A STUDY OF CHALLENGES FACED BY HOSPITALS AND THIRD-PARTY LOGISTICS IN MANAGEMENT OF BIOMEDICAL WASTE

Dissertation Submitted to

The IIHMR University, Jaipur

For the partial fulfilment for the award of the degree of

Master of Business Administration (MBA)

In

Pharmaceutical Management

By

Piyush Shukla

IIHMR-U/02/2021-23/0323

MBA PM-13

Under the Supervision and Guidance of

Dr. Sudhinder Singh Chowhan

Associate Professor

School of Pharmaceutical Management, IIHMR University, Jaipur

2023

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2023

DECLARATION BY STUDENT

I hereby declare that this dissertation titled “A study of challenges faced by hospitals and third-party logistics in management of biomedical waste” is the bonafide record of my original research work. I declare that it has not been submitted to any other university or institution for the award of any degree or diploma. Information derived from the published or unpublished work of others has been duly acknowledged in the text.

(Signature)

Piyush Shukla

May 24, 2023

CERTIFICATE

This is to certify that dissertation titled “A study of challenges faced by hospitals and third-party logistics in management of biomedical waste” is a record of the research work undertaken by Piyush Shukla in partial fulfilment of the requirements for the award of the degree of MBA Pharmaceutical Management from the IIHMR University, Jaipur under my guidance and supervision and his approach to the research study has been sincere, scientific, and analytical.

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ABSTRACT

Effective biomedical waste management is of the utmost significance for safeguarding human health and the environment. Third-party logistics (3PL) play a crucial role in the transportation and disposal of biomedical waste. However, there are several issues faced by 3PL in the management of biomedical waste. This project aims to identify these issues through personal interviews with 3PL experts. The identified risks are then categorized using the Supply Chain Operations Reference (SCOR) model and prioritized using a risk matrix. Based on the priority of the risks, mitigation strategies have been proposed. This study provides insights into the challenges faced by hospitals and 3PL in the management of biomedical waste and suggests effective mitigation strategies that can be implemented to achieve efficient and safe biomedical waste management.

ACKNOWLEDGEMENT

As I have come towards the completion of my project report, I would like to seize this Opportunity to acknowledge all the valuable contribution in my study.

It imparts me immense pleasure to take advantage of this once-in-a-lifetime opportunity to express my profound gratitude and humble regards to my esteemed Guide Dr. Surya Prakash Associate Professor, School of Pharmaceutical Management, IIHMR, Jaipur, for his unparalleled and excellent, continuous encouragement and support which helped me in completion of my course and dissertation. Throughout the course, his discipline, views, simplicity, and tenacious work atmosphere is something what I always admired.

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Place- Jaipur

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ABBREVIATIONS

(a) CPCB - Central Pollution Control Board
(b) MeEFCC - Ministry of Environment, Forests, and Climate Change
(c) BMW - Biomedical Waste
(d) BMWM - Biomedical Waste Management
(e) 3PL - Third-Party Logistics
(f) PW - Plastic Waste
(g) SCOR - Supply Chain Operations Reference
(h) N/A - Not Applicable

CHAPTER 1
INTRODUCTION

1.1 INTRODUCTION

As it directly impacts the environment and the general population, biomedical waste management is a crucial issue in the healthcare industry. The creation of biomedical waste has greatly grown in India because of the nation's rising healthcare needs and expanding healthcare sector. Although biomedical waste management procedures in India have advanced, it has been difficult to put laws and rules controlling it into effect. [1]

To regulate how biological waste is handled within Indian healthcare settings, regulations were authorized under The Biomedical Waste Management Rules back in 2016 by both The Central Pollution Control Board (CPCB) as well as The Ministry of Environment, Forests, and Climate Change (MeEFCC). By offering a clear prescription on secure procedures for safe management of such medical wastes these guidelines have refined how these facilities handle this issue quite substantially. Some common methods implemented across institutions responsible for handling biomedical hazards include:

(a) **Segregation:** According to the 2016 Biomedical Waste Management Rules, biomedical waste is classified at the point of generation into various categories, such as infectious waste, sharps, chemical waste, etc., and is then disposed of in color-coded bags.

(b) **Collection:** The garbage is then collected using coloured bags or containers in accordance with the CPCB and MoEFCC requirements.

(c) **Transportation:** Authorized vehicles that adhere to the established requirements for transportation are used to carry the garbage to a treatment facility.

(d) **Waste Treatment & Disposal:** Using techniques like autoclaving, incineration, microwaving, etc., the waste is processed and disposed of in a safe and ecologically responsible manner. Several sites around the nation have been given permission by the CPCB to handle and dispose of biological waste.

(e) **Record-keeping:** In accordance with the directions issued by the MoEFCC and the CPCB, healthcare facilities are required to maintain records of the amount and kind of waste created, collected, processed, and disposed of.

(f) **Education and awareness campaigns:** To ensure that the public is aware of the risks connected with inappropriate biomedical waste management, healthcare staff are taught on the best methods for managing biomedical waste.

In regard to sustainable development, India ranks 120th out of 165 countries. The COVID-19 virus' rapid emergence has greatly exacerbated India's problem with controlling medical waste. The proper disposal of a significant amount of hazardous medical waste as a result has elevated to a high priority. [3] All individuals who support and funding healthcare operations have a social and legal obligation to handle biological waste (BMW) in a safe and sustainable manner. For healthier people and a cleaner environment, effective BMW management (BMWM) is essential. [2]

In the healthcare industry, third-party logistics (3PL) services are essential for handling biological waste. These operations, meanwhile, frequently run into problems that limit how well they can manage biological waste. [4] By in-depth interviews with 3PL and hospital specialists, our research seeks to pinpoint these challenges. To assess the hazards associated with the management of biomedical waste, the following goals were defined as a standard:

(a) To determine the priority list of the factors important to manage biomedical waste effectively at the hospital and for third-party logistics service providers.
(b) To identify the list of major issues faced by both parties in the management of biomedical waste.
(c) To analyse the identified factors.
(d) To present a conceptual path/ model for effective BMW management at the hospital and third-party logistics service provider.

CHAPTER 2
REVIEW OF LITERATURE

2.1 LITERATURE REVIEW

The previous study and research models that have been identified in recent years will be reviewed in this part.

India ranks 120th out of 165 countries in terms of sustainable development, and it suffers enormously from a lack of waste treatment infrastructure and services. However, the abrupt emergence of the COVID-19 virus has exacerbated India's difficulty with medical waste management. As a result, proper disposal of a substantial amount of hazardous medical waste has become a primary responsibility. [5] The pandemic of COVID-19 has culminated in a surge in the creation of plastic waste and biological waste (BMW) (PW). Because of the unanticipated increase in BMW and PW, the current waste management system is having difficulties, precisely in developing economies. PW and BMW must be appropriately disposed of; else, this virus will trigger a garbage pandemic. [6]

Effective biomedical waste management is critical for safe environments and healthy individuals. Poor biomedical waste management is a community health risk. Biological waste must be handled in a safe and consistent manner. [7] Hospitals and other healthcare facilities have a "duty of care" towards the environment and the public, as well as specific obligations regarding the waste they produce (i.e., biomedical waste). Negligence in the management of biomedical waste has a tremendous negative impact on human health, the environment, and both natural and financial resources. [8]

Many pathogenic and dangerous elements make up this form of garbage. Healthcare workers unavoidably need to be knowledgeable about BMW and its management and to have the right approach regarding them. Dangerous or potentially infectious waste, such as medical, research, or laboratory waste. There is a good chance that improper treatment of BMW can infect healthcare personnel, patients who use the facilities, as well as the surrounding and community. General, pathological, radioactive, chemical, infectious, sharps, pharmaceutical, or pressurised wastes are some categories under which BMW might be classified. For the correct handling and administration of BMW, India has created guidelines. Every healthcare institution, according to the 2016 Biomedical Waste Management Regulations (BMWM Rules), must take every necessary step to guarantee that BMW has no harmful consequences on human or environmental health. [9]

Even when there are rules that are followed, there are certain problems that continue. In order to achieve effective and secure biomedical waste management, this study offers insights into the difficulties faced by hospitals and 3PL in managing biological waste and presents practical mitigation techniques that if put into practise will generate positive outcomes.

CHAPTER 3
RESEARCH METHODOLOGY

3.1 RESEARCH METHODOLOGY

3.1.1 RESEARCH DESIGN:

A qualitative research design will be used in this study. To acquire information on the challenges in managing biological waste are encountered, through in-person interviews with 3PL and hospital professionals.

3.1.2 SAMPLING:

Purposive sampling was used as a method to identify volunteers with experience and knowledge of managing biomedical waste.

3.1.3 DATA COLLECTION:

Personal interviews were conducted with the selected participants.

3.1.4 DATA ANALYSIS:

The SCOR Method was used to categorise the interview data, and the Risk Matrix was used to rank the risks.

3.1.5 ETHICAL CONSIDERATIONS:

Ethical considerations were followed throughout the study. Informed consent was obtained from the participants. The privacy and confidentiality of the participants will be maintained.

3.1.6 LIMITATIONS:

The limited sample size, the use of purposive sampling, and the study's concentration on a particular geographic area are a few of the study's drawbacks. When evaluating the study's findings, these restrictions need to be considered.

3.1.7 SIGNIFICANCE:

By highlighting the difficulties experienced by hospitals and 3PL providers in managing biomedical waste, the study will add to the body of knowledge on the management of biomedical waste in India. The study's findings will be helpful in formulating plans and regulations to enhance the management of biomedical waste in the healthcare sector.

CHAPTER 4
RESULTS

4.1 RESULTS

The entire result component is separated into two sub-sections, the first of which covers the risks identified at hospitals, followed by categorizing them using the SCOR model, prioritizing them using the risk matrix, and identifying the top five risk factors at the endpoint. While the second part of the study covers the same at 3PL providers, the ultimate objective of this component of the study is to be able to identify the top 5 risk factors associated with both hospitals and 3PL providers, which if addressed could benefit the entire biomedical waste management system.

4.1.1 AT HOSPITALS

4.1.1.1 Risk identified at Hospitals-

(a) Segregation of waste
(b) Staff training
(c) Keeping track of the quantity filled in dustbins
(d) Dedicated team for bio-waste management
(e) Quality polythene usage
(f) Preventing dustbins from overfilling
(g) Reporting of accidents
(h) Storage
(i) Cost
(j) Public perception
(k) Regulatory compliance
(l) Coordination with third-party providers
(m) Equipment and technology for management
(n) Volume produced
(o) Human errors
(p) Security Concerns
(q) Changes in regulations
(r) Limited resources

(s) Cultural and language barriers

(t) Geographic location

4.1.1.2 Applying SCOR model to categorise the risks

4.1.1.2.1 PLAN

(a) Public perception

(b) Regulatory compliance

(c) Changes in regulations

(d) Limited resources

(e) Cultural and language barriers

(f) Geographic location

4.1.1.2.2 SOURCE

(a) Quality polythene usage

4.1.1.2.3 MAKE

(a) Segregation of waste

(b) Staff training

(c) Keeping track of the quantity filled in dustbins

(d) Dedicated team for bio-waste management

(e) Preventing dustbins from overfilling

(f) Volume produced

(g) Equipment and technology for management

4.1.1.2.4 DELIVER

(a) Coordination with third-party providers

4.1.1.2.5 RETURN

(b) Reporting of accidents

(c) Security Concerns

4.1.1.3 Applying Risk Matrix for risk prioritization

The matrix below was used to re-categorize the above-mentioned risks based on their likelihood of occurring vs. the impact they might have on biomedical waste management.

Likelihood/Impact	Negligible (1)	Minor (2)	Moderate (3)	Major (4)	Catastrophic (5)
Rarely (1)	Low	Low	Medium	High	High
Occasional (2)	Low	Medium	Medium	High	High
Frequent (3)	Medium	Medium	High	High	High
Regular (4)	Medium	High	High	High	High
Almost certain (5)	High	High	High	High	High

Table 4.1 Risk Matrix for Hospital

Risk	Likelihood	Impact	Risk Score
Segregation of waste	5	5	25
Staff training	4	5	20
Keeping track of the quantity filled in dustbins	5	4	20
Dedicated team for bio-waste management	3	4	12
Quality polythene usage	2	3	6
Preventing dustbins from overfilling	2	3	6
Reporting of accidents	2	4	8
Storage	3	3	9
Cost	3	2	6
Public perception	3	3	9
Regulatory compliance	3	3	25
Coordination with third-party providers	2	4	8
Equipment and technology for management	3	4	12
Volume produced	3	3	9
Human errors	3	4	12
Security concerns	2	5	10
Changes in regulations	3	3	9
Limited resources	3	4	12

Cultural and language barriers	4	3	12
Geographic location	3	4	12

Table 4.2 Scoring of risks identified at hospitals

4.1.1.4 Based on the risk scores given above, the top 5 risks in descending order of priority are:

(a) Segregation of waste
(b) Staff training
(c) Keeping track of the quantity filled in the dustbin.
(d) Dedicated team for bio-waste management
(e) Equipment and technology for management

4.1.2 RESULTS FROM 3 PL PROVIDER

4.1.2.1 Risk identified at 3PL

(a) Segregation of waste
(b) Reporting of accidents
(c) Non-compliance with regulations
(d) Lack of expertise
(e) Damage to equipment and technology
(f) Transportation risks
(g) Security concerns
(h) Lack of transparency
(i) Cost overruns
(j) Cultural and language barriers
(k) Inadequate disaster preparedness
(l) Inadequate quality control
(m) Limited resources

(n) Inefficient collection and segregation

(o) Inadequate training
(p) Dependence on a single 3PL provider
(q) Lack of environmental sustainability
(r) Inadequate record-keeping

4.1.2.2 Applying the SCOR model

4.1.2.2.1 PLAN

(a) Lack of expertise
(b) Non-compliance with regulations
(c) Inadequate disaster preparedness
(d) Dependence on a single 3PL provider

4.1.2.2.2 SOURCE

(a) Segregation of waste
(b) Inefficient collection and segregation
(c) Inadequate training
(d) Lack of environmental sustainability
(e) Cultural and language barriers
(f) Inadequate quality control
(g) Inadequate record-keeping

4.1.2.2.3 MAKE

(a) Damage to equipment and technology
(b) Cost overruns

4.1.2.2.4 DELIVER

(a) Reporting of accidents
(b) Transportation risks
(c) Security concerns
(d) Lack of transparency

(e) Limited resources

4.1.2.2.5 RETURN

(a) N/A

4.1.2.3 Applying Risk Matrix for risk prioritization

The matrix below was used to re-categorize the above-mentioned risks based on their likelihood of occurring vs. the impact they might have on biomedical waste management.

Likelihood/Impact	Negligible (1)	Minor (2)	Moderate (3)	Major (4)	Catastrophic (5)
Rarely (1)	Low	Low	Medium	High	High
Occasional (2)	Low	Medium	Medium	High	High
Frequent (3)	Medium	Medium	High	High	High
Regular (4)	Medium	High	High	High	High
Almost certain (5)	High	High	High	High	High

Table 4.3 Risk Matrix for 3PL

Risk	Likelihood	Impact	Risk Score
Segregation of waste	5	5	25
Reporting of accidents	2	5	10
Non-compliance with regulations	4	5	20
Lack of expertise	3	3	9
Damage to equipment and technology	2	4	8
Transportation risks	3	4	12
Security concerns	4	4	16
Lack of transparency	4	3	12
Cost overruns	3	4	12
Cultural and language barriers	4	3	12
Inadequate disaster preparedness	2	5	10
Inadequate quality control	3	4	12
Limited resources	4	3	12
Inefficient collection and segregation	3	4	12
Inadequate training	3	3	9
Dependence on a single 3PL provider	2	4	8
Lack of environmental sustainability	4	5	20
Inadequate record-keeping	3	3	9

Table 4.4 Scoring of Risks Identified at 3PL

4.1.2.4 The risks that fall into the high-risk category were found to be:

a. Segregation of waste
b. Non-compliance with regulations
c. Reporting of accidents
d. Lack of environmental sustainability
e. Inadequate disaster preparedness

CHAPTER 5
DISCUSSION

5.1 DISCUSSION

5.1.1 Risk mitigation strategies that can be used at Hospitals

5.1.1.1 Segregation of waste:

According to the study, the segregation of waste was one of the most significant dangers, so below are some recommendations that can help hospitals minimize such risks:

(a) Establishing a sound waste management strategy that includes sorting various waste categories in accordance with governmental regulations.
(b) In compliance with the regulations, providing distinct bins for various trash categories (such as hazardous and non-hazardous garbage, sharp waste, etc.) and clearly labelling them as to what they contain.
(c) By offering ongoing training to the hospital's employees on proper waste segregation and the significance of having and sticking to a waste management plan.
(d) Regularly monitoring the entire process and conducting timely audits to see whether the system is in conformity with the plan can be very beneficial in reducing such risks.

5.1.1.2 Staff training:

The study I conducted revealed that staff training was the second-most significant risk, so the following are some approaches hospitals can use to reduce such risks:

(a) By routinely constructing a thorough staff training program that covers instruction in garbage management, infection control, and other pertinent subjects that are crucial for controlling waste generated.
(b) By making all of these training necessary for the entire staff since it's likely that some of them might skip them; also, hospitals should offer refresher training as needed.
(c) As these wastes can include sharp and infectious materials, such training ought to include how to utilize personal protection equipment while handling them.

5.1.1.3 Keeping track of the quantity filled in the dustbin:

The handling and management of hospitals may be greatly impacted by the overfilling of garbage containers, so below are some approaches to minimising these hazards:

(a) It can be fairly helpful to track the garbage that is placed in the dustbins by installing waste monitoring devices that keep track of how much is put there.
(b) Such systems require regular checks, analysis of the data produced by them can give the results like the pattern or the amount of the waste produced every hour.
(c) With the help of such data, forecasting can be done correctly to determine the precise time when the garbage will be full and planning can be done accordingly.
(d) These data can also be helpful for locating systemic faults, which can improve the effectiveness of waste management.

5.1.1.4 Dedicated team for bio-waste management:

The study found that most of the hospitals don't have the dedicated team for their waste management and that contributes to a great extent in the waste management at hospitals, below are mentioned some points that can help to mitigate such risks:

(a) Designating a crew solely responsible for waste management on the premises.
(b) Providing the necessary personal protective equipment and ensuring sufficient and ongoing training related to waste management best practices.
(c) It's essential to provide them with all the tools they need to handle the waste produced, and doing so can be quite beneficial

5.1.1.5 Equipment and technology for management:

The study also found majority of the hospitals were not equipped with the proper technology and the equipment's to manage the waste effectively and hence the risk was found to be one of the major one, below are mentioned some points that might help to minimize such risks-

(a) Regular investment in appropriate waste management equipment and technologies is key to manage the whole process effectively and efficiently.
(b) Regular maintenance and repair of such equipment's and technologies can be quite helpful.
(c) By making the rule/law regarding the standard of the equipment and the technologies should be used by hospitals to manage waste by government can play a major role.

5.1.2 Risk mitigation strategies that can be used at 3PL:

5.1.2.1 Segregation of waste:

(a) Conduct routine audits and inspections of waste management procedures to confirm adherence to all applicable rules and legislation.
(b) Educate and teach all staff members on correct trash segregation and disposal practices.
(c) Create and put into action a waste management plan with detailed instructions on waste collection, transportation, and disposal.
(d) Periodically examine waste management procedures to spot any problems or violations and take necessary corrective action.

5.1.2.2 Non-compliance with regulations:

(a) To ensure compliance with all applicable laws and regulations, develop and implement a compliance framework that consists of policies, procedures, and training.
(b) Conduct routine audits to check for obedience to regulations and find any areas where it isn't.
(c) Educate and teach all staff members about the laws that govern how the firm operates.
(d) Assign a compliance officer or team to oversee and manage compliance with laws and make sure that any violations are promptly reported.

5.1.2.3 Reporting of accidents:

(a) Create a procedure for reporting incidents that is clear and simple and involves rapid notification of all pertinent authorities and impacted parties.

(b) By providing the continuous trainings about how to report any accident might serve the purpose.

(c) By developing a full extended plan which explains that what to do in the situation of any emergency and covers all the answers of the questions that might be asked related to any accidents.

5.1.2.4 Lack of environmental sustainability:

(a) To ensure environmental sustainability, develop and implement an environmental management system (EMS) that consists of policies, procedures, and training.

(b) Conduct routine audits to keep track of environmental sustainability practices and find any areas that could use improvement.

(c) Educate and teach all employees about sustainable environmental practices, such as waste minimization, energy saving, and pollution control.

(d) Establish environmental sustainability goals and monitor your success in reaching them.

5.1.2.5 Inadequate disaster preparedness:

(a) Develop and put into effect a disaster preparedness strategy that outlines how to handle several sorts of emergencies, such as natural disasters, cyber-attacks, and supply chain disruptions.

(b) Test the disaster preparedness plan on a regular basis and look for any areas that could use improvement.

(c) Educate and inform all staff members about disaster preparedness protocols and their roles and duties in the case of a crisis.

(d) Establish a communication strategy that outlines how to notify all parties in the event of a disaster.

CHAPTER 6
CONCLUSION

6.1 CONCLUSION AND RECOMMENDATIONS

The successful management of biomedical waste is a complicated and diverse issue that needs careful planning, coordination, and execution across multiple departments and stakeholders, it may be deduced from the examination of the dangers found in hospitals. The dangers noted emphasise the significance of establishing a thorough and integrated strategy for managing biomedical waste that takes into account both internal and external concerns.

The top five risks are waste segregation, staff training, monitoring the amount of trash placed in trash cans, a dedicated team for managing bio-waste, and tools and technology for management, listed in decreasing order of importance. To reduce any negative effects, these risks need to be handled immediately and effectively.

Significant dangers associated with third-party logistics providers (3PL) in the management of biological waste are also noted by the investigation. The hazards mentioned include breaking the law, a lack of knowledge, destroying tools and technology, dangers associated with transportation, and insufficient training. Hospitals must work closely with 3PL providers to make sure that all rules and laws are followed, that proper training is given, and that clear communication routes are created to reduce these risks.

Based on the analysis, the following recommendations are proposed to improve biomedical waste management:

(a) Develop and execute a comprehensive biomedical waste management approach that involves all parties and departments.
(b) Regularly train and educate staff members about ensuring correct waste segregation and disposal.
(c) Keep a close watch on the amount of garbage produced and take the necessary precautions to avoid overfilling garbage containers.
(d) Establish a specialized team for handling biological waste to ensure efficient waste treatment and disposal.

(e) Make investments in high-quality polythene usage, waste management machinery, and technology to lower the likelihood of human mistakes and mishaps.

(f) Maintain open lines of contact with 3PL providers in order to guarantee compliance with rules and regulations.

(g) Continually evaluate the performance of 3PL providers to identify potential areas for improvement.

(h) Develop strategies for addressing emergencies and disasters associated with the management of biomedical waste.

(i) Establish environmental sustainability goals and encourage the use of eco-friendly waste management techniques.

(j) Establishing a database that maintains records of all hazards that might arise will aid in important decision-making linked to forecasting, route planning, and many other areas, and this will undoubtedly help in the effective and efficient management of biomedical waste.

Overall, great biomedical waste management is extremely important to the health of healthcare personnel, patients, and the surroundings. Hospitals and 3PLs can ensure safe and sustainable waste management practices that mitigate risks and create a healthy environment for all by applying the aforementioned recommendations.

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ANNEXURES

CHECKLIST OF BIO-MEDICAL WASTE PRODUCTION					
	CATEGORY				VEHICLE NO.
FLOOR	RED [kg]	YELLOW [kg]	BLUE [kg]	GREEN [kg]	
1st Floor					
2nd Floor					
3rd Floor					
4th Floor					
5th Floor					
Total [kg]					

CHECKLIST OF BIO-MEDICAL WASTE PRODUCTION												
	CATEGORY											
	RED			**YELLOW**			**BLUE**			**GREEN**		
Floor	Morning [kg]	Evening [kg]	Night [kg]	Morning [kg]	Evening [kg]	Night [kg]	Morning [kg]	Evening [kg]	Night [kg]	Morning [kg]	Evening [kg]	Night [kg]
1st Floor												
2nd Floor												
3rd Floor												
4th Floor												
5th Floor												
Total [kg]												