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Analysis of the Current Management of Health Service Waste: A Case Study of a University Hospital in Manaus/AM

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Abstract*—The health waste management activity, whose steps range from the identification of generation sites to the environmentally appropriate final disposal, requires appropriate planning, where each step of the process needs to be performed properly to ensure worker safety and mitigate the impacts generated to the environment allied to the hospital costs. Current legislation, such as: Law 6.938/81, which deals with the National Environmental Policy, Resolution 222/2018, Law 12.305/2010, which establishes the National Policy on Solid Waste (PNRS), among others, guide this process. The general purpose of this case study is to analyze the current process of management and treatment of waste from the health service of the Hospital Universitário Getúlio Vargas (HUGV). To achieve these results, a quantitative/qualitative, exploratory descriptive research was carried out on the HUGV Waste Management Plan. The information was collected through an Observational Roadmap of the Current Flow, based on the ANVISA Board Resolution 222/2018. Consistently, the results obtained showed that the hospital cost of waste treatment is directly related to the management of HSW. With this, it was concluded that the management process carried out in the hospital is not fully in accordance with the current legislation, and that this non-compliance results in the high cost for the treatment and final destination of the HSW, demonstrating the importance and the need to update the hospital's PGRSS (Health Services Waste Management Program). The research makes a relevant contribution to the HUGV with suggestions for proposals for improvements in the work of managing HSW.*

I. INTRODUCTION

In Brazil, the CONAMA[1] Resolution 05/1993 defined minimum procedures for the management of solid health waste, which was improved, updated and supplemented in the procedures with the definition and guidelines so that health services could update their Health Services Waste Management Program - PGRSS. The increase in waste

generation has become a global concern in the socio-environmental scenario[2].

In this context, Anvisa[3] published Resolution 306 of 2004 regulating the Good Practices of Waste Management - PGRSS, guiding entities (both state, municipal and federal district) responsible for its inspection, with the help of local environmental agencies. In 2018, there was a review of the Resolution that gave rise to 222/2018 of the National Health Surveillance Agency[4].

The PGRSS is defined as a framework of management procedures that establish the correct management of waste generated in the establishment[5]. The hospital units (HU) elaborate and implement the management stages, based on current legislation, adapted to their physical, personal and financial infrastructure.

Waste is dangerous because it contains probable biological agents such as bacteria, fungi, viruses, chlamydiae, rickettsiae, mycoplasmas, parasites and other agents, cell lines, prions and toxins that spread contagious diseases in the environment.

This paper is justified by the need for urgent measures to adapt the PGRSS to the new Resolution 222/2018, in order to avoid secondary impacts on human health, the environment and hospital costs. Aveni[6] points out the fragility and delay in issuing efficient responses during the Covid-19 crisis.

The research was developed with the general purpose of analyzing the current process of handling and destination of waste from the health service of the Hospital UniversitárioGetúlio Vargas - HUGV, using as specific purposes: Identify the current places of generation and segregation of the generated HSW; analyze the flow of the segregation, packaging and treatment process currently carried out in the HSW; to relate the current management of HSW with hospital cost for treatment and final disposal.

II. BIBLIOGRAPHIC REVIEW

2.1 Classification of health service waste

Studies have shown that most Brazilian municipalities do not have a PGRSS and do not follow the regulations for their proper management[7]. These negligences also point out the problems of inadequate management and its consequences for the environment, the professional and patient safety, in this case due to absence or poor management[8].

Among solid waste, the HSW pose serious risks to health and the environment if handled improperly, because, in addition to having the presence of pathogenic organisms, they can compromise the quality of soil and water[9].

In addition to the Health Services Waste Management Plan, the resolution also presents the classification of waste into five groups, namely: group A (infectious); group B (chemicals); group C (radioactive) group D (common) and group E (sharps), according to the types of waste, their characteristics and examples presented in table 1:

Table 1: Classification of HSW pursuant to ANVISA Board Resolution No. 222/2018.

Group	Features	Example
A	Presence of biological agents that, due to their characteristics of greater virulence or concentration, may pose a risk of infection.	Culture mediums; disposal of vaccines; anatomical parts; viscera, leftover laboratory samples and their containers containing feces, urine
B	It comprises waste with chemical substances that can pose a risk to the environment and public health.	Expired, contaminated, interdicted, partially used medicines. Mercury and other heavy metal residues. Developer fluids and
C	Radioactive waste, i.e. any materials resulting from human activities that contain radionuclides.	Waste from groups A, B, C and D contaminated with radionuclides from clinical analysis laboratories, nuclear medicine and
D	Waste with no biological, chemical or radiological risk to health or the environment.	They are similar to household waste. Toilet paper and diaper, sanitary napkins. Leftover food from patients or leftovers from food
E	It involves sharp materials.	Objects and instruments containing sharp, sharp edges, corners or protuberances capable

Source: ANVISA Board Resolution 222 (2018).

III. METHODOLOGY

The research characterizes as qualitative/quantitative, according to Silva[10], qualitative research in health, as far as it can be seen, that several authors Bosi[11],Campos[12],

Silva, Mendes & Nakamura[13], Minayo& Guerriero [14],Ramos et al.[15], Ribeiro et al.[16], has been validating the legitimacy of nature and method, in a way that is consistent with the epistemological field.

As for the purposes, the research is descriptive and exploratory, the descriptions are prepared when there is already a robust framework of knowledge that accepts to accurately identify the variables that clarify the fact[17].

The sites of generation and segregation of waste in each clinic were researched, the information was collected through two Observational Roadmaps (RO) of the Current Flow based on ANVISA Board Resolution 222/2018 (Figure 2).

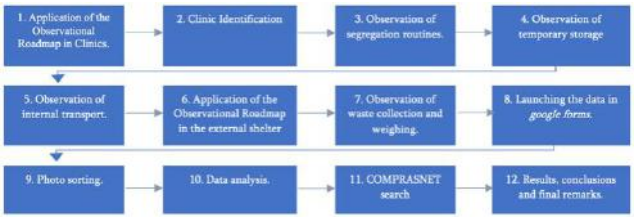

Fig.1: Flow of data collection.

Source: Authors, (2021).

The research took place on-site, during the day, following the normal routine of the wards. The spaces of the utility rooms, displacement of the collection cars, the internal logistics for the external shelter and the organization of the external shelter were verified. It was observed that the waste is stored in the rooms for each group and, subsequently, weighed (this is the case of waste from group A, B and E), which occurs when the contracted company carries out the external collection. The estimated average weight generated daily was collected from the spreadsheet of the person responsible for environmental management.

Financial data were collected on the Federal Government website COMPRASNET (public data). The study was carried out at the Hospital Universitário Getúlio Vargas - HUGV, Manaus-AM. HUGV plays a strategic role in the training of human resources and development and technology for health, providing its physical and technological infrastructure for practical training of students at the Universidade Federal do Amazonas - UFAM.

IV. RESULTS AND DISCUSSION

4.1 Waste of Group A

According to ANVISA Board Resolution No. 222 of 2018 and CONAMA, it is mandatory to segregate waste at the time of generation at source, waste must be subjected to microbial inactivation when necessary, at the unit itself. At HUGV, an outsourced company was hired to carry out the treatment and final disposal of this group, as it does not have the structure to carry out internal treatment.

Regarding Group A, the following observation was made: “Is the waste properly segregated at the time of generation?” (Figure 3). In all clinics, the generation of waste from the group was found, taking into account the observed locations, only in 20% of the clinics studied were observed properly segregation.

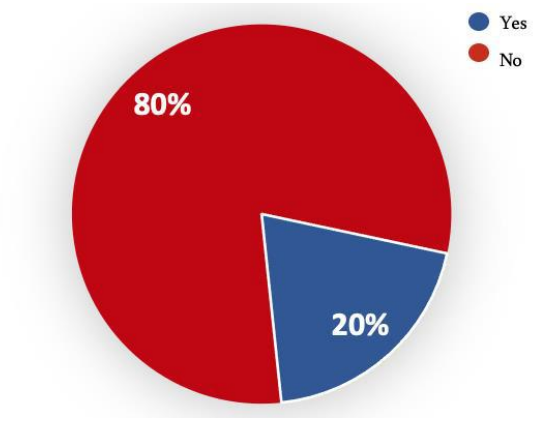

Fig.2: Is the waste properly segregated at the time of generation?

Source: Authors, (2021).

Segregation consists of separating or selecting waste according to its classification, actions must be carried out at the time of generation, at the origin. It was possible to verify that in some containers, common material is discarded, such as enteral nutrition bags (Figure 4), syringe packages (Figure 5), which is a matter of concern, since they will be weighed and sent to an outsourced company for treatment and final disposition.

Biological agents are microorganisms capable or not of causing some type of infection, allergy or toxicity in the human body, such as: bacteria, fungi, viruses, chlamydiae, rickettsiae, mycoplasmas, parasites and other agents, cell lines, prions and toxins. 2018). Empty Enteral Nutrition packages are considered common waste (figure 5), they are framed in Art. 40 of ANVISA Board Resolution 222/2018, as they do not represent a biological, chemical or radiological risk.

In the containers observed with infectious waste, 80% of the clinics do not properly segregate this waste, presenting mostly syringes and plastic packaging.

Fig.3: Common waste (enteral nutrition bag)

Source: Authors, (2021).

Fig.4: Common waste (packaging)

Source: Authors, (2021).

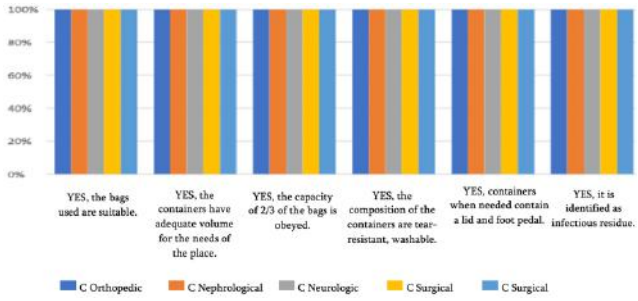

Fig.5: Quality of the containers used to segregate waste of Group A.

Source: Authors, (2021).

When observing the quality of the bags and containers, it was found that the bags used in the packaging are of good quality, thus avoiding the use of double bags, all are standardized with the symbol of infectious material and obey the capacity of 2/3, allowing to close securely, ensuring integrity and correct handling by cleaning personnel. ANVISA Board Resolution 222/2018 recommends that they must be red, but white is used, supported by GVIMS Technical Note No. 04/ANVISA.

Taking into account the size of the hospital and the distance between the generation sites and the external shelter, HUGV uses the utility room (space inside the clinics) for temporary storage. Observing the internal collection II (it is recommended in the hospital that the internal collection I is the collection of collectors from the point of generation and their storage in the temporary waste storage) the collection cars are removed from the corridors 3 (three) times a day **Waste of Group B.**

Waste of Group B is generated in all clinics participating in the study. When checking the group's waste containers, it was noted that there was a mixture with common waste, especially in the containers with medicine bottles. It was observed whether the waste was properly segregated at the time of generation (Figure 6).

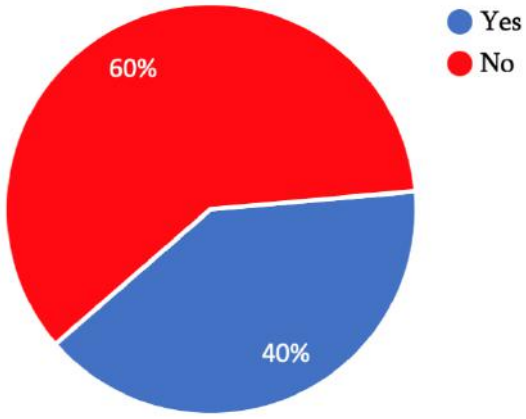

Fig.6: Is the waste properly segregated at the time of generation?

Source: Authors, (2021).

In 60% of the clinics, the segregation of medication vials is performed incorrectly, as the disposal of syringe packages is observed in the same container used for the glasses (Figure 7). Proper management of RSS, especially in hospitals, in any situation, contributes to minimizing the risks to professionals involved in the management and to the environment[18]. These items can be toxic, pathogenic and environmentally adverse due to their non-biodegradable and/or reusable nature[19].

It is important to note that generating establishments must verify whether or not the management of RSS is in compliance with these laws, especially regarding the correct segregation in the source of generation and final destination according to their classification Aduan et al.[20].

Fig.7: Container with medicine bottles

Source: Authors, (2021).

Medicine bottles are sent to the external shelter for temporary storage. When they reach the storage capacity of the place, the outsourced company is asked to collect it from the outside, which occurs every 15 days. The bags used for disposal of waste of group B are of adequate quality and size for the amount generated in the locations, not exceeding a capacity of 2/3.

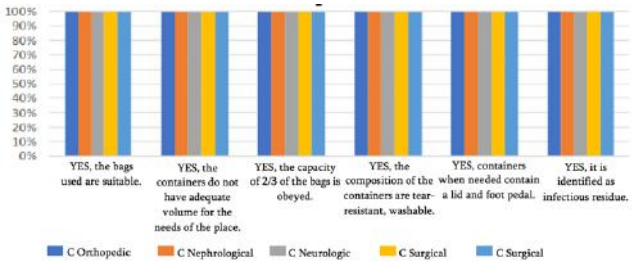

*Fig.8: Regarding the quality of the bags and containers used to waste disposal of Group B.*Source: Authors, (2021).

At the time of segregation, packages containing hormonal, antimicrobial, cytostatic, antineoplastic, immunosuppressive, digitalis, immunomodulatory, antiretroviral products were observed, all of which are sent to an external shelter for further treatment.

Of the five clinics studied, only 20% (Figure 9) have empty packaging segregation, whose components are not part of the classification according to Art. 61 of ANVISA Board Resolution 222/2018.

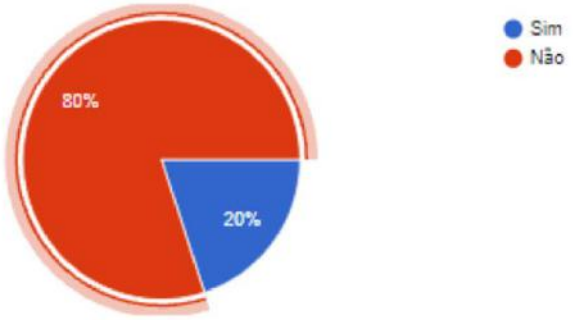

Fig.9: What percentage of segregation of primary drug packaging according to Paragraph 3 of Art. 61 of ANVISA Board Resolution 222/2018.

Source: Authors, (2021).

Fig.10: Segregation of empty solution bottle in the Nephrology Clinic

Source: Authors, (2021).

Fig.11: Empty solution bottle in the Clinic

Source: Authors, (2021).

It was identified that in the Nephrology clinic, the pilot project of "segregation process of empty solution packaging" was started, the initiative is supported by Art. 40 of ANVISA Board Resolution 222/2018, "HSW

(Health Service Waste) that do not present biological, chemical or radiological risk can be sent for recycling, recovery, reuse, composting, energy recovery or reverse logistics", and in Paragraph 3 of Art. 61 "only empty containers of non-hazardous chemical products can be sent to recycling processes".

Daily, after the use of the saline solution bottle, which was not contaminated, the nursing team breaks the equipment, removes the identification label and places only the saline bottle in the identified container (Figures 10 and 11); an average of 1.7k of empty solution bottles are segregated and weighed daily in the clinic. However, the Hospital does not send it for recycling, as the recycling symbol does not appear on the packaging of its products.

Another pilot project observed at the Nephrology Clinic is the reuse of Buffer Solution packages (acetic acid-H3CCOOH and acetate ion-H3CCOO- Figure 12) for packaging empty medication bottles (Figure 13)

Fig.12: Bottles of buffer solution (acetic acid (H3CCOOH) and acetate ion (H3CCOO).

Source: Authors, (2021).

Fig13: Re-used Buffer Solution Pack.

Source: Authors, (2021).

The buffer solution is widely used in the Clinic, and the packaging, when not reused, is donated to the collectors' cooperative (the company is selected through Electronic Auction). The initiative collaborates with the reduction of the negative visual aspect in the hospital environment.

The group's internal waste collection is carried out 3 (three) times a day. The packages are stored in the external shelter, are destined for external collection when they reach the storage capacity of the place.

- **Group C waste.**

No generation of residues from Group C was observed.

- **Group D waste.**

In all Clinics, Group D waste is generated, as shown in Figure 16. Waste from this group is classified as tailings, except when sent for reverse logistics, energy reuse, recovery, recycling, recovery or reuse.

Most of the waste in the clinics is leftover food, properly segregated in 100% of the clinics. However, it was observed that there is a large amount of residues in this group, especially after meals.

Fig.14: Container with residue from group D.

Source: Authors, (2021).

The containers used do not support the amount generated and withdrawals are not performed when necessary (Figure 14), it was observed that the bags are incorrectly placed in the containers.

In all clinics there were collectors for common waste, however the containers are of inadequate size for the amount of waste generated in the environments; the 2/3 capacity is not observed, leaving the packages overflowing, as can be seen in Figure 14.

We find good quality bags in all clinics, the composition of the containers allows washing, they are tear-resistant, they contain a lid and pedal, they are all identified as common waste.

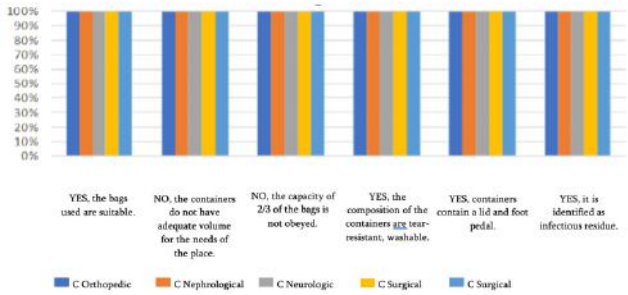

Fig.15: Regarding the quality of the bags and containers used to dispose of waste of Group D.

Source: Authors, (2021).

Collection of residue from group D is performed three times a day (Figure 19) in all clinics.

- **Group E waste.**

In all Clinics, Group E waste is generated. Boxes are placed in all wards and medication rooms.

When observing whether there is adequate segregation, it can be seen that in 60% of the clinics there was a mixture of materials in the boxes (Figure 16)

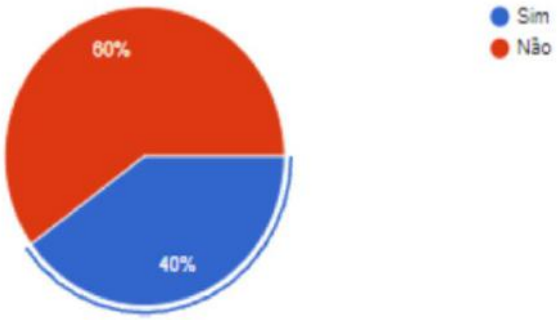

Fig.16: Group E waste is properly segregated at the source of generation.

Source: Authors, (2021).

Fig.17: Sharps box.

Source: Authors, (2021).

Fig.18: Group E waste.

Source: Authors, (2021).

The materials most seen in the boxes are syringes, gauzes, tubes of ointments and packaging (Figure 18). At the time of segregation - when carried out improperly - common waste, in possible contact with the contaminated ones, are considered infectious, which contributes to an increase in the amount of contaminated waste, increasing the risks for the personnel who handle them and for the population[18]. This situation is concerning, as this waste will be heavy, and the treatment has a significant cost for the hospital.

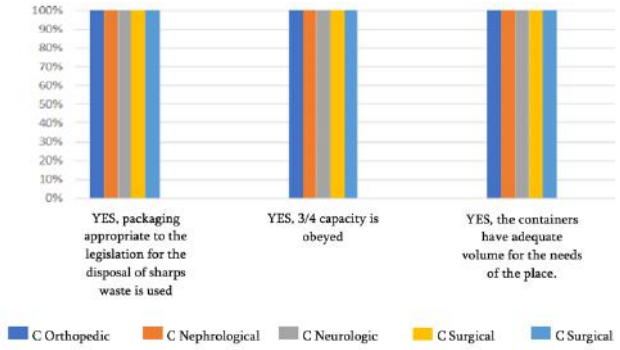

Fig.19: Regarding the quality of packaging (boxes) used for waste disposal

Source: Authors, (2021).

In all clinics, appropriate packaging is used for the legislation for the disposal of sharps, the capacity of 3/4 is obeyed, and the containers have adequate volume to the needs of the observed places, the boxes are identified with all the risks present in the content.

The internal collection of waste from group E are scheduled 3 (three) times a day, but the boxes with the sharps are only sent to the external shelter when they reach their maximum capacity of 3/4.

- **Space for temporary storage.**

In the Roadmap, it was verified whether "the spaces

intended for temporary storage (place for waste from group A, B and C, which can be in a specific place within the clinic itself) meets the demand of the place". In the HUGV, the area destined to this demand is the utility room, because the space does not hold the collection cars, leading the team to choose to store these cars in the corridor next to the elevators (Figure 20).

Fig.20: Temporary storage.

Source: Authors, (2021).

The legislation provides for the use of a multipurpose space, provided that, in addition to the minimum area of 6m^2, it also has an additional 2m^2 (HSW 222/2018). Due to the need for space, the Environmental Management team adjusted as follows: in the Nephrology clinic, the collection cars are located in the DML room (a room for storing utensils and cleaning material). In the Medical, Neurology, Orthopedics and Surgical Clinics, carts are in the aisles.

When observing the quality of the carts used in the transport of collection II, it was found that they comply with current legislation, are made of rigid material, with wheels and allow adequate cleaning.

The collection carts used for the internal transport of waste from the temporary shelter to the external shelter are made of suitable material (with wheels, cover and identification), the carts are transported through a service elevator, at defined times, in order to avoid conflict of schedules with the other services that meet the demand of the hospital.

According to Gomes[21], Health Institutions must prepare a PGRSS based on the characteristics and classification of waste, making it mandatory to prepare a plan to raise awareness of the correct management of HSW and environmental and occupational safety conditions (2018).

It is recommended at the Hospital that collection I is the process that begins at the time of segregation at origin, collection II refers to the logistics carried out between the temporary storage and the external shelter, and collection III is the removal of waste from the external shelter by the specialized companies until its final destination.

The external shelter, located on the ground floor of the hospital, has its dimensioning adequate to the internal demand, the frequency of collection of the urban municipal cleaning system and the routine of the outsourced company that performs the waste treatment. There are separate environments exclusively for groups A and E, B, D, thus avoiding cross-contamination (Figure 21).

Fig.21: External shelter environments, intended for waste storage.

Source: Authors, (2021).

Table 2: External storage of Group A, B, D and E.

Group A	It was verified in the guide that the space meets the daily demand. External collection is carried out once a day (Figure 26), to carry out the treatment of waste, the Hospital hired a specialized company, which is responsible for collection and external transport. The waste goes through an incineration process and then goes to the sanitary landfill. The company is located in the Terra Nova neighborhood in the city of Manaus/AM. As recommended in item I Article 6 of ANVISA Board Resolution 222/2018, there is an estimate of the amount of waste generated from Group A, which corresponds to the monthly average of 4,493.92k (four thousand, four hundred and ninety-three kilograms and ninety-two

Group B	The space destined to the temporary storage of group B meets the demand, the solid residues of the group (bottles of medicine glasses and other packages containing chemical products), are stored in the temporary shelter in boxes, and sent to the outsourced company for incineration every fifteen days (Figure 26). The final destination is the sanitary landfill. In compliance with item I Article 6 of ANVISA Board Resolution 222/2018, the estimate of the amount of waste generated from Group B corresponds to the monthly average of 237.11 k (two hundred and thirty-seven kilograms and eleven grams).

Source: Authors, (2021).

- **Group D**

The largest amount of waste generated is from group D, external collection is carried out once a day, and is carried out by the city hall and destined for the sanitary landfill. The monthly average of common waste sent to the sanitary landfill is 3,731.18k (three thousand, seven hundred and thirty-one kilograms and eighteen grams) (Table 3), an underestimated number, since the night collection is not heavy, however it serves as a parameter for adjustment actions in internal processes.

However, it was observed that there is a significant amount of group D waste materials that are not rejects, which can be recycled, and receive the destination as follows:

- Reuse: alcohol and buffer solution packages;

- Recycling: The hospital has a donation contract with a collectors' cooperative where the paper, cardboard boxes, cans, gallons of buffer solution and other plastics that do not contain hazardous or flammable waste are destined;

- Reverse logistics: No implementation project was observed, there are many materials such as batteries and fluorescent lamps, which can be collected by the supplier companies. However, there is a gap in this process since clear rules have not yet been defined with the material suppliers. By the rules, these residues are classified as Class I residues (NBR 10.004/2004).

The result demonstrates that the hospital is behind schedule with the implementation of actions according to the guidance manual of the Ministry of the Environment (MMA) that addresses the elaboration of Solid Waste Management Plans.

Table 3: Estimate of group D waste generated from January to August 2021.

Health Service Waste Group.	External Collection Frequency.	Is HSW weighing performed?	Monthly average estimate.
Group D	Once a day	Partially	3,731.18k
Monthly Average Waste			3,731.18k

Source: Environmental Management Commission/HUGV, (2021).

- **Group E**

The external storage meets the hospital's demand, the contracted company performs the collection once a day, where they are sent for incineration and final disposal in the sanitary landfill. The monthly average is 389.16k (three hundred and eighty-nine kilos and sixteen grams).

- **Hospital cost with health service waste management.**

As the Hospital does not have the structure to perform treatment in the unit, it was decided to outsource the service through a specialized company, defined through Electronic Auction, the contract has as its purpose the collection, treatment and adequate final disposal of HSW. The amount paid per kilo collected in the year is BRL7,0301 (Notice 64/2019-COMPRASNET).

Table 4: Estimate of group A, B, E waste generated from January to August 2021.

Health Service Waste Group	**External Collection Frequency**	**Is HSW weighing performed?**	**Monthly average estimate**
Group A	**Once a day**	**Yes**	**4,493.92k**
Group B	**Twice a month**	**Yes**	**237.11k**
Group E	**Once a month**	**Yes**	**389.16k**
Monthly Average Waste			**5,120.19k**

Taking into account the average generated per month of 5,120.19k (Group A, B, E), the hospital bears a monthly cost in the range of BRL35,995.47 (thirty-five thousand, nine hundred and ninety-five reais and forty-five reais and seven cents) with waste treatment.

It is evident that the volume of HSW is quite

expressive, and this amount is directly related to segregation at origin. Adequate segregation reduces the amount of contaminated waste generated, which results in a decrease in costs with treatment and disposal of this waste and the recycling of common waste[22].

Segregation, often inadequate, raises waste management costs for generating entities, because when common waste is discarded together with the infectious waste, the volume of contaminated material increases, increasing hospital costs, as these are paid per kilo of waste to be treated[23]. In Brazil, however, still around 27.5% of municipalities allocated their HSW without declaring the previous treatment given to them[24].

Improving the quality of services provided with a balance between economic, social and environmental costs is the biggest challenge for the hospital segment[25]. The results obtained show that the hospital cost with waste treatment is directly related to the management of HSW, that is, inadequate segregation, greater financial resources will be needed for treatment and final disposal.

V. CONCLUSION

With this research, it was possible to observe, through the literature analysis, the observational guides in the clinics and in the external shelter, pertinent legislation, and the guidelines of the policies of health and environment agencies, that the management process carried out in the hospital is not fully in accordance with the current legislation, and that this non-compliance results in the high cost for treatment and final destination of the HSW generated in the health care activity.

Materials such as: collection carts, bags, boxes with sharp holes and containers for segregation, necessary to comply with the process, comply with the legislation, and are even standardized in all clinics. This positive point allows the safety of the worker, avoiding work accidents.

In the area of the external shelter, the separate and identified spaces for the storage of waste according to legislation is another positive aspect of HUGV, avoiding cross-contamination and prioritizing the safety of collecting agents, allowing adequate organization at the time of transport to their respective destinations. The weighing performed serves as a parameter for the necessary adjustments and control of payments to the outsourced company.

The initiative to implement the project to segregate solution vials in the nephrological clinic is an important step in reducing costs, as it is a product used on a large scale within the hospital. In this thinking, it is a matter of implementing the protocol in other clinics, being the first step towards a feasibility study to send the bottles for recycling.

However, regarding the non-conformities aspects, the spaces for temporary storage of the collection carts were observed, which is a problem to be solved, since the place where they are allocated, in addition to bringing visual pollution, can represent a danger to passers-by who access the corridors. Searching for alternative solutions for this situation is a priority to comply with the current legislation.

The routine practiced by professionals demonstrates disagreements with what is recommended in ANVISA Board Resolution 222/2018, generating risks to workers' health and the environment.

The inadequate segregation observed in the clinics in this study could be minimized by implementing *on-site* training for professionals, in addition to raising awareness of the importance of the PGRSS to improve segregation, making it possible to add a culture of worker safety and concern for the environment.

When it comes to the management of hospital waste, it is possible to notice the large gap in knowledge and/or non-compliance with the protocols of health professionals, mainly according to the specificities of groups A, B and E. Ordinary waste was unnecessarily sent for treatment, which leads to an increase in treatment and final disposal costs.

The relation between inadequate management and hospital costs is directly related since common waste was evidenced in several containers destined for waste from Group A, B and E. Payment for treatment and final disposal is estimated per kilo generated, which can be reduced if correctly segregated at source.

From this perspective, it is extremely necessary that new training and awareness-raising actions are created to meet the current regulations regarding segregation and, in this way, contribute to the reduction of financial costs related to the treatment.

As a contribution, this paper suggests updating the hospital's PGRSS with the following actions:

1	Training and awareness-raising actions are created to meet the current regulations regarding segregation. However, in order for it to become a continuous action, it is necessary to insert the role of action multipliers in each clinic, with biannual or annual rotation. The professional would be awarded institutional recognition through a “Hospital Friend” certificate (or another nomenclature that represents the dedication of the server) with wide

2	Display in a visible place an explanatory folder on the classification of each waste generated so that it can be consulted at the time of segregation or affix the containers with the indication of the items that can be segregated.
3	Expand the solution bottle segregation project to all clinics where they are used, as it is a viable means of saving for the hospital. It can even create an internal classification to award the clinic with the highest quantitative acquisition of a segregated bottle. Verify the possibility of inserting in the notice for the acquisition of solution that the manufacturers meet the technical standard of ABNT (Brazilian Association of Technical Standards) NBR 13230, which defines the symbology for identifying plastic materials.
4	As for the space destined for the collection carts that are in the aisle, the team can carry out a study of the physical spaces that currently exist, in order to allocate them more safely or reduce the size of the collection carts so that they can be placed within the current area, but increasing the number of times they are collected.

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