

Biomedical Waste Management: Issues and Challenges in a New Hospital

Mrs .Surabhi Banerjee¹, Mr. Subhojoy Dasgupta² Mr. Subhadip Chowdhury³

¹(Master In Hospital Administration, Batch 2015-17, Dsms College Of Health Care Management, Durgapur, India)

²(Master In Hospital Administration, Batch 2015-17, Dsms College Of Health Care Management, Durgapur, India)

³(Department Head, Mha, Dsms College Of Health Care Management, Durgapur, India)

Track: Health Care Management

Abstract: Typically Hospital Waste Has An Important Role On Environment And Public Health. And From Biomedical Waste Serious Health Hazards Occur. For The Prevention Of That Health Hazardous The Government Of India Provide A Frame Work For Management Of Bmw Generated In The Country In Bio-Medical Waste (Management And Handling) Rules, 1998. But The Question Is That How To Manage The Bmw Properly. But There Is A Problem. Improper Waste Management Generated In Hospitals Can Have Direct And Indirect Impact On Public Health And The Personnel Working In Health Care Organization And The Environment.

And It Is Also Notice That From Improper Biomedical Waste Management There Are Various Effects Like Ground Water Contamination, Radioactive Pollution, Air Pollution Etc. Can Cause Serious Health Issues Leading To Death Of Working Personnel In The Unaware Health Care Setting. Not Only The Hospital, The Biomedical Waste Oppose Threat For General Public Who Are Exposed To Medical Waste. So Prior To Disposal Of Medical Waste, It Requires Treatment Before Final Disposal Like Incineration, Deep Burial, Microwaving, Autoclaving Etc. For Medical Waste Treatment And Management Is Critical Job Because It Needs Resource, Motivation, Knowledge Proper Control System Strong Regulatory Framework And Sufficient Information Regarding Biomedical Waste. Here Discuss The Definition, Category Issues And Challenges Regarding Biomedical Waste And Procedure Of Handling Biomedical Waste In A Cost Effective Technique To Maintain A Biomedical Waste Department In A Modern Hospital.

Key Words: Biomedical Waste, Safety, Disposal, Handling, Framework.

I. Introduction:

Hospital Defined As ‘An Integral Part Of The Medical And Social Organization Which Is To Provide For The Population Complete Health Care, Both Curative And Preventive; And Whose Out-Patient Services Reach Out Into The Family In Its Home Environment. The Hospital Is Also A Centre For The Training Of Health Workers And For Bio-Social Research’ By WHO (World Health Organization). For This Various Types Of Waste Is Generated, Solid, Liquid Or Bio-Medical Waste. We Can Categorize Them As Hazardous And Non-Hazardous Waste. About 15% Of Wastes Are Hazardous In Nature As Per Different Observation. The Segregation, Collection, Packaging, Transportation And Treatment Of Wastes Are A Procedure To Keep The Stakeholders Of The Hospital Safe From Hazards. The Biomedical Waste (Management And Handling) Rules, 2016 Defines It As “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 Biological And Including Categories Mentioned In Schedule I.”

From The Above Definition, This Is Clear That Any Health Care Facility, Including Hospitals, Health Centers, Diagnostic Centers, Pharmaceuticals Generate A Large Amount Of The Waste. This Is Important To Identify The Source From Where The Biomedical Wastes Are Generated. This Is Important To Prevent It From Source To Generation So The Health Facility Can Cut Cost On Treatment And Reduce The Storage Hazard. There Are Two Main Sources:

1.1 Major Sources:

- a) Any Type Of Hospital (Government Or Private)
- b) Nursing Homes.
- c) Dispensaries.
- d) Laboratories (Pathology/ Microbiology)
- e) Blood Bank And Research Centers.
- f) Primary Health Centers.

1.2 Minor Sources:

- a) Clinic
- b) Animal House And Veterinary Institutes
- c) Blood Donation Camps
- d) Vaccination Centre
- e) Care Provided To Ill Patients In Home.
- f) Medical Waste Generated From Everyday Uses Of Sanitary Napkins, Condoms, Baby And Adult Diapers, Colostomy Bags Etc. In Home.

As Per Biomedical Waste (Management And Handling) Rules, 2016, Schedule I, The Category Of Hospital Waste Are:

Table 1: Categories Of Biomedical Waste

Category	Type Of Waste	Category	Type Of Waste
Yellow	A) Human Anatomical Waste B) Animal Anatomical Waste C) Soiled Waste D) Expired Or Discarded Medicine E) Chemical Waste F) Chemical Liquid Waste G) Discarded Linen, Mattresses, Beddings Contaminated With Blood Or Body Fluid. H) Microbiology, Biotechnology And Other Clinical Laboratory Waste.	Red	Contaminated Waste (Recyclable)
		White (Translucent)	Waste Sharps Including Metals
		Blue	A) Glassware B) Metallic Body Implants.

1.3: The Challenges Are Ahead For A Developing Country Like India Is Modernization Of Health Care Facilities And Technologies And The Increasing Number Of Biomedical Wastes. As Per Indian Society Of Hospital Waste Management, The Quantity Of Waste Generated In India Is Estimated To Be 1-2 Kg Per Bed Per Day In A Hospital And 600gm Per Day Per Bed In A General Practitioner’s Clinic.

To Be A New Hospital, It Is Necessary To Know The Sources And Procedures Properly Before Operation To Reduce The Waste As Well As The Treatment Of Waste Cost. Now-A-Days The Concern Towards Quality For A Corporate And Government Hospital Is Priority And Biomedical Waste Management Is One Of The Part Of Quality. To Reduce The Hazards Towards Public, Environment, And Reduce The Nosocomial Infection, Waste Management Is Necessary.

1.4: There Are Certain Causes Of Ineffective Biomedical Waste Management. They Are Discussed Bellow Like

1.4.1. Lack Of Awareness Between The Different Levels Of Staff From The Top Management To The Housekeeping Staff Regarding The Effect Of Bio-Hazardous Waste.

1.4.2. Insufficient Allocation Of Resources Are Also A Main Factor For The Ineffective Biomedical Waste Management. If The Resources Are Not Allocated Properly The Proper Care And Handle Of Biomedical Waste Are Not Possible

1.4.3. Improper Control Of System In Any Health Care Organization May Cause The Ineffective Biomedical Waste Management

1.4.4. Many Hospital And Health Care Organization Are Not Take Proper Biomedical Waste Management Policy

1.4.5. Lack Of Regulatory Framework May Causes Ineffective Biomedical Waste Management

1.4.6. Most Of The Employee In The Hospital Does Not Aware Of Any Negative Impact Caused By Biomedical Waste. So The Employee Has Lack Of Evidences Regarding The Negative Impact Of The Improper Biomedical Waste Management

1.4.7. Most Of The Employee Does Not Know The Proper Way Of Managing And Handling Of Biomedical Waste. So They Are Unable To Do The Effective Management

1.5. The Effects Of Improper Biomedical Waste Management Poses A Risk To The Health Of The Worker, The Community People And To The Environment. So The Awareness Are Increasing Day By Day All Over The World To Prevent The Health Hazardous

Improper Management Of Health Care Waste Cause Occupational Health Hazardous Also. The Patient, Patient Relative, Health Worker, People Who Handle The Waste Have The Greater Risk Of Contamination Of Waste Materials

Improper Waste Management May Lead To Water, Soil And Air Pollution Which Directly And Indirectly Affect The Human Life.

Improper Waste Disposal Technique Give The Opportunity To The Rag Pickers To Pick Up The Disposable Items From The Waste That Increases The Possibility Of Reuse Of Items And Sold Them. That Transmits The Disease To The People Who Repack And Reuse Them.

Environmental Pollution Also Occurs For The Inadequate Waste Disposal. Many Insects Rodents Are Responsible For The Transmitting The Disease Like Cholera, Hepatitis, Aids.

II. Methodology:

Though Direct Observation And Data Collection Different Paper And This Notice That About 80% Of The Health Care General Waste And The 20% Waste Are Infectious Waste. It Is Also Notice That Most Hospital And Health Care Facility Do Not Use Appropriate Waste Management. In Proper Sterilization And The Reuse Of Infectious Material Cause 30% Injuries. The Rag Pickers Are Use To Pick The Materials From Hospital Like Syringe, Iv Bottle, Iv Set And Other Plastic Materials Are More Like To Develop Hiv And Other Blood Borne Disease And Even Cancer Also. For Data Collection The Proposed Methodology Are- Documents Review, Observation, Review Of Various Lecturers Etc. It Is A Qualitative Research Design.

Direct Screening The Quality Of Bio-Medical Waste Segregation, Transportation, Storage Facility, Treatment And Environmental Parameters Are The Source Of Primary Data, Nabh Rules And Regulations Screening With The Facility Of A New Hospital Is Secondary Source Of Information.

It Is Previously Notice That The Hospital Waste Causes Various Health Hazards. For Prevention Of That Various Proposed Methodology Are Used Like –

2.1 Using Safety Measures Or Personal Protective Device And The Important And Mostly Used Devices Are – Gloves ,Cap And Mask Or Face Mask, Grown /Apron With Full Sleeve Shirts, Eye Glasses/ Protective Goggles, Gumboots Etc.

2.2 Collection Of Waste And Segregation- Collection And Segregation Is Very Essential Part , Collection Waste And Segregation Wastes Differentiate & Collect According To Their Nature And In The Design The Colour Coded Beg/Container . And For Sharp Waste They Are Collected Puncture Proof Container.

2.3 Transportation & Storage Of Waste- Transportation Are Done By Two Parts. One Is Transportation Of Waste To The Central Storage Area And 2nd Is Transportation Of The Waste From Central Area To Final Disposal Area And Storage Means Store The Waste In The Locality And The Final Disposal Site From Where The Treatment Of Waste Are Done.

2.4 Disposal Technique- The Disposal Technique Is Also Two Steps. First One Is Pre-Treatment(Infected Items Has To Disinfected First Then Sent To Them Final Disposal) And Second Step Is Final Disposal Like Incineration, Safe Pit For Sharps Landfill Etc.

2.5 Awareness And Education – Last But Not The List, Proposed Methodology Includes Awareness And Education Programme Which Delivers A Continued Education To Identified Different Target Groups ,Example Of Target Groups Are –Doctor, Nursing Staff, Ward Boy Or Attendants, Group D Staff, Machinery Operator, Canteen Staff And Patient Relative.

III. Review Rules Of Bmw, 2016:

The Biomedical Waste Management Rules, 2016 Clearly Indicate That It Omits The ‘Handling’ Word. It Applicable To Hospitals, Nursing Homes, Clinics, Dispensaries, Veterinary Institutions, Animal Houses, Pathological Laboratories, Blood Banks, Ayush Hospitals, Clinical Establishment, Research Or Educational Institution, Health Camps, Medical Or Surgical Camps, Vaccination Camps, Blood Donation Camps, First-Aid Rooms Of Schools, Forensic Laboratories, And Research Labs. The Rule Does Not Apply On Radioactive Wastes, Hazardous Chemicals, Hazardous Wastes, Municipal Solid Wastes, Lead Acid Batteries, E-Wastes, Hazardous Microorganisms, Genetically Engineered Microorganisms And Cells, Which Are Governed By Other Government Agencies And Rules. The Present State Pollution Control Board From Respective State And The Pollution Control Committees In The Union Territories Are The Prescribed Authority For Bmw, 2016. Other Prescribe Authorities For Specific Duties Are:

- Ministry Of Environment, Forest And Climate Change, Government Of India;
- Central Or State Ministry Of Health And Family Welfare, Central Ministry For Animal Husbandry And Veterinary Or State Department Of Animal Husbandry And Veterinary;
- Ministry Of Defence;
- Central Pollution Control Board;
- State Government Of Health Or Union Territory Government Or Administration;
- Municipalities Or Corporations, Urban Local Bodies And Gram Panchayets. [1]

IV. Common Practice For A Hospital As Per Rules And Regulations:

Any Hospital And Bio-Medical Waste Management Facility Aim To Improve The Health Status Of The People And The Community But On The Other Hand Major Health Risk Are Happened From The Failure To Management To The Infectious Waste. Every Hospital Try To Manage The Waste Generated In The Hospital. The Main Objective Of Bio-Medical Waste Management Are To Prevent Transmission Of Disease From Patient To Patient ,From Patient To Health Worker , From Patient To Visitors And Vice-Versa And Also To Prevent Injury, Exposure To Harmful Effect Of Pathological, Radioactive And Chemical Waste. The Main Aim Of Every Hospital Is To Prevent The Hazardous. For That The Hospital Authority Try To Make The Hospital Nabh Accredited Through Which They Are Able To Accomplish Their Goals From Simple Step By

Step Procedures And The Hospital Authority Also Maintain The Bio-Medical Waste Management Rules (2016) They Are-

4.1 The Hospital Has The Authority For The Management And Handling Of Biomedical Waste By Prescribed Authority. Most Of The Hospital Taken Provision With Regard To Biomedical Was Prescribed By Pollution Control Board. There Must Be On Outsourced Agency Like Green Tech For The Collection Of Bio-Medical Waste And The Outsourced Agency Must Have Appropriate License. Appropriate Memorandum Of Understanding (Mou) Is Available Between The Hospital And The Outsourced Agency.

4.2 The Hospital Authority Implemented Proper Segregation And Collection Of Bio-Medical Waste From All Patient Care Area And It Is Monitor Properly. The Rules Regarding Proper Segregation And Collection May Be That Kind Like-

(A)The Hospital Waste Are Segregated And Collected In Different Colour Code Bag And Containers As Per The Provision.



Diagram-1

(B) Pictures/Posters Of Bio-Medical Waste Segregation Are Displayed Near The Bins.

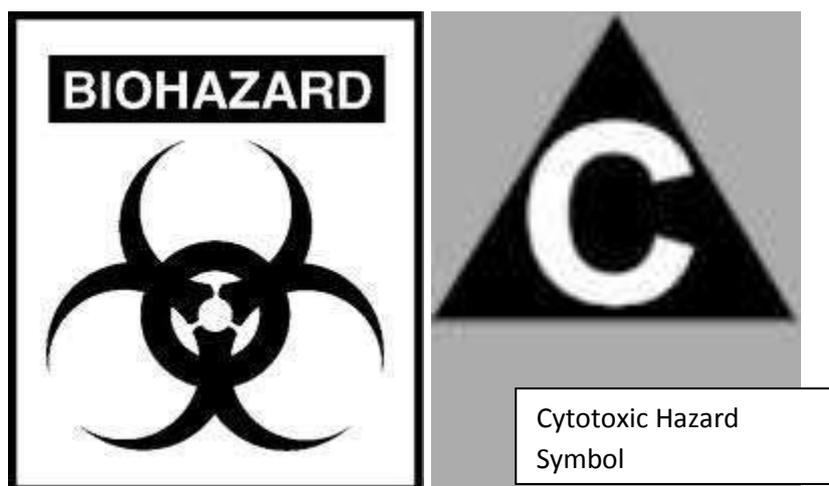
(C) Proper Training Are Given To All The Staff During Induction And In Service Education Periodically On The Appropriate Segregation And Collection Of Bio-Medical Waste.

(D) The Segregation Of Bio-Medical Waste Is Done At The Point Of Generation.

(E) Most Of The Hospital Follows That Segregation Is Done By The Person Who Are Responsible For The Generating The Waste Like Doctor, Nurse, Technician Etc. Not By The Cleaning Staff.

(F) The Individual Colour Coded Bags Are Marked With The Area Of Generation, Date, Time, Of Collection Before They Are Sent To The Temporary Storage Area.

(G) Printed Bio-Hazardous Symbols Put On Bio-Hazardous Bins. The Bio-Hazardous Bins Are Not Openly Transported Within The Hospital In A Closed Container. The Staffs Also Are Responsible For Transporting The Waste Must Use Personal Protective Device



Handel With Care. Biohazard Symbol And Cytotoxic Hazard Symbol (Schedule 4, Part I, Bmw, 2016)

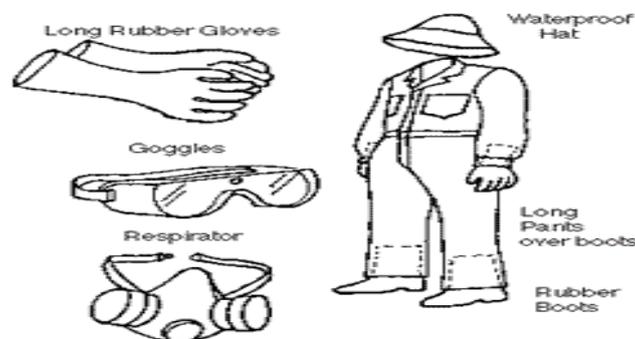
Diagram-2

(H) Every Hospital Must Have Infection Control Committee In The Committee There Are Some Member. There Are Head Of The Hospital Infection Control Doctor, Infection Control Nurse , Quality

Coordinator, Head Of Every Departments Like Cardiology, Pediatric, Urology Etc. Between Them Infection Control Nurse Plays An Important Role And Many Hospital Make The Provision That Monitoring Of Segregation Is Done By Infection Control Nurse.

4.3 Most Of The Hospital Bio-Medical Waste Treatment Facility Is Managed As Per The Provisions. There May Be In-House Or Outsourced Authorized Contractor. If The Biomedical Waste Treatment Facility Is In-House Then They Are Directly Responsible For The Treatment Of Bio-Medical Waste, But If The Bio-Medical Waste Treatment Facility Is Outsourced Then That Facility Is Visited Once In 6 Months By The Organization To Ensure Waste Disposal According To The Bio-Medical Waste Management Rules. Most Of Hospital Has A Temporary Demarcated Storage Area For Each Type Of Waste And The Area Must Be Kept Clean. There Must Be Appropriate Hand Wash And Trolley Wash Area Near Temporary Storage Area.

4.4 Appropriate Personal Protective Measures Are Used By All Categories Of Staff Who Are Responsible For Handling Biomedical Waste Like Mask, Gloves Etc. The Handling Persons Are Also Immunized Against Hepatitis B And Tt. Every Staff Like Clinicians, Nurses, Technicians, Housekeeping And Patient Attendant Staffs Are Also Made Aware And Trained On The Requirement And Use Of Personal Protective Measures. Here We Previously Mentioned That Every Hospital Has The Infection Control Committee. And It Is The Responsibility Of Infection Control Team Member To Give The Training And Records Of Training Are Kept With The HR.



Personal Protective Measure

Diagram-3

4.5 Most Of The Hospital Responsible For Submitting Requisite Fees, Documents And Report Of Competent Authority On Stipulated Date If The Biomedical Waste Treatment Facility Are Outsourced. The Hospital Quality Team Member Is Responsible For Maintaining Various Forms And Format. The Hospital Authority Is Responsible For Submitting The Forms As Per The Schedule With The Quality Of Waste Generated In A Year. This Waste Are Measured And Recorded Colour Code Wise Before Transporting To Outsourced Services The Time Of Collected Are Also Documented And One More Thing Must Be Circulated To Every Waste Handler That The Waste Are Not Kept For More Than 48 Hours. [2]

4.6 The Common Problem Is Nosocomial Infection Or Hospital Acquired Infection Most Of The Hospital Faced As A Result Of Improper Biomedical Waste Management Practiced. For That Most Hospital Include Proper Equipment Cleaning, Disinfection And Sterilization Practices. Sterilization Process Register Are Maintained With The Batch, Item, Expiry Dates And Shelf Life Of The Items Accordingly Policy Of Reuse Of Single Use Device Are Made And Documented. Not Only Equipment Cleaning Is Important But Also The Cleaning And Disinfection Practices Are Defined And Monitored As Per The Centre Of Disease Control And Prevention Guidelines. Most Of The Hospital Have An Infection Control Manual The Hospital Authority Are Responsible For Providing Appropriate Personal Protective Equipment Are Provided To All The Staff Who Are Responsible For Handling Various Chemicals And Disinfectants Beside The Cleaning And Disinfection Of Various Department And The Equipment The General Hygiene Are Also Important For Reducing Infections. In Every Hospital There Must Be Protocols And Procedures For Regular Cleaning, Terminal Cleaning, Cleaning Of Blood And Body Fluid And There Must Be An Isolation Room For Infectious Patients. The Commonly Used Disinfection Situation Factors And Methodology Are Clearly Specified And Followed In Hospital. The Infection Control Committee Is Responsible For Approval Of Proper Disinfection. Brooming ----The Clinical Area Are Avoided And Dry Mopping Are Done. Proper Training Are Given To The Housekeeping Staffs Regarding The Housekeeping Methods, Materials And Other Aspects. Documentation Are Done And Checked By Housekeeping Supervisor.

4.7 Many Bio-Hazardous Occurs Due To Improper Laundry & Linen Management Process Which Include A Well Defined Protocols For Disinfection, Washing, Drying, Sterilization Of Laundry And Linen Articles. Laundry May Be In-House Or Outsourced. In In-House Then The Hospital Must Have The Protocols For Proper Disinfection And Washing Of Infected Cloths And If Outsourced They Are Transported Other

Disinfection. Appropriate Ppes, Are Maintain By The Laundry Staff. Every Hospital Must Have The Hygiene Facility In All Patient Care Area To Prevent The Infection From And To Patient. For That All Patient Care Areas Are Required Large Wash Basin Depending On Requirement , Hands Free Tap Adequate Water, Soap, Facility For Drying Hand Without Contamination. Hand Tubs Are Provided In All Clinical Areas Per Bed And Essential Area. The Hospital Staff Are Trained On Regular Basis On Hand Washing Step. Awareness Of Staffs Are Given On When To Wash Hand And When To Use Hand Rubs. Hand Washing Posters Are Provided In All Hand Washing Areas For Giving The Continuous Reminder Of The Staff.



Steps Of Handwashing
Diagram-4

Most Of The Hospitals Have The Policy Of Giving Pre And Post Exposure Prophylaxis To All The Concerned Staff. For Needle Stick Injury Infection Control Nurse Is Informed And Record Are Maintained

4.8 Handling Of Biomedical Waste

Most Of Hospitals Are Use Special Precaution For Bio-Medical Waste Handlers Who Handling The Waste. They Are Like-

- (a) All Employee Of The Hospital, Even Those Who Are Directly Responsible For Handling Biomedical Waste Must Be Vaccinated Against Hepatitis B And Tetanus
- (b) Its Notice That Most Of The Sharp Injuries Occur At The Time Of Their Use And The Time Of Disposal, So Extreme Care Must Be Taken With Needles And Other Sharps.
- (c) The Sharps Can Cause Accidental Injuries Of They Left Casually On Counter Steps, Trays, Trolley And Beds.
- (d) Clipping, Bending Or Breaking The Sharps And Needle With Hand Must Be Avoided To Avoid Any Accidental Sharp Injuries And The Needles Are Destroyed With Needle Destroyer.
- (e) Proper Segregation Of Sharps Are Done At The Site Of Generation And Then They Placed In A Puncture Proof Container.
- (f) For Proper Disinfection All The Disposal Items Must Kept In Any Disinfection Solution (According To Hospital)
- (g) The Tradition Exposure Must Be Avoided As Much As Possible.
- (h) Universal Precaution Must Be Taken In Hiv Position And Hepatitis B Positive Cases And In Operation Theater
- (i) In Ot (Operation Theatre), For The Transfer Of Instrument Tray Or Bowl Must Be Used Instead To Hand.
- (j) Emergency Medicine And First Aid Box Must Be Available In Every Hospital For Primary Treatment.
- (k) The Infectious And Non-Infectious Waste Show Not Mixes.
- (l) The Wastes Are Put In The Bag In A Manner That It Does Not Spill.
- (m) Excessive Weight Of The Waste Bag Should Be Avoided To Prevent Spillage And Other Of Tearing Of The Bag, For That The Bag Is Filled By Waste Only $\frac{3}{4}$, Then Tied And Properly Labeled.
- (n) Non Infectious Waste Is Like The Household Waste And As The Household Waste Does Not Require Any Special Treatment Gone Like Them The Non Infectious Hospital Waste Does Not Require Any Special Treatment.
- (o) Many Hospitals Put Their Eyes On Quality Of The Generation Waste. Large Amount Biomedical Waste Means Burden, More Cost And More Efficient System. So The Hospital Try To Reduce The Waste Generation By Some Way-

- Use The Most Useful And Important Materials And Important Materials And In As Much As Minimum Quantity.
- The Disposable Items Are Replaced With Reusable Articles Of Adequate Sterilization.
- To Reduce The Packing Materials Waste Many Hospital Must Buy Any Product In A Bulk.
- Most Environment Friendly Materials Are Used.

4.9 Hospital Waste Collection, Segregation And Treatment:

Most Of The Hospitals Are Responsible For Taking Safety Measure, Collection, Segregation, Storage & Transportation. But The Disposal Technique Is Also Very Important For Prevention Of Health, Environment Hazardous For Which The Hospital Has To Be Dependent. But Many Government And Non-Government Hospital Also Use Much Disposal Technique. The Disposal Of Waste Has Two Steps-

- Pre-Treatment –(Treatment Prior To Final Disposal)
- Final Disposal

Pre-Treatment Is Done In Many Ways-[2]

- Chemical Disinfection
- Autoclave
- Hydro Cave
- Microwave Irradiation
- Shredder For Plastic Materials.

Final Disposal-[2]

- Incineration
- Safe Pit For Sharps
- Landfill

4.10 Chemical Disinfectant:

Disinfectant Has Antimicrobial Agent That Destroy The Microorganisms When It Is Applied On The Surface Of Non-Living Objects But It Does Not Mean That It Kills All Microorganisms. Sterilization Is More Effective Than Chemical Disinfectant. Most Of The Hospital Use Disinfectant Procedures Too Reduce The Microorganisms. The Items Which Are Non-Incinerable , Disinfectant Are Used Like The Plastic Materials, Rubber And Metallic Things Must Be Disinfectant Properly Before Sending Them To The Final Disposal. For Chemical Disinfectant Are Have The Following Steps:

- I. Mutilation Of Syringe And Needles Are Done With The Help Of A Needle Destroyer And Scissors Are Used For Cutting The Plastic And Rubber Items
- II. Everyday Fresh Hypochlorite Solution Are Made In A Plastic Bucket By Mixing 10 Gms Powder And 1 Liter Water
- III. A Perforated Small Size Bucket Is Placed In The Main Bucket Which Contains The Solution. Then The Items Which Need To Be Disinfectant Are Placed In The Perforated Bucked In A Manner That All The Items Are Well Dipped In The Solution. And It Also Ensure That This Position Must Keep About 30 To 60 Minutes
- IV. When The Recommended Time Is Passed Away The Perforated Bucket Are Pull Out From The Solution And All The Solution Remain Back In The Main Container .Then One By One All The Items Are Take Out And Are Put In Properly Labeled Bags. And In Case Of Sharps Items They Are Put First In A Cardboard Then Only Put In A Plastic Bag To Avoid The Damage Of The And Pricking
- V. The Solution Must Change In Every 12 Hours

4.11 Autoclave:

Any Microbiological, Biotechnological And Infected Disposable Plastic And Rubber Waste Need Autoclaving. It Is A Very Effective Technique Because It Works On The Application Of Heat And Pressure For A Recommended Period Of Time. For Autoclaves There Are Some Rules And They Are As Follows:

- I. At The Time Of Autoclaving The Machine Must Shows The Time Pressure And Temperature
- II. If The Machine Are Unable To Show Them Then The Whole Process Are Repeated
- III. The Medical Waste Are Autoclaved By 2 Ways
 - i. Gravity Flow Autoclave
 - ii. Vacuum Autoclave
- IV. After The Completion Of The Autoclaving The Plastic Items Are Shredded And The Other Items Are Sent To The Site Of The Final Disposal

4.12 Hydroclave:

Hydroclave Is The Process Of Inactivating Most Of The Microorganisms From The Infected Waste By Exposing Them To High Temperature, And High-Pressure Steam. The Operating Cost And Investment Is Low And It Is More Environments Friendly. Hydroclave Is Required For The Shredded Infectious Waste

4.13 Microwave Irradiation:

Microwave Is An Effective Technique For Destroying The Most Of The Microorganisms From The Infected Disposable Waste. Microwave Is Worked Based On The Heat Conduction Because The Watery Part Of Any Waste Is Rapidly Heated And The Infectious Parts Are Destroyed. But It Is An Expensive System.

Shredding Of Plastic Materials:

The Plastic Materials Like Bottles, Iv Set, Syringes Etc Are Shredded Into 1 Cm Size For Their Non-Recycling

4.14 Incineration:

Incineration Is A Process That Converts The Organic Combustible Waste Into Inorganic, Incombustible Materials By Using High Temperature And Reducing The Volume And Weight Of The Waste. There Are Three Types Of Incinerators And They Are As Follows:

- i. Single Chamber Furnaces
- ii. Double Chamber Pyrolytic Incinerators
- iii. Rotary Kilns

For Using The Incinerator Sit Has Certain Rules:

- i. The Site Of Incinerators Must Not Be Near The Residential Areas. There Must Be A Safe Distance
- ii. At The Site Of Incinerator Unauthorized Entry Must Be Restricted
- iii. Proper Electricity And Water Supply Must Be Available All The Time
- iv. An Automatic Loading Device Must Be Used For Loading The Waste Into The Incinerators Machines
- v. Within 24 Hours The Biomedical Wastes Are Incinerated
- vi. Proper Checking And Monitoring Must Be Done Periodically
- vii. Incinerator Should Not Use During Shut Down And Start Up Phases.
- viii. Suitable Technique For Pollution Control Must Be Used
- ix. Proper Cleaning, Disinfectant And Transportation Facility Must Be Available At The Site Of Incineration

But It Is Noted That All Items Are Not Suitable For Incineration. Some Are Suitable And Some Are Not Suitable. They Are Given In The Following:

Table No.2

Suitable Items	Non Suitable Items
Human Waste Like Tissues, Body Fluids Blood	Radioactive Chemical Waste
Animal Waste	Pressurized Gas Container
Laboratory Waste	Photographic Waste
Dressing Materials	Halogenated Plastic Waste
	High Mercury Contain Waste
	Heavy Metals Waste

4.15 Safe Pit:

Safe Pit Is Very Useful Method For The Disposal Of Sharps Waste .There Are Many Method For The Disposal Of Sharps But It Is The Most Effective Way And Economical Also. Sharps Are Responsible For Various Injury And Infections When They Reused, And The Sharps Are The Mostly Used In Any Health Care Facility .For The Prevention Of Infection It Is Needed To Avoid Its Reuse. To Avoid Reuse The Sharps Are Buried In A Safe Pit.

4.16 Landfill:

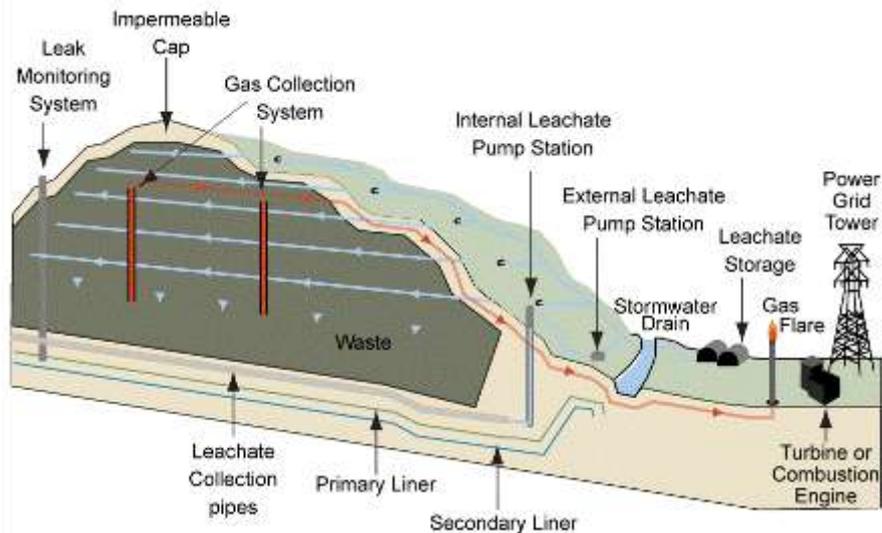


Diagram-5

It Is The Effective Method Of Disposal Particularly In The Developing Country. For Design And Operation Of The Landfill Some Essential Elements Must Maintain. They Are As Follows:

- i. A Proper Place Is Selected For Landfilling By Taking Proper Permission Away From The Residential Area
- ii. For The Landfilling A Vehicles Are Responsible For Carrying The Waste Materials To The Landfill Site. So It Is Necessary To Give Attention That The Site Are Easy Approachable By The Vehicles.
- iii. Constant Supervision And Security Must Be Maintained To Restrict The Unauthorized Entry.
- iv. The Main Cover Of The Landfill Is Constructed In Ways That Prevent Rain Water.

Issues And Challenges For A New Hospital

A New Hospital Always Faces Some Issues That Arise After The Shake Down Period. We May Enlist The Specific Issues And Will Encounter The Problems And Possible Solutions Which Directly Associated With Hospital Or The Greater Community. The Processes To Identify The Problem Area And Precaution Are Important Aspect For A New Hospital. Some Possible Steps Are:

5.1 Identify The Problem Areas: The Problem Areas Are Important Prior To Identified And Thus Start It From The Building Design Period Of A Hospital. The Possible Area From Where The Wastes Are Generated Is Important. For This, It Is Important To Enlist The Areas Before Designing And Implementing The Specific Available Measures To Control It. Generally The Wastes Are Generated From Bed Sides, Operation Theatre, Cssid, Kitchen, Laundry, Hospital Mopping And Housekeeping, Pharmaceuticals, Gas Installation, Hvac (Heat, Ventilator, Air Condition), Bio-Medical Waste Treatment Plant, Mortuary And Autopsy Centre, Research Centre, Blood Bank, Transfusion Centre, Pathological Laboratory, Radiology Etc. For Segregation, Storage And Transportation The Separate Bay And Particular Requirement Must Be Available In The Place.

5.1.1: First Of All, The Bio-Medical Wastes Should Reduce From Source. For This Many Methods And Technologies Are Available. For Examples, Vacuum Blood Collection Tube Can Be Used To Reduce The Time And Contamination. Moreover The Auto-Disable Syringes Replace The Shredding Machine And Problem Of Separate Collection And Reduce The Use Of Puncture Proof Bags.

5.1.2: Identify Some Potential Hospital Infection Sources To Reduce The Chance Of Cross-Contamination And Waste Reduction. For Example, Some Unexpected Areas Are Potential Source Of Hospital Infection Like Blood-Pressure Cuff [3], Computer Key-Board, Wheel-Chairs And Stretchers, Waiting Chairs, Stair Railings, Handle Of Doors Etc.

5.1.3: Set Up An Infection Control Team And Committee On The Same Subject To Identify The Normal Sources Of Waste And Separate The Bio-Medical Waste Generation Area. To Reduce The Waste Volume From Source, Central Sterile Supply Department (Cssid) Has An Immense Importance. Special Provision Should Be Provided To Reusable Items, As They Are The Most Potential Source Of Nosocomial Infection.

5.1.4: Special Provision Should Take To Colour Coded The Segregation Containers And Labeling It Properly As Per Bmw Rule, 2016.

5.1.5: The Proper Ventilation System And Air-Circulation Should Maintain Inside The Operation Theatre Area, Proper Zoning Of The Side, Ante-Chamber For Intensive Care Units (Icu, Ccu, Nicu, Etc.), Proper Colour And Machinery Maintenance To Eliminate The Cross-Infection Chance.

5.1.6: Cautiously Handle The Biomedical Wastes And With Proper Protection. The Protective Gear Should Be Who Affiliated And Marked As A Quality Product. Reusable And Recyclable Products Should Be Handled Carefully. The Protective Gear Should Be Clean Regularly And The Expiry Date Should Maintain For Each Equipments That Related With Biomedical Waste Handling.

5.1.7: Follow The World Health Organizations Guidelines. Who Has A Clear Guideline For Health Care Facilities (Hcfs) About Health Care Wastes (Hcws) Which Largely 85% Is Municipal Waste And 15% Is Hazardous Wastes. But In India, The Total Waste Is Less Than The European Or Usa Recorded Wastes. [4]

5.1.8: Every Hospital Now-A-Days Are Going To Be Accredited By Some National And International Bodies, That Ensure The Quality And Treatment Facility Of The Hospitals. National Accreditation Board For Hospital & Healthcare Providers (Nabh); Joint Commission International (Jci); Quality Council Of India (Qci), International Organization For Standardization (Iso); Etc. Are Some Of The Body Who Give The Quality Accreditation. Nabh Is A Leading Body In India And In Its 10 Chapters; One Is Dedicated To Hospital Infection Control (Hci) [5]

5.1.8.1: As Per Nabh, The Main Aim Of Hci Is To Safeguard The Patients, Visitors, And Health Care Providers From Infection. A Infection Control Committee Has To Be Setup To Work On The Risk Factors. An Infection Control Manual Has To Be Set Up. For This A Standard Practice Are Initiated To All Employees In The Hospital. Some Guidelines Are Set Up. For Example: A) Hand-Hygiene Guidelines, B) Safe Injection And Infusion Practice, C) Transmission Based Precautions, D) Cleaning, Disinfection, And Sterilization Practices, E) Antibody Policy, F) Laundry And Linen Management, G) Kitchen Sanitation And Food Handling Issues, H) Engineering Services, I) Housekeeping Procedures, J) Ongoing Surveillance On Infection Control And Measurements, K) Control Healthcare Associate Infections (Hai) Or Hospital Acquired Infection, L) Documented Procedure To Identify The Outbreak Etc.

5.1.8.2: Jci (Joint Commission International) Has Several Similar Procedure To Prevent The Onset Of Infection Through Review The High Risk Areas Such As A) Disinfection And Sterilization, B) Device Related Infection, C) Procedure Related Infection, D) Environmental Service Methods, E) Reducing Multidrug-Resistant Organisms (Mdros) And Implementing Antimicrobial Stewardship In The Organization, Etc. [6]

5.1.9: Apart From The In-House Medical Waste, The Hospital Should Consider The Store Area Of The Biomedical Wastes Before Treat It. A Separate Bay Should Be There Which Is Isolated From The Main Structure And Hvac System Of The Hospital To Transport It Up To Store Area. The Store Area Should Be A Separate Area And Very Close To Treatment Area. The Proximity Reduces The Chance Of Cross-Infection. Close Surveillance Should Be There To Monitor Periodically. As Per Who Recommended,[7][8] The Storage Area Must Be: Impermeable, Hard-Standing Floor With Good Drainage System. There Should Be Water Supply For Cleaning Purpose. A Lock System Should Be There For Safety From Unauthorized Access. The Area Should Protect From Direct Sun Light. A Separate Good Lighting System And Passive Ventilation Is Must. Preventive Measures Should Be Installed In Case Of Any Disaster Like Leakage Or Fire.

5.1.10: As Per The Review Of Waste Generated In A Public Hospital, About 80% Of The Waste May Be Treat As Municipal Waste And Other Wastes Are Hazardous And Need To Be Treated Carefully Like- Pathological And Infectious Waste, Sharp Waste, Chemical And Pharmacological Waste, Radio-Active Or Cytotoxic Waste Etc. The Treatment Facilities Like Incineration Also A Primary Air Pollutant Producer Which Has Some Quality Criteria Imposed By Biomedical Waste Management Act. The Liquid Waste Treatment Facility Also Checks The Cod (Chemical Oxygen Demand). The Pollution Control Board Has To Check The Pollution With The Biomedical Waste Control Machinery. For These, Several New Applied Biological And Eco-Friendly Innovations May Work:[2]

5.1.10.1: A) Chimney That Absorb Most Of The Pollutant And Reduces The Ash In Volume Must Be Desirable.

B) Earth Worm Like Epigeic Can Reduce And Use The Biomedical Waste Into Vermiculture Procedure, That Is One Of The Most Eco-Friendly Solution For Deep Burial And Organic Material.[9]

C) Implement Biowat (Biomedical Waste Water Treatment) To Treat Liquid Waste Can Reduce The Chance Of Water Pollution And Even It Can Recycled. [10]

D) Facilitate Renewable Energy For Biomedical Waste Treatment Like Autoclave And Others To Reduce The Carbon Production.

E) Recycle The Shredded Material And Sharp And Glasses As Far As Possible By Means Of No Harm.

V. Limitations Of The Study:

6.1 The Study Is Only Based On A New Hospital. There Are Scopes Of Further Detail Study.

6.2 The Screening Facility Is Limited.

6.3 It Only Covers Hospital Related Biomedical Waste, But There Are Untapped Possibilities Of Study On Biomedical Wastes Produced In Home And Disposed Off In Municipality Dustbin. (Sanitary Napkin, Condoms, Catheter, Plastic Colostomy Bags, Etc.)

- 6.4 Not Covered Housekeeping Waste And Gardening Waste In Hospital.
- 6.5 Not Covered The Waste Related To Plastic Bag.
- 6.6 Not Covered The General Hospital Non-Hazardous Waste.
- 6.7 Financial And Technological Limitations Of Developing Countries And Small Private Hospitals To Deal With Biomedical Waste Eco-Friendly.
- 6.8 Hospital Acquired Infection Data Is Not Involved In The Study.

VI. Conclusion-

New Technologies Are Arising For Treatment Of The Disposal & Treatment Of Various Waste Products. Many Disposal Techniques Like Deep Burial, Landfill Cause Environmental Hazardous Indirectly Lead To Health Hazardous. Such Disposal Techniques Are Costly And Dangerous If Fault Accrue. It Is Critical To Reduce Waste From Reduction And Recycling.

For Recycling And Reduction Of Waste Awareness Is The Most Important. Many Experts Said That Is The Most Economical Methods Of Disposal But Recycling Of Waste Reduces The Need For Continuous Landfill Disposal Method. The Goal Of Hospital Waste Management Is To Prevent The Heath Hazardous. In The Above Discussion It Is Said There Are Many Plans To Proper Disposal Technique Of Hospital Waste. Many Of The Plan And Implementation Cause High Cost And The Maximum Number Of Staff And Proper Use Of Resource Awareness Education For Working Effectively. In The Above Discussion We Are Able To Understand That The Bio-Medical Waste Treatment And Disposal Strategy Are Different According To Hospital. But Proper Disposal And Treatment Of Hospital Generated Waste Are Necessary To Prevent The Hospital Acquired Infection And To Protect The Environment And Health Of The People.

Reference:

- [1] Dal Singh Kharat ,Central Pollution Control Board, Delhi, 'India. Biomedical Waste Management Rules, 2016: A Review', International Journal Of Advanced Research And Development, Volume-1, Issue-10, October-2016, Page No. 48-51
- [2] Biomedical Waste Management Rules, 2016 Government Of India.
- [3] Dr. Asima Banu, Ms. Deepthi Shetty, 'A Prospective Study To Demonstrate Blood Pressure Cuffs As A Potential Source For Infection In Hospitals And Disinfection Techniques To Prevent The Same.' Journal Of The Indian Society Of Biomedical Waste Management, Vol-9, Issue-1, Sep-2010.
- [4] Dr. Sunita Singhal, Cmo Incharge, Dept Of Hospital Waste Mgt, Vmmc And Sufdarjung Hosopital, New Delhi; Dr. K.T Bhowmik, Medical Superintendent And Consultant Radiologist, Vmmc & Sufdarjung Hospital, New Delhi. Category Wise Quantification Of Waste Generated In A Tertiary Care Mult Ispecialty Hospital In New Delhi: A Retrospective Analysis. Ishwm Vol-7, Issue 1, Sep 2009.
- [5] [Http://Www.Nabh.Co/](http://www.nabh.co/)
- [6] [Https://Www.Jointcommissioninternational.Org/Assets/3/7/Jci_Fact_Sheet_Ipc.Pdf](https://www.jointcommissioninternational.org/assets/3/7/Jci_Fact_Sheet_Ipc.Pdf)
- [7] [Http://Www.Who.Int/Water_Sanitation_Health/Medicalwaste/En/Guidancemanual1.Pdf](http://www.who.int/water_sanitation_health/medicalwaste/en/guidancemanual1.pdf)
- [8] [Http://Www.Who.Int/Water_Sanitation_Health/Medicalwaste/061to076.Pdf](http://www.who.int/water_sanitation_health/medicalwaste/061to076.pdf) Storage
- [9] M.S. Dinesh¹, Geetha K.S. ², Vaishnavi V.³, Radha D. Kale⁴ And V. Krishna Murthy, 'Ecofriendly Treatment Of Biomedical Wastes Using Epigeic Earthworms', Journal Of Ishwm Vol. 9 Issue 1 September 2010
- [10] [Http://Vikaspedia.In/Health/Health-Care-Innovations/Health-System-Strengthening-1/Eco-Friendly-Biomedical-Waste-Water-Treatment.](http://vikaspedia.in/health/health-care-innovations/health-system-strengthening-1/eco-friendly-biomedical-waste-water-treatment)