Original Research Article

Assessment of Hospital Waste Management Practices in the Federal Medical Centre Owo, Nigeria

Abstract

The issue of hospital waste management has been a global concern over the years, increase in population has tremendously led to increase in the demand for medical care facilities such as laboratories, diagnostic centres, pharmacy, chemist stores, maternity homes, morgues among others. Waste has been defined as any product or material that is not useful to the owner. Hospital waste has been categorized by (WHO) as infectious and non-infectious. Improper waste management waste management can deface the physical environment also another prominent issues that cannot be overlooked is the exposure of cleaners, health workers and patients to health risk such as hospital acquired infection, transfusion transmitted diseases, rising incidences of hepatitis B, and HIV, respiratory tract infection among others. Inadequate funding has led to shortage of facilities and human resources, poor land use planning and developmental control. This paper therefore assesses the hospital waste management practices in the Federal Medical Centre, Owo with a view to suggesting measures to improve effective waste management that will promote safety and conducive physical environment. This study adopted survey research design, primary and secondary data were sourced, a total of 269 sets of questionnaires was distributed, while 260 were retrieved. The study revealed that the waste management practices in the study are not satisfactory as indiscriminate dumping of infectious wastes and poor handling were found in the study area. This study therefore recommends adequate attention must be paid by the government and the hospital management.

Keywords

Hospital Waste, Waste Management, Waste Segregation, Collection, Disposal

1. Introduction

The increase in consumption habits, changing of life style utilization of destructive mixtures, and metropolitan exercises, such as economic, commercial, and industirial have impacted the quantitative and subjective qualities of civil solid waste. In recent decades, municipal solid waste has compromised the general wellbeing and the climate just as every one of the normal assets through broad creation and harmful compound outflows from landfills and incinerators **[32].** Waste has been defined as any product or material that is not useful to the owner [**10].** Waste is a fundamental result of human exercises, it is likewise the aftereffect of wasteful creation processes whose ceaseless age is a deficiency of indispensable assets hence is of importance in wealth creation **[13].**

Medical wastes are viewed as the second most dangerous squanders all around the world after radioactive waste [**6],** it includes different types of waste like sharps, human body parts, blood, synthetic squanders, drug squanders and medical gadgets.

Since the ages, hospital are known for the therapy of ill individuals yet are uninformed of the unfriendly

impacts of the wastes produced by them on human body and climate. Presently it is undeniably true that there are numerous unfriendly and hurtful impacts to the environment and individuals which are brought about by the emergency medical waste generated during the patients treatment. Clinic waste is a possible wellbeing risk to the medical services labourers, public, flora and fauna of the environment. [**2**] mentioned that inappropriate waste management can cause potential effects such as growth of worms, rodents, and insects in addition to unpleasant odors and it may lead to spread of diseases such as hepatitis, cholera, and typhoid. [**5**] declared that when the quantity and the complexity of the medical waste increases, the risk of conveying diseases through unsafe handling practices also increases such diseases as Hepatitis B and C and AIDS. Therefore, this study assesses the hospital waste management practices in the Federal Medical Centre (FMC) Owo with a view to suggesting measures to improve effective waste management that will promote a conducive physical environment, this could be achieve through the classification of waste generated in the study area.

2. Literature Review

The tremendous increase in population has trigger the rate of solid generation. Hospital wastes becomes a very serious environmental and public health threats. Hospital waste includes all the wastes generated by health-care activities and produced by a medical institution (public or private), a medical research facility or a laboratory World Health Organization[**31**]. Hospital wastes as used and unused materials procured from packaging such as wrappers from bandages and cutters, disposal items such as blood, tissues, sharps, cultures and various stocks of infectious agents.

The medical waste management in Phitsanulok province, Thailand, much emphasis was laid on improvement of hospital waste management. He went further to classify the waste and create the implementation structures at hospital **[27].** Numerous factors was unveil such as type of hospital, specialization, proportion of reusable items, and waste management plan were investigated in waste generation assessment. **[7]** carried out a research on management and disposal of medical waste in private hospitals in Fars province, Iran. In this study, the amount of different kinds of waste produced at hospitals were determined and a relationship between the weight of the waste generated and several factors were put into cognisance such as number of bed, economic, social and cultural status of the patients and the general condition of the area where the hospital was situated was found. Although the results did not confirm a statistically significant correlation between types of health services provided. The Federal Environmental Protection Agency (FEPA), of Nigeria [**15**] has further break down medical wastes as cultures and stock of infection agents and associated biological wastes, pathological wastes as tissues, organs and body parts, stocks of infection agents from research and industrial laboratories, placenta and production of human blood, sharp instruments used on patients such as needles, syringes, pipette, broken glasses and scalpels.

2.1. Concept of Sustainable Development

The definition of sustainable development, intergenerational equity recognizes the long-term scale of sustainability in order to address the needs of future generations **[26].** Furthermore, Sustainable development deals with the development that meets the needs of the present without compromising the ability of future generations to meet their own needs**. [31]**

The concept of sustainable development plays a prominent roles in the maintenance of economic advancement and progress while protecting the health of general public and ecological value, it also provides a framework for the integration of environment policies and development strategies" [**29**].

Developing countries are resource constrained when it comes to safe management of hospital wastes. Health-care waste contains potentially harmful micro-organisms which can infect hospital patients, health-care workers and the general public. Other potential infectious risks may include the spread of drug-resistant micro-organisms from health care establishments into the environment. Improper management of hospital waste potentially exposes health workers, such as waste handlers, patients and the community at large to infection, toxic effects and injuries, and risks polluting the environment. It is essential that all medical waste materials are segregated at the point of generation, appropriately treated and disposed of safely **[31].**

In recent years, concern over hospital waste has increased throughout the world. Negligence of hospital waste poses a public health risk. Therefore, appropriate Hospital Waste Management is a crucial issue for maintaining human and public health **[21].** Health care activities can generate different kinds of hazardous waste, mismanagement of these wastes can result in environmental and occupational health risks.

The Hospital Waste Management practices cover all processes from the point of generation of the wastes to the place it is disposed. Initial handling, collecting, transporting, disposing and monitoring of waste materials are collectively called waste management. The primary objective of waste management to reducing the amount and hazards of waste in order to create conducive, livable and friendly environment. Reusing the waste through the provision of secondary raw materials and use of the waste as energy resource are other objectives of waste management **[19].**

2.2. Hospital Waste Management in Nigeria

In developing countries like Nigeria, where many health concerns are competing for limited resources, it is not surprising that the management of healthcare wastes has received less attention and the priority it deserves **[1]** Unfortunately, practical information on this important aspect of healthcare management is inadequate and research on the public health implications of inadequate management of healthcare wastes are few and limited in scope **[1]**. Although reliable records of the quantity and nature of medical wastes and the methods of management to adequately dispose of these wastes has remained a problematic in many developing countries of the world, it is believed that several hundreds of tons of hospital wastes are deposited openly in waste dumps and surrounding environments, often alongside with general wastes **[3]**.

Generally, fast growing city in Nigeria, like most developing countries, lacked the infrastructure, as well as institutional capacity necessary to effectively manage medical wastes as part of the effort to enhance protection of human life and the environment from health hazards arising from improper management of hazardous waste **[23].** Recent studies in Nigeria has estimated waste generation of between 0.562 to 0.670 kg/bed/day **[17].** and as high as 1.68 kg/bed/day **[22]**. As reported in the literature, there may not be much of a difference in the way and manner wastes generated in various health care institutions are managed in Nigeria.

2.3. Methods of Waste Disposal

2.3.1. Sanitary Landfilling

In some developing countries, where hospitals lack the required means to treat wastes before disposal, direct landfilling is likely to be necessary for much of the produced materials **[8].** Although landfilling is recognized as a cost-effective means of disposing of any solid waste, studies have been conducted about HSW landfilling, especially in countries with large free lands **[18].** The main threats of this technique include the possible pollution of soil and groundwater, requirement for large land areas, and high residual volume of waste **[16].** Landfills or open dumps have been considered as one of the major challenges for groundwater resources because the leachate can release a high amount of pollutants into the groundwater resources.

For instance, the impact of leachate from an unlined landfill site filled by non-infectious hospital waste on groundwater quality was evaluated by **[20]** in India.

2.3.2. Incineration

Incineration is the broadest method used for the elimination of HSW in developing countries. In the literature, three critical types of hospital solid waste incinerators (HSWIs) were identified in the studied developing countries; controlled air, excess air, and a rotary kiln. Among these three types, the controlled air incinerator was the most used disposal method for HSW. Generally, the incineration method has an advantage in reducing the volume of waste and can decrease HSW up to 90% **[11].**

2.3.3. Microwave

Microwave method has widely been used in developed countries such as Canada, Japan, Korea, Philippines, United Kingdom (UK), and United States. However, because of the complexity and high cost, it has received only limited attention in developing countries. Using the microwaves in developing countries such as China and Brazil has been reported in the recent decade. **[12]** reported that by the end of 2012, 136 non-incineration treatment facilities such as high-temperature steam, chemical disinfection, and microwave had been used in China.

2.4. The Study Area

This study was carried out at the Federal Medical Center, Owo, located in Owo Local Government Area of Ondo State, Nigeria. It was formerly general hospital at Owo owned by the Ondo state government it was taken over by the Federal Government of Nigeria in 1989. Both the clinical and administrative activities commenced at 1994.

The hospital provides healthcare services at the primary, secondary and tertiary levels to the people within its catchment areas which are Ondo, Kogi, Edo, Ekiti and Osun States (Figure 2). It also receives patients from almost all the states of the Federation because it is situated a stone's throw from the highway that links Abuja to Lagos. It is also an approved training center by both the West African Postgraduate College and the National Postgraduate College to train Resident Doctors in some specialist area of Medicine. The centre has 25 medical and 7 non-clinical departments. It is a 300 bedded tertiary health center. The research population of the hospital is 1343. While the hospital total land area is estimated to be 58.5 hectares of land.

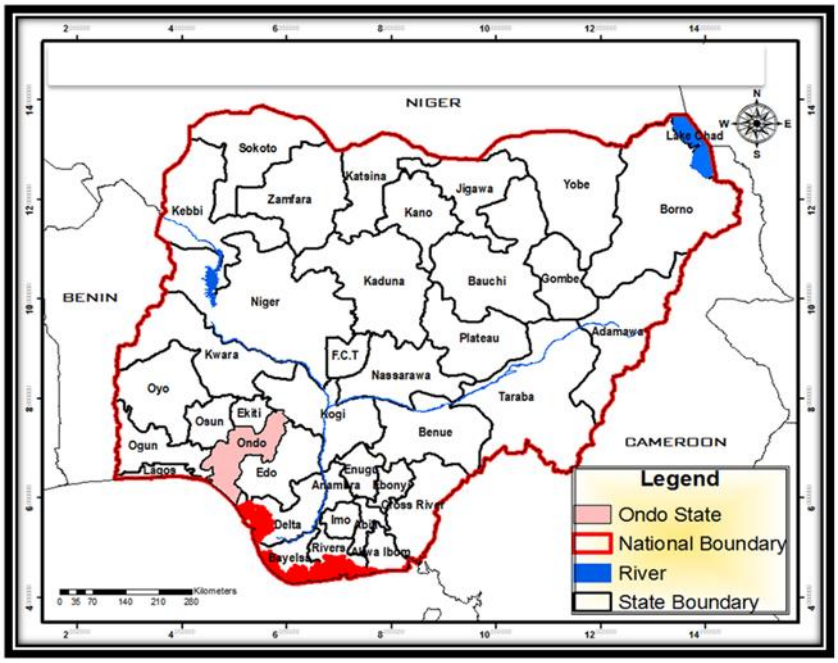

Figure 1. Ondo State Map within the National Setting.

Source: Ondo State Ministry of Physical Planning and Urban Development, 2021

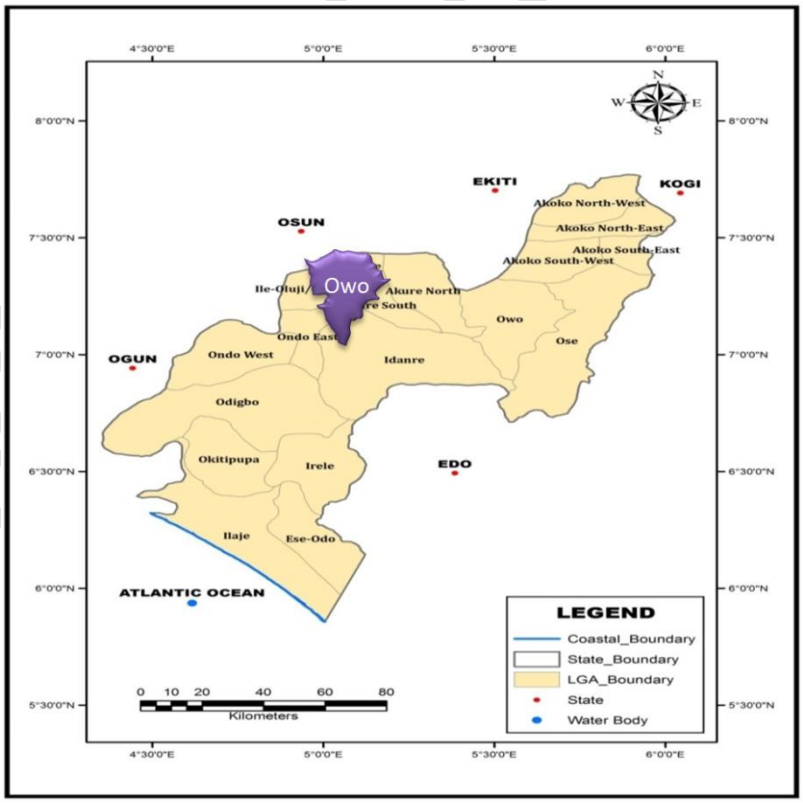

Figure 2. Owo within its Regional Setting.

Source: Ondo State Ministry of Physical Planning and Urban Development, 2021

3. Research Methodology

The research focused on the Assessment of Hospital waste management practices in the Federal Medical Centre Owo, Nigeria. Survey research design was employed in the research work. A reconnaissance survey was carried out to examine and familiarize with the current condition of hospital waste management in FMC, Owo. Primary data were collected on socio-economic characteristics of the respondents, classifications of hospital waste, the effects of hospital waste on fauna and flora component of environment of the study area. Primary data were obtained from Doctors, nurses, laboratory scientist, cytologist and non-medical staff. While secondary data were sourced from publish and unpublished journal, articles, dissertations, Google Earth. Also relevant maps were sourced from Ondo State Ministry of Physical Planning and Urban Development. Information regarding to the establishment of hospital, population figure, the names and number of departments wards and unit in the hospital were gotten from FMC Registry. 25 medical units/ Department were identified in FMC, Owo, while 7 department are non-medical. the total number of staff in the centre was found to be 1343 out of which 269 (20%) were taken as samples for the study. Effort was made to ensure that the various units formed part of the sample. Stratified random technique was adopted to administer questionnaires. Tables and charts were used in the presentations of the descriptive statistics. IBM Statistical Package for Social Sciences version 23 and Excel version 21 were used to carry out the analysis and presented through tables and charts where necessary.

4. Discussion of Findings

4.1. Classification of Hospital Waste

This section gives information on the categories of hospital waste generated in the study area, the following variable were assessed the equipment used for waste collection, the attitude of the hospital workers towards waste management.

Wastes generated by health care activities includes a broad range of materials, from used needles and syringes to soiled dressings, body parts, diagnostic samples, blood, chemicals, pharmaceuticals, medical devices and radioactive materials **[30].** Hospital wastes are the wastes generated by hospital or clinic laboratories as the result of surgeries, autopsies, or other medical procedures. Figure 3 revealed that general wastes rank as the highest type of solid waste generated in FMC, Owo. General wastes are non-infectious in nature such as cans/tins, used mattress and pillows, papers, food packaging, construction debris. (Figure 4) On the average hospital waste generated for FMC Owo was 1.4-1.8kg waste per bed/day. Out of this 78.3% are general waste which is just like the domestic waste and can be disposed of in municipal bin. The remaining 21.7% are the infectious and hazardous wastes which include dressing materials, sharps/disposables, radioactive, chemical, pharmaceutical (Figure 5) among others. They require special management by expertise of the health care professionals for proper waste management. In Nigeria the disposal of hospital waste in pits and open dumps is detrimental to ground water resources and even more dangerous to the entire physical environment. For example, the location of incineration is less than 40metres to histopathology department, while temporary waste storage facility is located at staff quarter.

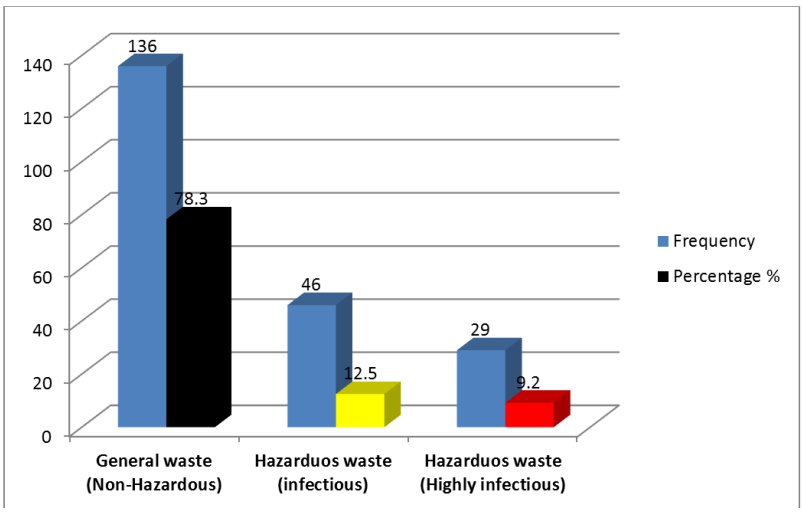

Figure 3. Classification and Generation of hospital waste in the F M C Owo.

Source: Authors' Field work, 2021

4.1.1. General Waste

Figure 4. General waste Generated at FMC Owo.

Source: Authors' Field work 2021

4.1.2. Hazardous (Infectious Waste)

This is the category of hospital waste that are hazardous waste is one which may be toxic, corrosive, shock sensitive, flammable, reactive, explosive, radioactive, containing infectious agents and sharps. These category of waste was accounted for 21.7%. the waste comprises of the contaminated body fluid contaminated, used Plaster of Paris (POP), Used face mask and gloves, used Intravenous Injection, giving sets, used blood bags, used catheters and urine bags among others.

Figure 5. Various types of wastes generated with different storage facilities.

Source: Authors' Field work, 2021

4.1.3. Hazardous (Highly Infectious Waste)

The hazardous wastes include infectious, radioactive, toxic or genotoxic items that can cause environmental and occupational health risks [**4**] Infectious materials containing dead tissue may conceal especially dangerous and communicable infectious agents. Such waste includes blood, body fluids, tissues, organs, body parts and human fetuses. A subcategory of pathological waste is anatomical waste, which consists of identifiable human or animal body parts, healthy or otherwise. Sharps are objects sharp enough to cut or puncture the skin, e.g. knives, scalpels and other blades, infusion sets, needles, hypodermic needles, saws, broken glass, nails, etc. They can transmit infections directly into the bloodstream. Sharps are generally treated as highly hazardous hospital waste regardless of whether they are contaminated or not. Regarding sharp waste, special consideration must be paid to: infusion, transfusion, and perfusion sets; butterfly needles; cannulas; disposable scalpel blades and razors; hemodialysis sets; laboratory slides; broken glass containers (bacteriological and clinical laboratories); ampoules containing solution residues, etc. These waste are mainly generated in the medical wards, clinics, operating theaters, laboratories and other medical department. They may seems to be few in quantity but if they are not properly managed, it may pose a severe risk to the health of hospital works, patients and the general public.

Figure 6. Segregated highly infectious waste taken to the incinerator house for burning.

Source: Authors' Fieldwork, 2021

4.2. Waste Management

Hospital wastes require proper management and disposal because improper handling could be very detrimental to the health of the host community. Unfortunately, Nigeria at present does not have a coordinated healthcare waste management system, especially in the area of segregation, collection, storage, treatment and disposal **[28].** Furthermore, improper disposal of hospital wastes alongside with noninfectious waste can expose the waste workers, animals and scavengers to serious health hazards **[24].** Moreover, toxic medication wastes can enter in food

chains and biological systems of human. This can lead to chronic and acute toxic effects among humans and can affect useful microorganisms, insects, animals and plants **[9].**

4.2.1. Waste Segregation

Segregation is key to efficient health-care waste management. It entails the separation of different types of waste (infectious, sharps, chemically hazardous, radioactive, nonhazardous) at the point of generation, according to the system of handling, treatment and disposal. Some systems, for example, may require separation of anatomical waste from other infectious waste due to differing methods of treatment and disposal. Segregating recyclable waste from other non-hazardous waste allows for waste minimization. Study revealed that most of the waste generated are not properly segregated, for instance used swabs and dressings, used cotton wool and surgical hand gloves were identified in the (Figure7). On this note, improper hospital waste segregation can convert the rest of general waste into hazardous waste if not properly managed.

4.2.2. Waste Collection

The types of containers used for medical waste segregation and collection were assessed, four types of containers are mostly used in FMC, Owo were ploythene bags, safety boxes, plastic waste bins and trolley. the results from this study showed that the hospital had 5 storage containers popularly known as communal waste bins to store waste temporarily. However, it was observed that indiscriminate dumping of general waste with hazardous waste was the common practices in the study area. (Figure 7)

Figure 7. Indiscriminate dumping of general waste and infectious waste.

Source: Authors' Fieldwork 2021

4.2.3. Waste Disposal

From the findings, various method adopted for waste disposal in the study area are sanitary land filling, incineration, open dumping and burning, open dump methods of waste disposal is commonly adopted in developing country like Nigeria. This method seems to be very cheap and accessible to the general public, but the implication can be very severe on the environment when burning of waste is taking place. The release of significant amount of greenhouse gases into the atmosphere such as harmful chemical like carbon monoxide, carbon dioxide and methane that can lead to severe respiratory disease and cancer. This method was adopted in the study area for final waste disposal off general waste. It can be deduced from figure 8 that 58.5% of the respondents using open dump and burning, 22.7% using incinerator and 18.8% sanitary land filling. From the findings of two incinerators were identified mainly for the treatment and disposal of wastes that contain harmful substances such as sharps, infectious and pharmaceutical waste (Figure 9). Though it was revealed that one was not in good condition due to poor maintenance. Pathological

or anatomical wastes such as abandoned corpses, amputated limbs and placentas. This is another type of hospital waste that requires proper management. It was revealed that whenever such waste is been generated, they are disinfected and preserved before final disposal. The disposal of human parts or abandoned corpses involve some legal processes before it can be done such as announcement through radio, television and on newspaper pages. If there is no responses from the general public, mass burial usually given through sanitary landfill. Currently, the three kinds of methods used are incineration, open dumping and landfilling, though the operations are far below international standard for hospital waste management.

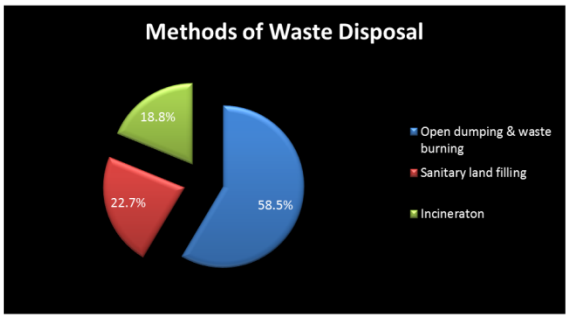

Figure 8. Various methods of waste disposal in the study area.

Source: Authors' Fieldwork 2021

Figure 9. The Hospital Incinerators.

Source: Authors' Fieldwork 2021

Figure 10. Open dump and waste burning.

Source: Authors' Fieldwork 2021

5. Recommendations and Conclusion

This study recommends urgent need for raising awareness and education on hospital waste issues also environmental health department are advice to make plans and introduce necessary policies for the proper collection, storage, transportation and safe disposal of the hospital waste, not only that there should be provision of sufficient funds for waste management, equip the cleaners with personal protective devices and employ qualified professional from the field of Urban and Regional Planning for proper land use planning while embarking on any physical project. Finally, proper hospital wastes management is very crucial to ensure health and environmental safety.

The increased hospital waste generation and improper management are in part due to increased population that outweighs the country capacity to deal with increased volumes of hospital waste. Also inadequate financial, human resources, relevant training of waste handlers on disposal practices and provision of adequate equipment are problems militating against proper waste management practice in Federal Medical Centre, Owo. Waste management, safety and environment cannot be overemphasized.

Hospitals and it facilities must safeguard the public health. However, the waste produced by the hospital if disposed of improperly, can pose an even greater threat than the original diseases due to the presence of concentrated forms of numerous risks including pathogenic and antibiotic resistant microorganisms **[25].**

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