Summer internship

AT

IIHMR, Delhi (April 1 to May31st, 2020)

A report

By

Dr. Ruchika Gambhir

POST GRADUATE DIPLOMA IN HOSPITAL AND HEALTH MANAGEMENT

2019-2021

CASE STUDY OF MANIPAL GROUP OF HOSPITALS AND VARIOUS HEALTH PROGRAMS

Manipal hospital was founded in 1953 by late Dr. Tonse Madhav Ananth Pai (a philanthropist and social entrepreneur).
Manipal hospitals are part of Manipal Education System and Medical Group which constitutes 6300 beds in 16 hospitals spread across 14 locations in 6 different states of INDIA and 1 in Malaysia (Klang hospital).
Focuses on comprehensive, curative, preventive and promotive care for patients all across the globe.

Accreditations:
NABH (*National Accreditation Board for Hospitals)*
NABL (*National Accreditation Board for Testing and Calibration Laboratories*) Accreditation for Human Research Protection Programs
AAHRPP (*Association for the Accreditation of Human Research Protection Programs*)
Accreditation for quality and technical competence of testing and calibration laboratories

MISSION
To provide affordable and quality healthcare to all (even to the lesser privileged groups of society)

VISION
To become one of Asia's biggest and most successful healthcare provider.

CORE VALUES:
Triad of *"**Clinical Excellence, Patient Centricity and Ethical Practices**"*
Clinical excellence- the foundation lies in an excellent team of doctors or medical practitioners who have great knowledge and experience in their respective fields of medicine along with the team of highly trained nurses and paramedical staff.

Patient centricity is the key that has won hospital the trust of patients. Its 'patient first' policy at all times of outpatient department even on holidays is one example of patient-friendly practices and also helps in developing a strong bond based on faith and truth with patients.

Ethical practices are strictly being followed in Manipal hospital.

Manipal hospital is the centre of excellence for the following:

1. Accident and emergency care
2. Cancer care

3. Cardiology
4. Gastrointestinal surgeries
5. Liver and organ transplantations
6. Neurology and Neurosurgery
7. Nephrology
8. Obstetrics
9. Gynecology
10. Orthopedics
11. Pediatric and child care
12. Rheumatology
13. Spine care
14. Urology

Other services provided by hospital include:

1. Anesthesiology
2. Bariatric Surgery
3. Clinical Psychology
4. Dental Surgery
5. Dermatology
6. Endocrinology
7. Ear, Nose And Throat
8. General Medicine
9. General Surgery
10. Genetics
11. Growth And Hormones
12. Hematology
13. Hepatobiliary Surgery
14. ICU and Critical Care
15. Infectious Diseases
16. Internal Medicine
17. In Vito Fertilization And Infertility
18. Laboratory Medicine
19. Neonatal and NICU
20. Nuclear Medicine
21. Nutrition And Dietetics
22. Ophthalmology
23. Psychology and Clinical Psychology
24. Pain Medicine
25. Pharmacy
26. Physiotherapist

27. Plastic And Cosmetic Surgery
28. Podiatric Surgery
29. Psychiatry
30. Pulmonary Diseases
31. Radiology
32. Rehabilitation Medicine
33. Renal Diseases
34. Reproductive Medicine
35. Robotic Assisted Surgery
36. Vascular And Endovascular Surgery
37. Transfusion Medicine
38. Microbiology And Pathology

Executive Leaders of Manipal hospital:

Dr. H. Sudarshan Ballal (CHAIRMAN of Manipal Health Enterprises Pvt.Ltd.)

Mr. Dilip Jose (Managing Director and Chief Executive Officer of Manipal Health Enterprises Pvt.Ltd.)

Mr. Karthik Rajagopal (Chief Operating Officer of Manipal Health Enterprises Pvt.Ltd.)

Mr. Sameer Agarwal (Chief Financial Officer of Manipal Health Enterprises Pvt.Ltd.)

Mr. Partha Das (Vice President and Head of Human Resources of Manipal Health Enterprises Pvt.Ltd.)

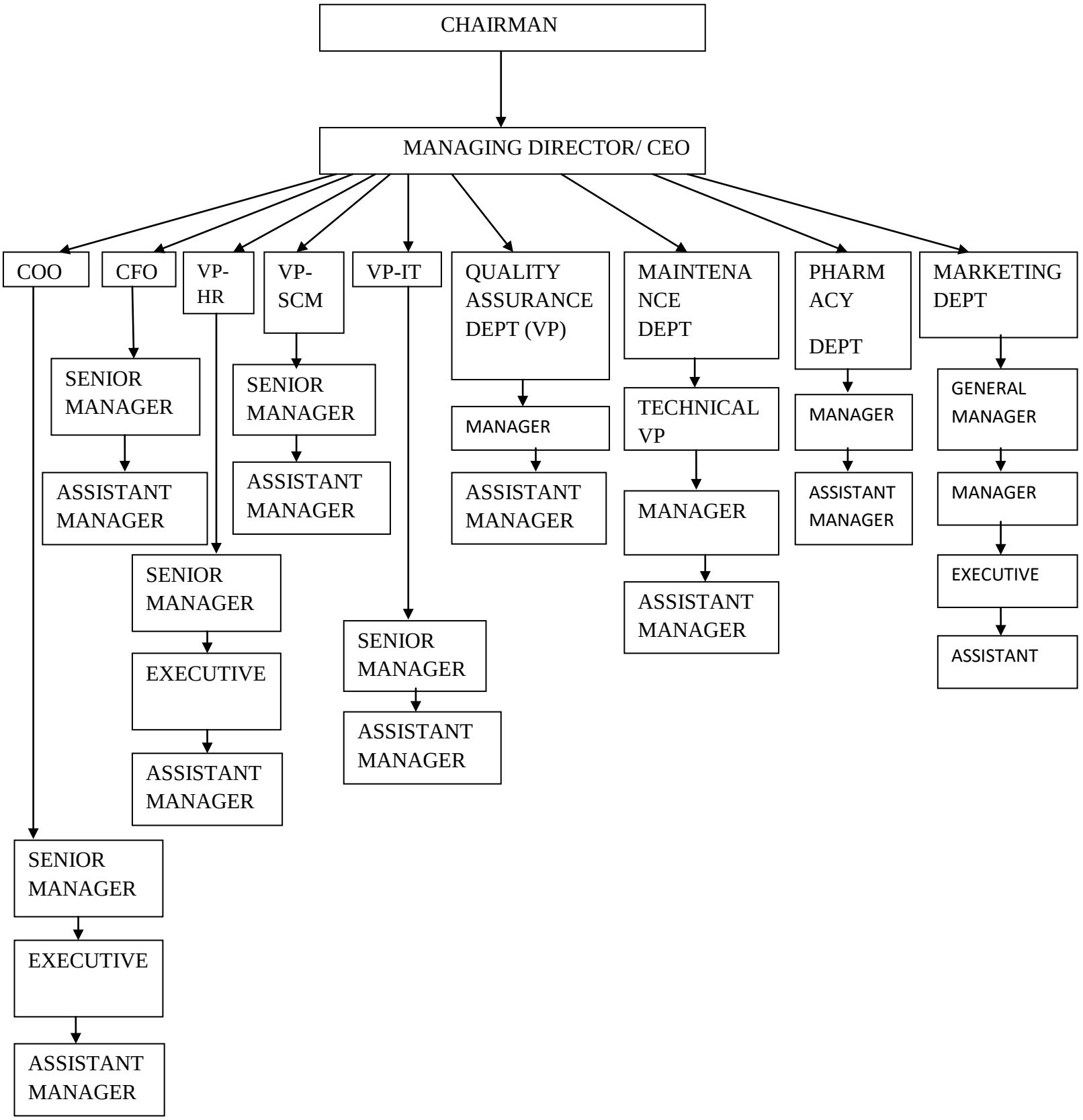
Mr. Sojwal Vora (Vice President of Supply Chain Management of Manipal Health Enterprises Pvt.Ltd.)

Mr. Nandkishor Dhomne (Vice President of Information Technology of Manipal Health Enterprises Pvt.Ltd.)

Departments of Manipal group of hospitals:

- Human resource department
- Finance department
- Marketing department
- Operations
- Information technology department
- Supply chain management
- Pharmacy
- Quality assurance department
- Maintenance department

ORGANIZATION CHART



ROLE AND RESPONSIBILITIES:

Human Resource Department: HR managers control both clinical and non clinical staff who are responsible for healthcare delivery to patients. Duties of HR includes to keep staff levels to appropriate levels(under and over staffed both are taken care of), Ensuring proper credentials and training for better functioning, Also takes care of grievances or benefits needed to be provided to staff.

Supply chain management department: refers to the delivery of resources needed to provide service to the consumer. It also involves managing supplies. It is also involved in the participation of regulatory agencies, such as the Federal Drug Administration and healthcare payers.

Finance department: responsible for the overall finances of the hospital and is accountable for the accuracy of all transactions.

Operations department: includes reviewing, evaluation, surveillance, appraisal, and monitoring. It consists of doing things that are necessary to meet and rather exceed the needs and expectations of those who are consuming those services or products.

Pharmacy department: this department deals with the procurement, storage, dispending, compounding, testing and distribution of drugs.

Quality assurance department: includes reviewing, evaluation, surveillance, appraisal and monitoring. It consists of doing things that are necessary to meet and rather exceed the needs and expectations of those who are consuming those services or products.

Marketing department: Hospital marketing is a method of promotion of high-quality medical services provided to a consumer that satisfies patients and their families' needs. It may inform consumers about the healthy concept and accurate choices and promotes the quality of medical care.

Information Technology department: IT department is responsible for managing clinical software and to help administration for maintaining patient records, also plays important roles in ensuring medical wards, operating rooms, labor, and delivery suites, and emergency departments run smoothly.

Some functions include billing, updating lab reports, registrations, and specialist software like radiology.

Maintenance department: To providing a safe, functional, and supportive environment for patients and staff members. It is also responsible for ensuring safe and economical operation and maintenance of hospital facilities & expensive equipment.

HR POLICIES:

Manipal hospital believes in team work and satisfaction of being there for each other. Hospital truly believes in the saying *"An Organization Is Only As Good As the People It Keeps."* And therefore it is necessary to keep employees motivated and engaged in work.

Recruitment

Recruitment is done by following methods-

- Through advertisement in newspaper
- Through hospital websites
- Through Job search websites(like indeed, naukri.com)
- Internal references

Selection process for medical staff

1. Recruitment
2. Scrutiny of applications
3. Entrance test
4. Oral interview
5. Medical test
6. Reference and background check
7. Appointment letter

Selection process for administrative and supportive staff

1. Recruitment
2. Scrutiny of applications
3. Oral interview
4. Medical test
5. Reference and background check
6. Appointment letter

Training

Training of all staff members are done for 3 days after joining.

Induction program is usually not organized by the hospital.

Promotions

Usually start a year after service

Based on experience and performance

Transfers

Nursing staff is usually transferred from one floor to other

Leaves granted:

12 Casual leaves

20 Paid leaves

Benefits:

- Health insurance
- Cafeteria
- Job training
- Soft skill training
- Child care
- Transportation
- Education assistance
- Gymnasium
- Free food
- Work from home
- International relocation

Benefits differ based on the designation of employees

Some benefits are provided to all employees which include benefits like health insurance, free food, soft skill training, job training, and transportation.

Nursing staff, Assistant Managers and Doctors are provided with additional benefits of childcare, cafeteria and educational assistance.

Deputy Managers, Managers and Vice Presidents are provided with further additional benefits of work from home, international relocation and Gymnasium.

Incentives

- 10% off on medicine
- 10 to 30% off on stay
- Free healthcare
- Accommodation facility to key medical staff

Motivation:

- ✓ Birthday celebrations
- ✓ Extra pay for extra time
- ✓ Rotational shifts
- ✓ Flexible time

Violation of rules:

Certain rules and regulations are laid down by administration for proper functioning of hospital.

In case of slight violation warning is given

In case violation of rules is to a greater extent then decision is taken after meeting of heads of concerned departments.

COMMUNICATION CHANNELS:

(within organization)

Mostly through *Emails* to keep a record of information passed.

Another channel used is *Telephones* and *Intercoms*.

In case of change of rules and regulations or new rules being passed *Notice Boards* are also used as a communication channel.

(outside organization)

New initiatives are usually printed in newspaper.

PROGRAMMES:

Manipal hospital CSR initiatives

Through Manipal foundations hospital touches lives of severals everyday

- 5000 Concessional & Free dialysis for patients under prolonged dialysis in support if Belange Sanjeev Hegde Trust.
- 10 Concessional care for bone marrow transplants
- 40 pediatric cancer care patients (for children under 12 from low-income groups) in association with Crusade against Cancer Foundation
- 268 cardiac surgeries for needy children from underprivileged backgrounds.

The hospital not only has ties with NGOs and funding organizations but also has tie-ups with some CSR companies.

Two Day Live Robotic Surgery Training Programme held in Manipal Hospital

Held in 2019 was a two-day training programme which provided hands on training on robotic surgeries, live video based teaching by national and international faculty with the participation of around 160 doctors across the country.

Surgeries were performed in Gastrointestinal Tract, Thoracic, Head and Neck, Pediatric, Bariatric and Hernia.

The motive was to share knowledge and demonstrate live hands on training in the field of robotic surgery as hospitals are committed towards innovations for providing better services to customers and making their lives better. (Dwarka)

"You can save life anywhere" campaign

Started in 2019, Aimed at creating awareness and training people about life saving techniques. The training programmes include making people learn about CPR(cardiopulmonary resuscitation) and AED (automated external defibrillator). The training is available on 2nd Saturday of every month.

Manipal hospital organizes breastfeeding awareness programme

This programme highlighted the importance of breastfeeding for both children as well as mothers. This initiative took place in association with Krishna district of Indian Academy of Pediatrics (IAP).

Programme was organized in the hospital premises were 100 mothers participated, where they were told about the importance of breastfeeding and duration of breastfeeding according to WHO guidelines.

Children should be only breastfed for an initial 6 months and after that till 2 years of age along with a combination of other foods.

Manipal hospital collaborates with NASSCOM to enhance healthcare management

The partnership aims at improving the patient life-cycle management and provides better care for Manipal Health's customers.

The collaboration will provide multiple benefits of advanced medical technology to improve healthcare with the help of internet of things and artificial intelligence.

This collaboration helps Manipal hospital to provide funds for the innovations and easy implementation of those innovations.

NASSCOM provides with the latest innovations which can benefit the healthcare industry and Manipal health provides the mentorship to healthcare startups to design their work/ solutions, By providing access to industry experts and working with startups to help them to collaborate and Working together helps to improve corporate social responsibility objectives of Manipal hospital.

According to Dr. Anoop Amarnath, Chief of Clinical Services, Manipal Hospitals "as India is moving towards universal health coverage the only means to provide access to healthcare to everyone is possible only through the digital world and hence this partnership between NASSCOM and Manipal hospitals will lead to a technology-driven technology model to reach out to those truly needing it.

Manipal hospital, Pfizer and other joins hands to improve health start ups in India

STARTHEALTH a programme where Manipal hospital, Narayana health along with PATH, Pfizer and Unitus Seed Fund have joined hands together to invest in early-stage startups that seek to enhance accessibility and affordability of technology-driven healthcare products and services to the low strata population.

Area of interest for healthcare innovation comprises of diagnostics and monitoring devices available at low cost which can connect patients and doctors, cloud IT solutions and lab devices and machines to provide affordable healthcare to all.

Manipal Hospital to give healthy heart lessons to teachers

This initiative was taken to create awareness about cardiovascular diseases among the youth "heart smart teachers" will be trained as "guardian of angels".

The strategy was to make child educate their parents about healthy hearts and how unhealthy lifestyles (poor diet, smoking, lack of physical activity) affect the health of the heart.
This strategy was based on a chain reaction.
"Heart Smart Teachers- Healthy Kids- Healthy Families- Healthy Nation"
(Bangalore 2018)

Manipal Hospitals undertakes major a IT overhaul for 2016

Hospital is working on many initiatives like process digitization, upgrading IT security, building new sites and apps for the business head, hospital staff and patients to improve efficiency.
The primary focus was on mobility, analytics and was made user friendly for patients, doctors and nurses to improve various tasks and activities they perform.
Hospital is digitizing all the processes of hospital which will act as a personal assistant or decision support system. The app formed consists of 7 to 8 features for each department like clinical, quality, finance, operations, sales and also others. It will contain all performance indicators, guidelines, rules and regulations.
The app will also be linked with HIS application. Also, app provided alert messages to business heads whenever there is some change for example drop in revenues or performance, patient satisfaction level index.
The hospital was also working on the concept of E-ICU and telemedicine. In E-ICU team of doctors can monitor different ICU's of different hospitals.

HEALTH PROGRAMS IN MANIPAL GROUP OF HOSPITALS

MANIPAL HOSPITAL AND CANCER PROGRAM

On Feb 4, 2020, Manipal Hospital Bangalore (foremost multi-specialty hospital and healthcare provider) pledged for cancer-free society on **world cancer day**.
Team of doctors lead by Dr. Sudarshan Ballal, Chairman Manipal Hospitals, Dr. Somashekhar S.P, MBBS, MS, MCh (Onco),& HOD Surgical Oncology-Manipal Healthcare Enterprises Pvt. Ltd., and a Consultant Surgical & Gynec. Onco & Robotic Surgeon, HIPEC Super Specialist, Manipal Comprehensive Cancer Center, plan on emphasizing the need to **raise awareness about cancer and early screening and detection of cancer to treat and defeat cancer in early stages**.
This program was inaugurated by Ms. Ganavi Laxman, Kannada Actress.
(HIPEC - HYPERTHERMIC INTRAOPERATIVE PERITONEAL CHEMOTHERAPY)

Cancer is a non-communicable disease which can occur due to environmental or genetic factors. Cancer can affect any part of the body and therefore predicting the cancer pattern is difficult still some percentage of studying cancer patterns lead us to the following results:

Leading Sites of Cancer in Males are usually tobacco-related cancer which usually affects mouth, lung, tongue, esophagus, and hypo-pharynx. Other than these, cancer is also observed in larynx, stomach, penis and leukemia.
Leading Sites of Cancer in Females includes Cancer of cervix, breast, ovary, thyroid, gall bladder, stomach, mouth and esophagus.

According to National Institute of Cancer Prevention and Research (NICPR), an estimated number of around **2.25 million** people are living with cancer.

On occasion Dr. H. Sudarshan Ballal, Chairman Manipal Hospitals said "The rate at which cancer patients are increasing is a serious concern for everyone around the globe. Primary reasons for which is lack of awareness, delayed diagnosis and also denial and ignorance of patients (around 50% patients do not seek treatment for cancer as it is a long journey and involves a lot of physical and mental pain caused by the disease and also the financial burden treatment will cause, making people reluctant to even accept the fact they are suffering from Cancer. Another reason is poor accessibility to cancer specialist hospitals making the scenario even worse). The only way to manage cancer is through treatment and Manipal hospital invests in the latest technology and equipment for proper treatment and also creates an opportunity to make services accessible to the public even by providing transportation. Manipal hospitals are working towards a cancer-free world for many years through various initiatives. Therefore curing cancer using HIPEC and PIPAC (Pressurized Intraperitoneal Aerosol Chemotherapy) provides a ray of hope to patients battling cancer. Manipal hospital has an expert team to deal with complex and complicated cases of cancer and hence, providing better outcomes and reducing the risk of reoccurrences."

Dr. Somashekhar S.P, MBBS, MS, MCh (Onco), FRCS. Edinburgh, Chairman & HOD Surgical Oncology-MHEPL, Consultant, Surgical & Gynec, Onco & Surgeon, HIPEC Super Specialist, Manipal Comprehensive Cancer Center added that a significant number of cancer cases are being treated using chemotherapy, radiotherapy, surgery and immunotherapy especially in early stages of the disease. With recent advancements of techniques like HIPEC and PIPAC, the burden of disease has reduced. Also, Manipal is referred centre for HIPEC and PIPAC in India (even for advanced level ovarian cancers and gastrointestinal cancers.

[HIPEC is the procedure in which highly concentrated, heated chemotherapy is delivered directly to the abdomen; it is done only for cancers present inside the abdominal cavity.

PIPAC is the method of chemotherapy where the physical properties of gas and pressure are used to enhance the efficiency of chemotherapy. This form of chemotherapy is supplied in the form of aerosols which leads to deeper penetration of the drug. Mainly used in cases of Peritoneal Carcinomatosis.]

In this pledge of "cancer-free world" by Manipal hospitals, IBM WATSON for Oncology also plays an important role. The technology is programmed and configured in a way that analyzes the evidence-based data for finding the best treatment options for a particular patient. It will also provide relevant content on a particular type of cancer for reference through accessing a large amount of data available in different research papers, medical journals, and other sources.

Manipal hospital along with times foundation and lions club organized **screening camps for breast cancer to create awareness about breast cancer**. The screening was done with the help of 'I- Breast' a novel sophisticated radiation-free device.

MANIPAL HOSPITAL AND DOWN SYNDROME PROGRAMME

On March 21, 2019, Manipal hospital organized **world Down syndrome** day to *draw attention towards down syndrome and to create awareness about it*.

In India, every year, an estimated 30000 children are born with Down syndrome which is a genetic condition marked by an extra copy of chromosome 21, where affected individuals have a characteristic facial appearance, weak muscle tone and to some extent learning disability.

Manipal hospital has been working on this project for the last 20 years where they are trying to create awareness about Down syndrome in society. Also, the hospital identifies cases of Down syndrome during pregnancy. Along with identifying this syndrome hospital also provides support to affected kids by speech and language therapy, occupational therapy, physiotherapy which helps in the development of patients so that they can be independent and live a good and meaningful life.

Dr. Sridevi Hegde, Senior Consultant, Department of Medical Genetics, Manipal Hospitals added that pregnant females should undergo screening for down syndrome and other chromosomal abnormalities in the first trimester of pregnancy. With the help of early detection, one can be informed about the condition which will help them in making a choice.

At the event, the hospital organized heartwarming cases of individuals who have Down syndrome and how they succeeded in their respective fields due to their determination, will and dedication to achieve in life. An inspiring story was shared by Irwin, mother of Lizaba who is patient of Down syndrome where she told everyone that how she treated Lizaba in the same manner as she treated her other children and then how Lizaba won gold and silver medals in swimming.
There were more of these kinds of stories and patients in the event organized by Manipal hospitals on world Down syndrome day.

MANIPAL HOSPITAL CONTRIBUTES TO COVID-19 PANDEMIC

During the time of pandemic Manipal hospital is contributing to various methods like it is taking care of the mental health of the population. Aarushi Dewan, a Resident Clinical Psychologist says that due to social distancing people can get more mentally sick, it is believed that today social parameters are an important part of our lives, therefore, loss of social parameters can be disturbing for mankind. The lockdown and isolation of individuals demands special mental health attention. Living circumstances involving separation, and helplessness, can result in depressive mood and anxiety and therefore Manipal hospitals are providing audio and video therapy sessions to those in need.
Manipal hospital also shares the idea of indulging in recreational activities to reduce stress at the time of the pandemic.
Also, Dr. CR Satish Kumar, Consultant Clinical Psychologist adds that death anxiety due to the virus is high which leads to provoking suicidal thoughts among individuals. Also, mental disorders can happen because of the stoppage and reduction of alcohol and tobacco.

Also for cancer patients due to social distancing hospital has started with TELECONSULTATIONS for stage 1 cancers. Chemotherapies performed are performed in separate wards with proper isolations.

Manipal hospital also laid out some guidelines for senior citizens especially 70 years and above, also for their caregivers

ManipalHospitals
LIFE'S ON
OLD AIRPORT ROAD

Advisory for SENIOR CITIZENS during COVID-19

Advisory for senior citizens requiring mental well-being

Do's

- Communicate with relatives at home
- Communicate with neighbours, provided social distancing is followed and gathering of people is avoided
- Provide peaceful environment

Don'ts

- Avoid complete isolation
- Do not confine one-self in a room
- Avoid reading or watching news on corona virus and prevent anxiety

Contact helpline
080 4011 9000

ManipalHospitals
LIFE'S ON
OLD AIRPORT ROAD

Advisory for SENIOR CITIZENS during COVID-19

Advice to the caregivers

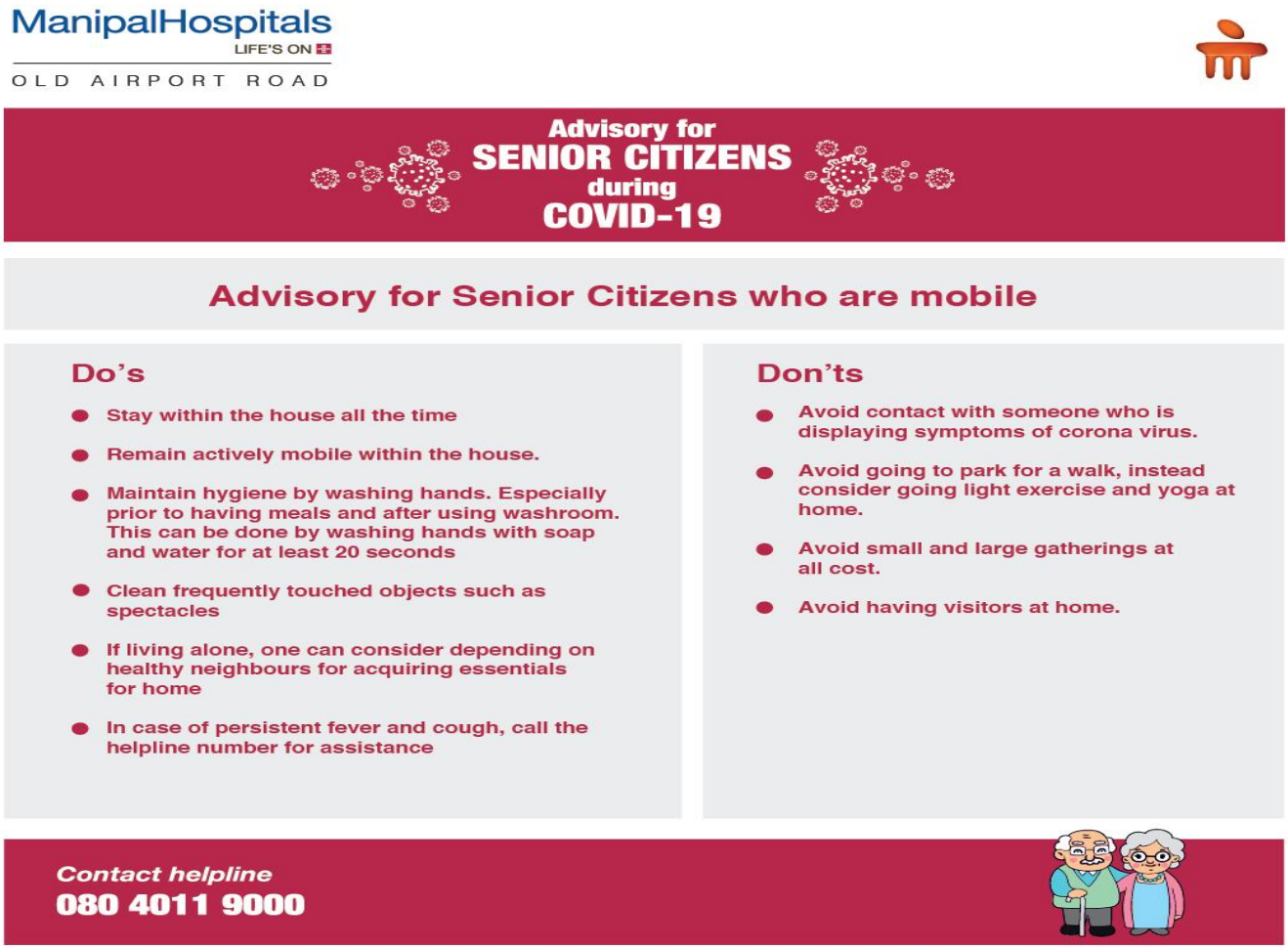
Do's

- Wash your hands prior to helping the older individual
- Clean the surfaces which are frequently used. These include walking cane, walking, wheel-chair, bed pan etc.
- Assist the older individual and help her/him in washing hands
- Ensure proper nutrition with grams of pulses per day

Don'ts

- If the care giver is symptomatic (fever/cough), avoid contact with the older adult
- Avoid keeping the senior citizen completely bed-bound
- Never touch the Senior Citizen without washing hands with alcohol-based sanitiser.
- Cover nose and mouth adequately using a tissue or cloth while attending on the senior citizen

Contact helpline
080 4011 9000



Manipal hospital is also providing doorstep medicine delivery to elderly, physiotherapy session and also video consultation with specialists.

MANIPAL HOSPITAL AND STRESS MANAGEMENT PROGRAM

Manipal hospital organized an event to talk about stress among young generations.
In the event organized by the hospital, there were 2-panel discussions which mainly discussed how work and wellness can go hand in hand as the new work culture is leading to increased stress in young ages.
Dr. Ballal said in a panel discussion that one should never take work to home, as taking work to home not only affects the health of individual nut also deeply impacts other family members. Therefore, he advised the corporate sector to maintain a healthy work life balance. He also added that corporate should think of comprehensive, effective and creative ways to fulfill overall needs of employee.
One of the panel discussions focused on building a holistic work environment by designing a wellness system.

Where major discussion was on how the corporate sector is providing employees with various relaxation services and how the employee needs to reciprocate to make it a success. One of the panelists also added that activities involved should be those which employees would appreciate and engage in.
In the discussion Rupa Parashuram (Vice President- Human Capital Management) Goldman Sachs India said that in their office they made cafeteria at a distance so that employees can walk out of the office for the cafeteria.

Some of the services provided by Manipal hospitals in the direction of wellness at work include-

Vaccination
Health centre
Doctors and nurses
Onsite ambulance service
Employee health check-up
Physiotherapy and ergonomic support

Manipal hospital also planned for the T10 corporate cricket league scheduled in June 2020.

MANIPAL HOSPITAL AND TOBACCO CESSATION PROGRAM

Manipal hospital launches "Let's Together, Beat Tobacco" campaign on world no tobacco day, to create awareness of ill effects of tobacco.
The campaign aimed to highlight health associated risk of tobacco consumption which leads to cardiovascular diseases, pulmonary diseases, and lung cancer.
In the campaign, Manipal hospital launched quick evaluation tests of lung and heart for smokers and can also be used as a gift.
At the campaign, even a cyclothon was arranged.
With this campaign, the hospital wants to eradication tobacco consumption by creating awareness among the public.
Packages launched by Manipal hospitals include for tobacco associated risk assessment includes:

- Healthy heart package:-
  - RBS, total cholesterol
  - Serum creatinine
  - ECHO/TMT
  - Cardiac consultation
- How healthy is your lung?
  - Chest x-ray
  - Spirometry
  - GRBS
  - Pulmonology consultations

References:

Chetana Belagere (04th February 2020) Nearly 50% patients do not seek treatment- The New Indian Express retrieved from https://www.newindianexpress.com/cities/bengaluru/2020/feb/04/nearly-50-patients-do-not-seek-treatment-2098661.html

Deepthi Sanjiv (Mar 2, 2020) Innovations for a better tomorrow on display at Manipal | Mangaluru retrieved from https://timesofindia.indiatimes.com/city/mangaluru/innovations-for-a-better-tomorrow-on-display-at-manipal/articleshow/74420620.cms)

Healthcare | Manipal Education and Medical Group retrieved from Healthcare | Manipal Education and Medical Group)

June 26, 2019 Manipal Hospitals, NASSCOM to enhance healthcare management retrieved from https://www.biospectrumindia.com/news/79/14013/manipal-hospitals-nasscom-to-enhance-healthcare-management.html)

Kinjal Manoj Patel (22nd March 2019) Down's Syndrome no more a barrier for these achievers- The New Indian Express retrieved from https://www.newindianexpress.com/cities/bengaluru/2019/mar/22/downs-syndrome-no-more-a-barrier-for-these-achievers-1954299.html

Latest News | Gallery - Manipal Hospitals, Bangalore retrieved from https://www.manipalhospitals.com/media

Leadership | Manipal Education & Medical Group retrieved from https://www.manipalgroup.com/memg/about-us/leadership.html

Mar 22, 2019 Bengaluru: On World Down Syndrome Day, 24-year-old Lizaba recounts her heroic tale retrieved from https://www.deccanchronicle.com/nation/current-affairs/220319

Manipal Hospitals Employee Benefits and Perks retrieved from https://www.glassdoor.co.in/Benefits/Manipal-Hospitals-India-Benefits-EI_IE421645.0,17_IL.18,23_IN115.htm

Manipal hospitals | Facilities, Bed Count, Timings and Appointment Booking retrieved from https://www.credihealth.com/hospital-group/manipal-hospitals-india)

Manipal Hospital Senior Executive Reviews retrieved from https://www.ambitionbox.com/reviews/manipal-hospital-reviews)

Manipal Hospital Staff Nurse review retrieved from https://www.ambitionbox.com/reviews/manipal-hospital-reviews)

Manipal International retrieved from https://www.manipalinternationalpatientcare.com/about-us/overview)

November 19, 2012 Manipal Hospital commemorates World Diabetes Day across all its Hospitals in India retrieved from https://goanewswire.wordpress.com/2012/11/19/manipal-hospital-commemorates-world-diabetes-day-across-all-its-hospitals-in-india/)

Pankaj Maru (April 29, 2016) Manipal Hospitals undertakes major IT overhaul for 2016, IT News, ET CIO retrieved from https://cio.economictimes.indiatimes.com/news/strategy-and-management/manipal-hospitals-undertakes-major-it-overhaul-for-2016/52010228)

Poornima nataraj, (sep 30 2018) City hospital to give healthy heart lessons to teachers retrieved from https://www.deccanherald.com/city/city-hospital-give-healthy-695363.html

Poornima Nataraj, (FEB 04 2019) City hospitals observe World Cancer Day retrieved from https://www.deccanherald.com/city/city-hospitals-observe-world-716698.html

Rahul Kantak (Nov 14, 2012) Organisation Structure Of Manipal Hospital retrieved from https://www.slideshare.net/rahulkantak10/organisation-structure-of-manipal-hospital

Raji Raj(Jun 4 ,2015) Organiations study at manipal hospital, Goa retrieved from from https://www.slideshare.net/LibuThomas2/raji-presentation-organiations-study-at-manipal-hospital-goa

Ramy Girshally, Cedric Demtröder, Nurettin Albayrak, Jürgen Zieren, Clemens Tempfer & Marc A. Reymond (2016)Pressurized intraperitoneal aerosol chemotherapy (PIPAC) as a neoadjuvant therapy before cytoreductive surgery and hyperthermic intraperitoneal chemotherapy |retrieved from https://wjso.biomedcentral.com/articles/10.1186/s12957-016-1008-0

Shonali Advani (Feb 02, 2015) Pfizer, Manipal Hospitals & others join hands to accelerate health tech startups in India - The Economic Times retrieved from

(https://economictimes.indiatimes.com/small-biz/startups/pfizer-manipal-hospitals-others-join-hands-to-accelerate-health-tech-startups-in-india/articleshow/46090830)

Working at Manipal Hospitals: Employee Reviews about Pay & Benefits retrieved from Indeed.co.in

Working as a Registered Nurse at Manipal Hospitals: Employee Reviews retrieved from https://www.indeed.co.in/cmp/Manipal-Hospitals

COMPARATIVE ANALYSIS OF BIOMEDICAL WASTE MANAGEMENT IN DIFFERENT COUNTRIES: REVIEW

ABSTRACT

Biomedical waste is generated by all healthcare facilities. Biomedical waste management is one of the biggest issues the world is facing. It is a technique sensitive procedure which is different in some aspects of different countries and some aspects similar in different countries. Due to its effect on the environment, it is important to properly collect, segregate, transport, and dispose of this waste.

Keywords: biomedical waste management, segregation, transport, color coding, disposal.

INTRODUCTION

Biomedical waste is the waste generated by hospitals and healthcare facilities while providing services and facilities (diagnosis, immunization, treatment) to the patients. Each hospital or healthcare facility produces a different amount of biomedical waste every day. Some of the examples are given below:

Country	Quantity (kg/bed/day)
UK	2.5
US	4.5
France	2.5
India	1.5

The waste generated is harmful to the environment and humans and therefore it is essential to follow a proper procedure from collection to disposal of waste.

METHODOLOGY

The article reviewed 10 research papers from GOOGLE SCHOLAR, RESEARCH GATE, and some NATIONAL SITES and some INTERNATIONAL SITES to understand the laws related to biomedical waste management, (These 10 articles were selected after reviewing 15 articles abstracts out of 25 articles initially searches).

The articles which were reviewed revolved around safe handling, safe transportation, treatment, and disposal of biomedical waste management. The procedure of treatment and reports of waste collected was not included in the research.

LITERATURE REVIEW

BIOMEDICAL WASTE MANAGEMENT IN UNITED STATES

Legislations:

- OSHA Regulation
- DOT Regulation
- Medical Waste Tracking Act

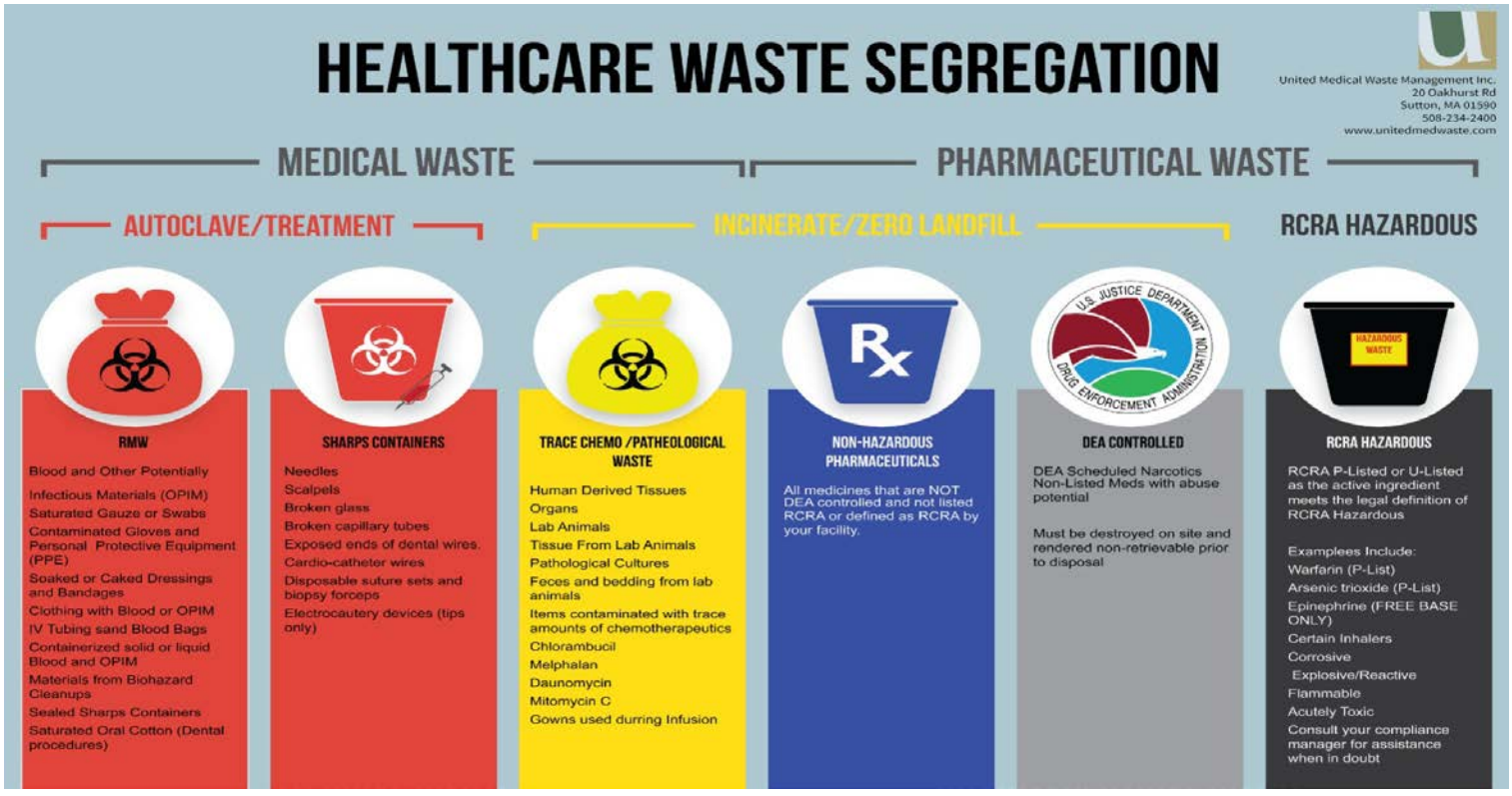
- US EPA Regulation and State Medical Waste Regulation.

Process:

1. Generation
2. Waste characteristics
3. Transport
4. Treatment, destruction, and disposal.

There are 2 types of generators of waste:
Small generators are those which produce less than 50 pounds of waste.
Large generators are those which produce more than 50 pounds (such as hospitals, dental clinics, laboratories).

Waste characterization:
Hazardous waste- like sharps, infectious wastes (materials suspected to contain pathogens which are capable to cause disease), pathological waste (tissues, organs, body parts, etc), Chemical Waste (discarded solid or liquid chemicals), pharmaceuticals (expired drugs and vaccines) and Radioactive Waste.
Non-hazardous waste a.k.a general waste.
Infectious Waste should be labeled with UN number (UN 2814, UN 2900, UN 3373).



Source: blog.unitedmedwaste.com

Transport

The carts used to carry the waste should be made of steel or fiberglass with a lid on it to cover it, and it should not exceed nominal volume {not exceeding 1,655 L (437 gallons)}.
The containers in which the waste is to be transported should be leak-proof and air packed but easy to open.

Treatment:

- Incineration
- Thermal treatment
- Chemical treatment
- Heat (Steam autoclave, Microwaves , Dry heat, and hot air systems)
- Chemical agents (ozone, chlorine compounds, alkali)

BIOMEDICAL WASTE MANAGEMENT IN UK

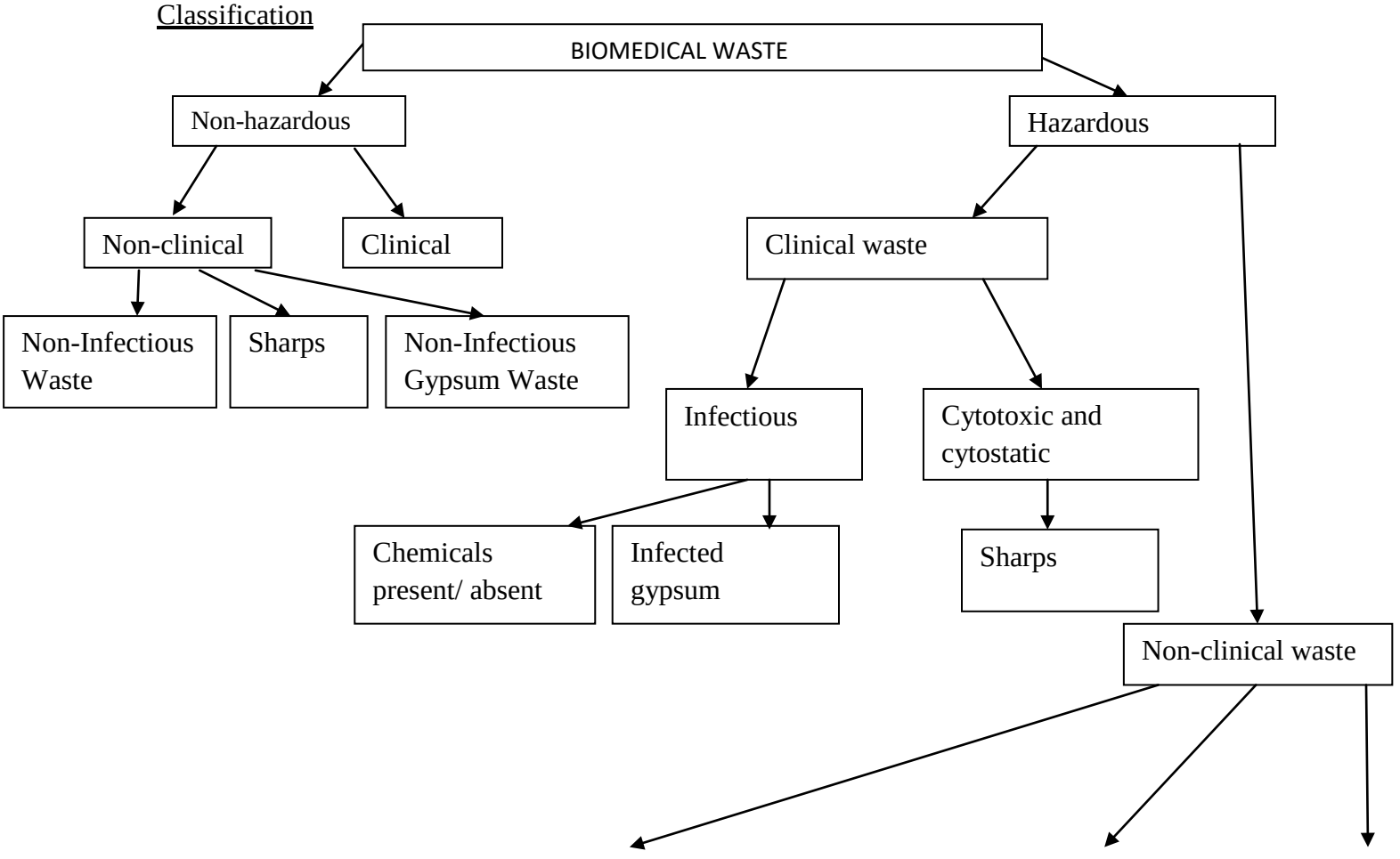
Legislations:

The environment permitting regulation

Process:

1. Classification
2. Segregation and color coding
3. Transport and packaging
4. Treatment and disposal

Classification



Segregation and color

Dental amalgam

Healthcare chemicals without Hazardous properties

X-Ray fiber and developers

Waste Type	Cl	Coding	
Infectious	Hazardous	YELLOW	Infectious waste which requires disposal by incineration.
Infectious	Hazardous	ORANGE	Infectious waste which may be treated to render safe prior to disposal or alternatively it can be incinerated.
Cytotoxic / Cytostatic	Hazardous	PURPLE	Waste consisting of, or contaminated with, cytotoxic and/or cytostatic products which requires disposal by incineration.
Offensive	Non-Hazardous	YELLOW & BLACK	Non-infectious, offensive/hygiene waste which may be recycled, incinerated or deep landfilled.
Anatomical	Hazardous	RED	Anatomical waste which requires disposal by incineration.
Medicinal	Non-Hazardous	BLUE	Waste medicines, out of date medicines, denatured drugs, which requires disposal by incineration.
Dental	Hazardous	WHITE	Dental amalgam & mercury including spent and out of date capsules, excess mixed amalgam & contents of amalgam separators which requires disposal by recovery or recycling.
Domestic	Non-Hazardous	BLACK	This waste should not contain any infectious materials, sharps or medicinal products, and requires disposal by landfill.

Source: initial.co.uk

Transportation and Packaging:

Carriage regulation ensures that all the infectious or hazardous goods should be identified using a 4 digit UN number and a proper shipping name.

Packaging instructions changes with the change in the UN number. Therefore the personnel involved should be trained properly.

Treatment and disposal

4 criteria:

- Criterion A: Reduction in pathogen numbers
- Criterion B: Destruction of anatomical waste
- Criterion C: Unstable and recognizable
- Criterion D: Healthcare waste is categorized into 2 broad groups High temperature (incineration processes) and low-temperature materials.

Treatment of various color-coded materials is done in different ways like:

Yellow, purple, red, and blue coded waste should be treated by incineration.

Black coded waste is disposed of in landfills.

And white coded amalgam waste is sent for recovery.

BIOMEDICAL WASTE MANAGEMENT IN INDIA

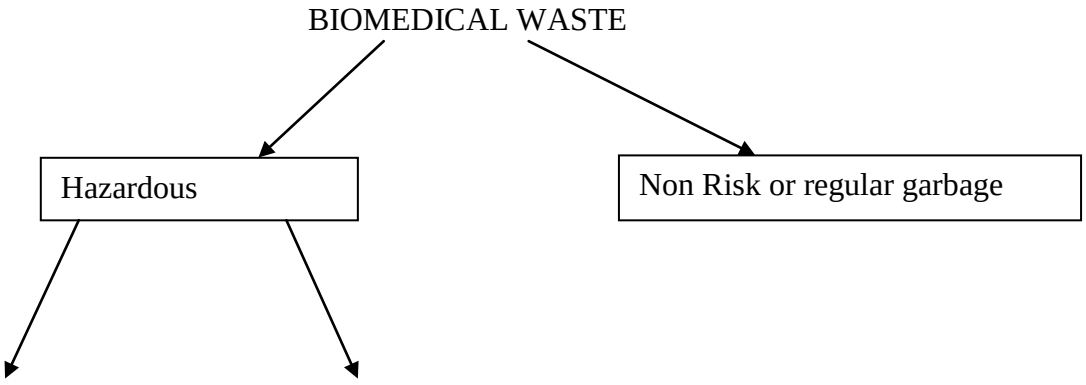
Legislations:

Biomedical waste (Management and Handling) rules 2016

Process:

1. Classification
2. Collection and segregation
3. Transport
4. Treatment and disposal

Classification



Biohazardous waste (sharps, and other infectious waste like blood, cultures,and tissues)

Radioactive and chemical waste (pharmaceutical waste)

nd seg

ion of should be done at/or near the site of generation of

gation should be done with the remembrance of color coding for particular waste.

COLOR CODING FOR SEGGREGATION OF BMW

COLOR	WASTE	TREATMENT
Yellow	Human & Animal anatomical waste / Micro-biology waste and soiled cotton/dressings/linen/beddings etc.	Incineration / Deep burial
Red	Tubing, Catheters, IV sets.	Autoclaving / Microwaving / Chemical treatment
Blue / White	Waste sharps (Needles, Syringes, Scalpels, blades etc.)	Autoclaving / Microwaving / Chemical treatment & Destruction / Shredding
Black	Discarded medicines/cytotoxic drugs, Incineration ash, Chemical	Disposal in secured landfill

All the bags should contain the International biohazard symbol.

Transport

Within the hospital or healthcare facility (from the generation site to storage site), it should be transported on trolleys, in absence of trolleys fully enclosed wheeled carts should be used.
The vehicle used for offsite transportation should be different from the general waste collection truck/tractor. The hazardous healthcare waste should be handled by special purpose vehicles (which should also contain the symbol of biohazard).
All the waste should be packed in containers that are rigid, leak-resistant, and resistant to tearing with the label of the organization on it.

Treatment and Disposal

- Autoclaving
- Microwave
- Deep burial
- Chemical disinfectant
- Dry heat sterilization

BIOMEDICAL WASTE MANAGEMENT IN DAKAR (SOUTH AFRICA)

The legal framework comprises of both International conventions and National rules
International conventions:

- Basel Convention.
- Bamako Convention.
- Stockholm Convention

National rules:

1974 decree governs the disposal of both domestic as well as biomedical waste in Dakar, where Public and private healthcare facilities are obliged to incinerate this kind of wastes, which were then revised in 1983 and then in 2001 considering the toxic effects of gases produced by incineration of waste.

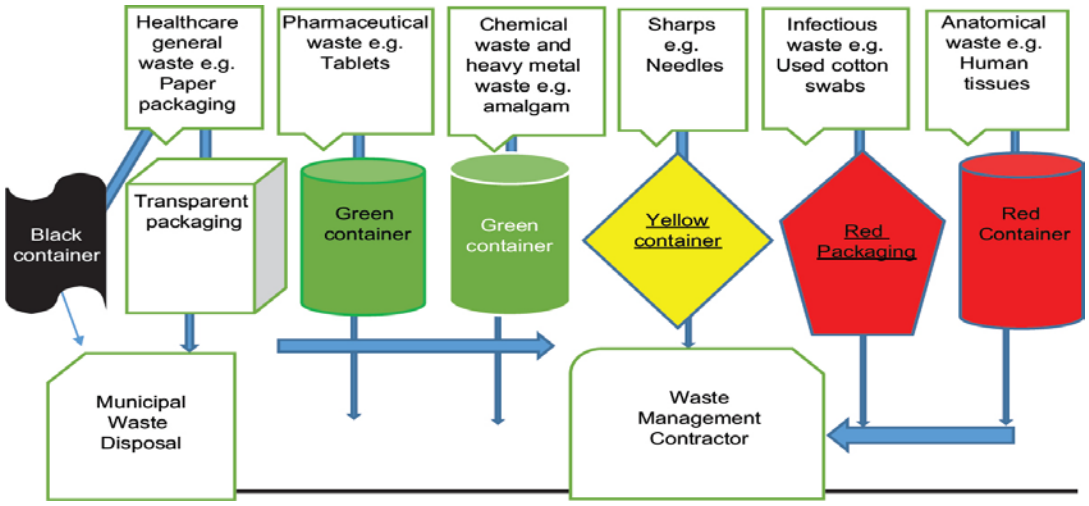
Although after the revised laws of waste management Dakar is not able to properly dispose of the waste leading to an occupational hazard and affecting the environment.

Generation, Transportation, and Treatment

Classified in 5 categories according to WHO:

A: Non-hazardous waste
B: Sharps, pharmaceutical, blood, and fluid wastes;
C: Infectious wastes from laboratories and microbiological cultures
D: chemicals, gases, liquids
E: Radioactive wastes

Segregation and color coding



Source: Nigerian journal of clinical practice

Transportation:

Occupational hazards are high in Dakar due to improper transportation of biomedical waste, due to lack of wheeled trolleys and proper containers. There is no evidence of waste transportation outside the healthcare facilities in Dakar.

Disposal:

- Incineration
- Steam autoclave sterilization
- Landfills

SIMILARITIES & DIFFERENCES

Title	**Similarity**	**Difference**
CLASSIFICATION	Classification is based on WHO GUIDELINES which are followed by all the above-mentioned countries.	Slight variation is seen in classification according to the countries convenience and staff education, like the UK has classified nonhazardous waste in further categories while US, India, and Dakar have considered nonhazardous waste equivalent to general waste.

SEGREGATION AND COLOR CODING	In every country, segregation is done according to their slightly varies classification of waste This classification of waste leads to a slight variation in color-coding. Where yellow is basically for infectious waste like blood, Blue is for gloves, Black is for general waste and pharmaceutical waste White is for syringes.	In the UK due to change in classification color coding also comprises orange, purple, and yellow& black containers. In Dakar green containers are observed. In the USA there is an additional DEA controlled category that takes care of narcotics.
TRANSPORT	US, UK, and INDIA follow the rules needed to prevent leakage or any sort of spillage by ensuring proper containers for waste (spill-resistant, puncture-resistant, leak resistance, made of steel usually) and the vehicles carrying it are covered with the International symbol of biohazard over them. Transportation within facilities is done using trolleys and wheeled carts.	DAKAR is the country where there is no evidence of waste being transported outside healthcare facilities and also the transportation within facilities is mainly done manually. (without trolleys or carts)
TREATMENT & DISPOSAL	Treatment and disposal of waste is usually done by incineration, landfills, autoclaving, etc These methods are followed in all countries. **Pre-treatment of certain cultures, wastes including sharps are done before disposal.**	In DAKAR pre treatment of infectious waste is usually not seen.

References

A Kumar, S Duggal, *R Gur, SR Rongpharpi, S Sagar, M Rani, D Dhayal, CM Khanijo (2015) Safe transportation of biomedical waste in a health care institution retrieved from www.researchgate.net/publication/278039883

B. Ramesh Babu*, A.K. Parande, R. Rajalakshmi, P. Suriyakala, M. Volga (2009) Management of Biomedical Waste in India and Other Countries: A Review retrieved from www.semanticscholar.org

Collection, Segregation, Transport, Treatment & Disposal Methods (2011) (Powerpoint slides) www.worldbank.org

Dal Singh Kharat (2016) Biomedical waste management rules, 2016: A review retrieved from https://www.researchgate.net/publication/317305231

Department of Transportation Regulations (2006) Department of Transportation (DOT) regulations

Http://www.hercenter.org/regsandstandards/dot.php

Dieng, C,. Mberu, B., Dimbuene, Z., Faye, C., Amugsi, D., Aboderin (2016) Biomedical waste management in Dakar: Legal framework, health and environment issues retrieved from www.urbanark.arg

Government Of India Ministry Of Environment, Forest And Climate Change s(2016) Bio-Medical Waste (Management and Handling) Rules.

Https://dhr.gov.in/

Ndiaye M[1], El Metghari L, Soumah MM, Sow ML.(2015) [Biomedical waste management in five hospitals in Dakar, Senegal] retrieved from www.ncbi.nlm.nih.gov/pubmed/22763955

Reddiar Janagi, Jignesh Shah, Dilip Maheshwari (2015) scenario of management of medical waste in US and UK: a review retrieved from https://www.jgtps.com

Waste Management at medical centres (2013) retrieved from www.disaster-info.net

BARRIERS IN PATHWAY OF BIOMEDICAL WASTE MANAGEMENT IN INDIAN SCENARIO: A REVIEW

Dr. Ruchika Gambhir
International Institute of Health Management Research, Sector 18, Dwarka,
New Delhi-75
Email id: ruchikag14@gmail.com

ABSTRACT

Biomedical waste is produced in tonnes daily all over India. It is the waste that is produced by hospitals and other healthcare units to treat and diagnose mankind. It is important to manage this highly infectious and hazardous waste produced as it can cause undesirable effects on human health and the environment. Although, there are a lot of policies and protocols made by the government agencies for proper management, and a lot of technology is coming up intending to reduce the efforts associated with waste management. Still, there are a lot of barriers and challenges seen in any healthcare unit or hospital which hampers the process. In this study, an attempt has been made to study and describe the barriers faced by any hospital in India.

KEYWORDS: bio medical waste management, healthcare units, interrelationship, hazardous waste, lack of management, policies, challenges, barriers, staff knowledge.

INTRODUCTION

Biomedical waste management is defined as the waste material produced by the hospitals, laboratories, dental clinics, research centers in providing services and facilities (diagnosis, immunization, Treatment) to the society.

Biomedical waste is divided into majorly 2 categories:

Hazardous waste

Non-hazardous waste consists of non-infected plastic, paper, etc.

Biohazardous waste is further divided into infectious and non-infectious wastes.
Infectious wastes comprise of sharps, glass.
Non-infectious wastes comprise of radioactive waste, chemical waste, and cytotoxic waste.

It is observed that 75% to 90% of wastes produced by hospitals are non-hazardous where 10% to 25% comprises waste which is harmful to humans, animals, and the environment.
This 10% to 25% of waste mixing up with the rest of the non-infectious waste increases the chances of spread of infection and therefore it is necessary to follow a proper protocol and procedure management of the waste generated.

Process of waste management

Comprises of 4 steps:

1. **Segregation** of waste at the point of generation into reusable and non-reusable materials, also safe storage in containers. Easy waste is divided into various categories and classified according to the color codes.

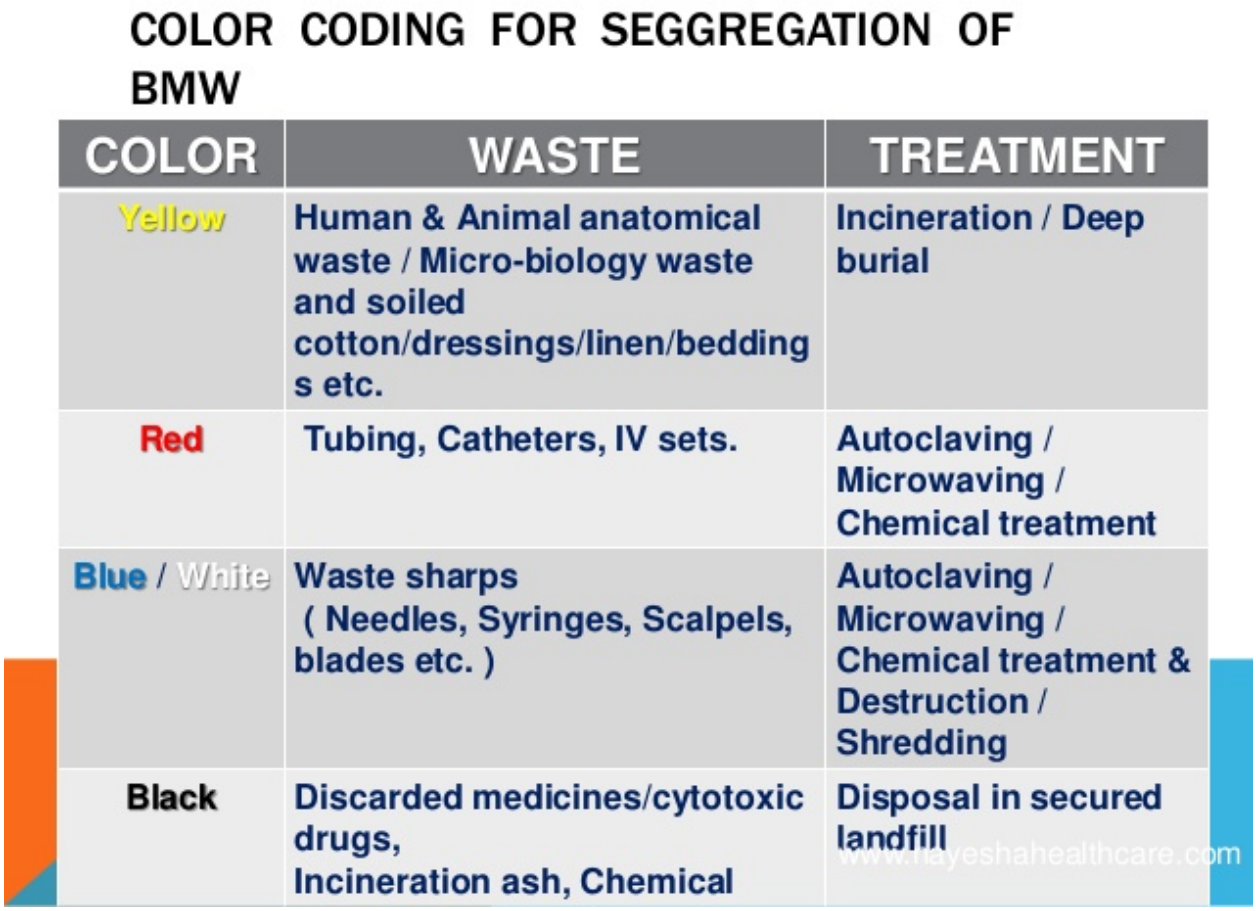
Categories of biomedical waste

There are 10 categories into which waste is divided:

category	Waste content	Components	Methods of disposal and treatment
Category 1	Human Anatomical Waste	Human tissues (which includes organs and body parts)	Incineration /deep burial
Category 2	Animal waste	Animal tissues, organs, body parts carcasses, fluid, blood, and experimental animals used in research. Waste generated by veterinary hospitals and colleges	Incineration /deep burial

Category 3	Laboratory waste	Wastes from laboratory cultures, stocks or specimens of microorganisms live or attenuated vaccine. Human and animal cell cultures used in research and laboratories. Wastes from the production of biologicals, from research toxins, dishes, and devices used for the transfer of cultures	Local autoclaving/ microwaving/ incineration
Category 4	Waste sharps	Needles, syringes, scalpels, blades, glass, etc. that may cause puncture and cuts. This includes both used and unused sharps	Disinfectants and chemical treatment /autoclaving/microwaving and mutilation shredding
Category 5	Discarded Medicines	Wastes comprising of outdated and discarded medicines	Incineration / destruction & drugs disposal in secured landfills
Category 6	Solid Waste	Items contaminated with blood, and body fluids including cotton, dressings, soiled plaster casts, linens, beddings, other material contaminated with blood	Incineration , autoclaving
Category 7	Solid Waste	Wastes generated from disposable items other than the waste sharps such as tubing's, catheters, intravenous sets, etc	Disinfectants and chemical treatment /autoclaving/microwaving and mutilation shredding
Category 8	Liquid Waste	Waste generated from laboratory, washing and cleaning, housekeeping and other disinfecting activities	Disinfections by chemical treatment and discharge into drains
Category 9	Incineration Ash	Ash from incineration of any bio-medical waste	Disposal in municipal landfill
Category 10	Chemical Waste	Chemicals used in the production of biologicals, chemicals used in disinfection, etc	Chemically treated and discharged into drain

Color coding for waste segregation



COLOR CODING FOR SEGGREGATION OF BMW

COLOR	WASTE	TREATMENT
Yellow	Human & Animal anatomical waste / Micro-biology waste and soiled cotton/dressings/linen/beddings etc.	Incineration / Deep burial
Red	Tubing, Catheters, IV sets.	Autoclaving / Microwaving / Chemical treatment
Blue / White	Waste sharps (Needles, Syringes, Scalpels, blades etc.)	Autoclaving / Microwaving / Chemical treatment & Destruction / Shredding
Black	Discarded medicines/cytotoxic drugs, Incineration ash, Chemical	Disposal in secured landfill

s

2. **Transport** of biomedical waste in safe puncture-proof and leak-proof covered containers or vehicles.
3. **Treatment** of waste can be done using autoclaving, incinerators, Chemical disinfectants.
4. **Disposal** of waste can be done using landfills and deep burial pits..

Effects of biomedical waste:

Although biomedical waste affects air, soil, water it leads to a lot of health hazards. Biomedical waste increases the exposure to microbial infections, radioactive materials, and cytotoxic elements like mercury, pesticides, disinfectants, and isotopes used in treatment and diagnosis affects multiple organs and systems. Improper handling of needles and syringes can lead to needle stick injury exposing workers or ragpickers to diseases like AIDS and hepatitis B/C.

However as easy, the procedure seems to be it still faces a lot of barriers, challenges, and limitations leading to poor management of waste.

RATIONALE

The purpose of the study is to learn about type of barriers any institute is facing while managing and handling the biomedical waste and who is basically responsible for mishandling of waste.

METHODOLOGY

Out of 40 articles searched on databases 23 were shortlisted after removing the duplications and geographical areas out of which 17 were selected based on abstracts, out of which 12 papers and 1 website , was studied(reviewed) for the research. All the articles are searched from GOOGLE SCHOLAR, RESEARCH GATE, PUBMED and NATIONAL DIGITAL LIBRARY.

KEYWORDS : hospital, staff knowledge, limitations, barriers, policies.

INCLUSION AND EXCLUSION CRITERIA:

Papers included comprises of hospitals conditions, staff knowledge, lack of management, policies and practices followed in INDIA, any paper telling scenario of any other country was excluded from this research.

The articles reviewed are basically starting from year 2010 although majority of articles are from the year 2015.

Only published articles were included in the study any unpublished articles were not included in the study.

Articles published in English were included.

LITERATURE REVIEW

BARRIERS ASSOCIATED WITH BIO MEDICAL WASTE MANAGEMENT IN INDIAN SCENARIO:

The process of healthcare waste management comprises of a lot of challenging issues like collection and segregation, proper treatment and safe disposal, occupational safety, environmental safety, and patient safety.

1. **Lack of segregation**

   The infectious waste and non-infectious wastes should be separated from the point of generation to point of disposal as even a portion of infectious waste can infect the non-infectious and non-hazardous waste making all the waste infectious therefore segregation of wastes should be done properly. But due to lack of awareness and training about the hospital staff and also students in medical and dental colleges, the segregation does not take place properly at the point of generation.[5]

Even if segregation is properly managed at the point of generation it is observed that the waste handlers sometimes tend to mix them up at the time of collection or disposal.

2. **Improper waste management operational strategy**

Ideally, the waste management operational strategy should include all information regarding the location of the containers, the frequency of waste collection. Also, the operational strategy lays down the guidelines like segregation of waste in different colored bags leak-proof containers for safe transportation, and prevention of mixing of non-infectious and infectious waste while handling.
Also, the waste transportation inside the hospital should be done in covered carts or trolleys to avoid any source of infection within the premises, but it is observed in various hospitals of India that the waste transportation is done by supporting staff not following the proper procedure of collection and disposal. It is also observed that in India there is no paperwork for the management of biomedical waste.[5]

3. **Lack of knowledge and training among healthcare professionals**

The subjects in the studies included all healthcare workers (doctors, nurses, technologists, lab attendants, paramedical staff and, also cleaning staff). In the studies, it was observed that although healthcare workers had good knowledge about biomedical waste and its side effects they only had satisfactory knowledge when it came to its management.[11]
In many parts of the country, the health workers even had poor knowledge about the legislations and generation hazards (In certain hospitals only 15% cleaning staff had an excellent awareness about the legislations and management of biomedical waste).[1]
From different studies, it came to observation that doctors, nurses, and even the students studying in medical and dental colleges had good knowledge about the segregation of waste and were aware of the harmful effects of hazardous infectious waste and therefore dispose of the waste in different colored bins as designated.
Whereas for cleaning staff all the wastes can be collected in one single bin except for sharps.[11]
In many places, the staff doesn't have proper knowledge about the disposal of sharps (only 31.3% of the population studied knew about the puncture-proof container of sharps) and radioactive waste.[9]
And it was observed that only 4.5% of healthcare professionals know that for max 48 hrs waste can be stored it needs to be treated after 48hr max, also fairly

population knew about the transmission of HIV AIDS and Hepatitis B and C Infection can transmit through the waste, (41.4% and 37.9% respectively).[9]

4. **Attitude of the workers**

Along with proper knowledge of management of waste, it is also necessary for the healthcare workers to follow proper handwashing techniques to avoid any infection, whereas it is observed in many hospitals that many healthcare workers (cleaning staff especially) do not use gloves while collecting and segregating wastes.

Also in some hospitals, the cleaners have good knowledge about the procedure to be followed, but are **not provided with gloves** acting as a de-motivator and hence increases the reluctance to follow the protocol.

It is also observed in some health care units the cleaning staff appointed to tend to leave the job in less than a week stating that the tasks and responsibilities allotted are tough to be completed and hence de-motivating the other staff members as well.[11]

5. **Financial constraints**

Every hospital or healthcare unit needs to have proper funding for management of biomedical waste(financial provision is required for sufficient manpower, disinfectants, devices, and equipment) whereas in India it is seen that neither government nor private hospitals have proper funding for the waste management which leads to lack of training and educating the healthcare professionals. Also, smaller health care units ignore the proper procedure due to inadequate funding.[5]

6. **Poor infrastructure**

One of the biggest limitation seen in the developing countries is lack of infrastructure which itself includes a lot of factors such as

- ✓ **lack of PPE** where in many countries PPE is especially an important apparatus (especially for infectious waste) for personnel collecting waste it is seen in developing countries like India there is no PPE are available to waste collectors. (along with PPE in some institutes it is also observed that cleaners are not even provided with gloves to protect themselves from the infections they can get while working).[4]
- ✓ **Lack of autoclaves** and **incinerators** (due to the high cost of installation as well as of maintenance, it is seen that fewer numbers of autoclaves and incinerators are installed within hospitals) which leads to the transportation of infectious wastes to the disposal centers.[4]

- ✓ **Lack of bins** and standardization is another barrier, as due to the insufficient number of bins the collection of waste is improper also because no standard method of collection of waste can lead to faulty separation of waste. Color-coded bins are not available in many hospitals and also the bins available are not the closed ones which increase the risk of spread of infections.[4]
- ✓ **Lack of wheeled carts** for transportation onsite, transportation should be done in covered wheeled color-coded (also puncture-proof and leak proof) bins to prevent any chance of leakage and infection in the premises.
- ✓ **Lack of proper storage space** it is seen that the waste collected tends to get intermixed making it difficult to separate and also making non-infectious waste potentially infectious.[4]

7. Lack of adequate facilities

Efforts to provide facilities for storage, collection, treatment, and disposal of health care wastes as well as appropriate technologies have so far been limited in India.

India lacks a significant number of landfills leading to the disposal of biomedical waste in open bins or directed into water bodies through which it affects air, soil, and water.

Although large health care units have their **onsite disposal landfills** which are impossible for small healthcare units to manage due to financial constraints.[5]

8. Poor top level management

The process of waste management requires proper monitoring and evaluation defined by the guidelines, which can be only possible by the active involvement of managers in this line.[5]

Also, good management is needed to always keep on motivating the workers, to listen to problems they are facing, and how they wished conditions were better and also to ensure that a proper budget is available so that workers are provided with the gloves and PPE required.

9. Insufficient support from government agencies

Lack of proactive environmentalism and low priority accorded to green procurement initiatives by the governments' acts as a significant barrier to Waste Management. In India, no agency is given the responsibility to educate healthcare workers about the guidelines of waste management and to spread awareness about it.[5] It is necessary to educate and aware of healthcare professionals and workers

the importance of proper handling and waste management techniques. It is also observed that in many government hospitals itself the nurses and the ward boys themselves don't know the color-coded bins.

If the government provides help and support to hospitals then the problem can be solved to a big extent.

10. Insufficient manpower

In India a shortage of manpower is seen in the medical profession, this shortage applies not only to doctors but also to the nurses, cleaning professionals, and managers who would work under this category.

In many hospitals, it is seen that due to long fixed hours of working a lot of staff is available in daytime whereas in night duties the number of staff is so less that not even a single sweeper is available.[5][11]

11. Special requirements for some materials to be disposed of

Some biomedical waste like sharps, syringes and radioactive waste requires special considerations for disposal.

Sharps and needles should ideally be disinfected using chemical disinfectants before disposal which was observed in none of the facilities surveyed.

It was observed that hub cutter was used in almost all hospitals (as approximately 95% of the healthcare professionals knew the importance of hub cutter),[10] knowledge about the mutilated syringes disinfection was observed fairly low.

Another important consideration rising in the newer world is the rise of nuclear medicine (where basically radioisotopes are used for the detection of various types of cancer). The disposal of these radioisotopes and other radioactive materials require special attention. These should be disposed of in geological repository, whereas in India only 3 geological repositories are present. Also, it is important to understand geological structures and processes.[8]

12. Reluctance to change and adopting new strategies

Resistance to change to any new policies, strategies, or equipment is not easily accepted by the workers. Although a lot of new technologies are coming up every day still in India lack of adaptability leads to using old ways of waste management.

It is recorded that many **barriers are interrelated** to each other.
For example:

Lack of operational strategy alleviates the problem of lack of segregation,
Lack of knowledge and training of cleaning staff alleviates the problem of improper segregation of waste.
Financial constraints result in the poor infrastructure of the healthcare system (lack of PPE, gloves, autoclaves)
Insufficient support from government alleviates the problem of financial constraints and lack of knowledge of cleaning staff (as the government can run programs to educate people about ill-effects of biomedical waste and its mixing with other wastes).
Poor attitude of workers towards work alleviates a lack of manpower in healthcare units.

CONCLUSION AND DISCUSSION

Hospitals and healthcare units generate tones of waste while providing services and facilities to the mankind. However, it is difficult to manage the waste generated all over the country. Mismanagement of this waste produced increases the chance of hospital-acquired infections within the premises as well as outside the premises making it an important issue to be taken care of by respective hospitals as well as the agencies and the government bodies. However, a huge difference is seen between ideal conditions and the situations happening. A lot of barriers are observed on the track of waste management which needs to be taken care of. Some of the problems can be solved by educating and training individuals working in the healthcare industry, changing the perspective of people working in this direction, and also changing the mindset of young people to make them more familiar with this prospect of a career. Also, government agencies need to be more involved in the whole process and need to provide more resources ensuring the safety of the workers associated. Better and strict policies and regulations are required to make every follow proper protocol.

References

1. Alok Sharma [1], Varsha Sharma, Swati Sharma, Prabhat Singh (2013) Awareness of Biomedical Waste Management Among Health Care Personnel in Jaipur, India retrieved from https://pubmed.ncbi.nlm.nih.gov/23474579

2. Anju Singh*1, Seema Unnikrishnan2 and Samriddhi Dongre (2019) Biomedical Waste Management in India: Awareness and Novel Approaches retrieved from https://biomedres.us/pdfs/BJSTR.MS.ID.002424

3. Anurag Tiwari, Prashant A. Kadu (2013) Biomedical Waste Management Practices in India-A Review retrieved from https://www.semanticscholar.org/paper/Biomedical-Waste-Management-Practices-in-India-A-Tiwari-Kadu/7292833efa326ca2db7554f5e80bc313cf99d341

4. Diego V de Godoy Delmonico, Hugo H dos Santos, Marco AP Pinheiro, Rosani de Castro and Regiane M de Souza (2018) Waste management barriers in developing country hospitals: Case study and AHP analysis retrieved from https://journals.sagepub.com/doi/10.1177/0734242X17739972

5. Kamalakanta Muduli1, Akhilesh Barve (2012) Challenges to Waste Management Practices in Indian Health Care Sector retrieved from http://www.ipcbsee.com/vol32/011-ICESE2012-D035.pdf

6. Sasankasekhar Mishra, John Pumwa, Manoranjan Dash, Kamalakanta Muduli (2018) challenges and prospects in waste management in indian health care supply chains retrieved from http://www.worldresearchlibrary.org/up_proc/pdf/1312-151877444027-29

7. SaurabhGupta[a] RamBoojh[b]AjaiMishra[c]HemChandra[d] (2009) Rules and management of biomedical waste at Vivekananda Polyclinic: A case study retrieved from www.sciencedirect.com/science/article/pii/S0956053X08001840

8. Scientific and Technical Issues in Radioactive Waste Management Retrieved from www.nap.edu/read/10119/chapter/8

9. Sourya Kanti Das, Romy Biswas (2016) Awareness and practice of biomedical waste management among healthcare providers in a Tertiary Care Hospital of West Bengal, India retrieved from https://ijmedph.org/article/183

10. Sthapana Sharma1, Jutika Ojah2, Achyut Chandra Baishya3 (2015) BIOMEDICAL WASTE MANAGEMENT OF GOVERNMENT HEALTH INSTITUTIONS IN GUWAHATI CITY, ASSAM WITH SPECIAL REFERENCE TO IMMUNIZATION SESSION retrieved from www.researchgate.net/publication/282390386_BIOMEDICAL_WASTE_MANAGEMENT_OF_GOVERNMENT_HEALTH_INSTITUTIONS_IN_GUWAHATI_CITY_ASSAM_WITH_SPECIAL_REFERENCE_TO_IMMUNIZATION_SESSION

11. Sudhir Chandra Joshi, Vishal Diwan, [...], and Cecilia Stålsby Lundborg (2015) Staff Perception on Biomedical or Health Care Waste Management: A Qualitative Study in a Rural Tertiary Care Hospital in India retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4449010

12. Sunil Kumar, Stephen R. Smith, [...], and Christopher Cheeseman (2017) Challenges and opportunities associated with waste management in India retrieved from www.ncbi.nlm.nih.gov/pmc/articles/PMC5383819/

13. Vanesh Mathur[1], S Dwivedi[1], MA Hassan[1], RP Misra (2011) Knowledge, attitude, and practices about biomedical waste management among healthcare personnel: A cross-sectional study retrieved from http://www.ijcm.org.in