes (b) No (c) Somewhat

28. Where do you dispose waste sharps?
(a) Red plastic bag (B) Blue plastic bag (c) Puncture poof container

29. How many times have you suffered a needle stick injury?
(a) Not at all (b) Once (c) More than once

30. Does your hospital have adequate measures to comply with the BMW rules?
(a) Yes (b) No (c) Partial

None of the part of data or information will be disclosed to any party or to anyone for any reason what so ever. The questionnaire is purely for academic purpose.

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