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The socioenvironmental benefits and challenges of municipalites in medicines reverse logistics: The case of Rio Grande do Sul, Brazil

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[ARTIGO] GT 18 Performance dos governos subnacionais e locais na administração pública

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Abstract:

The reverse logistics of medicines in Brazil is regulated under the Federal Decree 10,388/2020. This normative mandates consumers deliver the unused medicines for human consumption back to the pharmaceutical retail system. In Rio Grande do Sul State, since 2019, municipaities are allowed to create their own municipal solidary pharmacies, whose pharmacicts decide between the redispensation to needy people and the correct discharge of donated medicies, after a visual inspection. We interviewed ten professionals in charge of the solidary pharmacies that were able to work in the whole State between July 2021 and December 2022. Full quantitative data were obtained from one single municipality of the 22 that run such program. The main finding is that these institutions provide a relevant socioenvironmental service, avoinding the incorrect discharge of tons of medicines. One pharmacy has correctly addressed 3.8 tons of medicines wastes from July 2015 to December 2023, and benefited almost 38,000 persons.

Key words: Reverse logstics. Medicines. Municipalities. Socioenvironmental benefits.

Palavras-chave: entre três e cinco palavras separadas por ponto.

Introduction and brief liteature review

The theme of medicines wastage in health institutions (MACRIDGE et al., 2007) and along the pharmaceutical supply chain (VIEGAS et al., 2019) is widely documented, although the Reverse Logistics (RL) approaches are mainly addressed to the optimization problems of the pharmaceutical supply chain (TALEIZADEH et al., 2020). The reuse of such types of goods has also been increasingly considered because governments such as the UK have testified significant losses in their health procurement systems, close to 300,000,000 of pounds/year (ALHAMAD et al., 2018). Scholars are lately trying to understand the incluination of the population to accept the reuse of medicines (ALHAMAD and DONYAI, 2020). Furthermore, this thematic has been considered under the lenses of informal, collaborative and circular economies (VIEGAS et al., 2022), going beyond the RL frame.

The global costs of medication purchasing have rocketed 141% from 2009 to 2019, reaching USD 1.25 trillion in this last year (ALSHEMARI et al., 2021). At the same time, around 30% of the world citizens cannot afford basic medicines (DUONG et al., 2018). In Brazil, the prices of medicines to consumers are 1.9 to 13.1 times higher than those charged in Sweden, for example (PATTERSON and CARROL, 2019). According to Vieira (2018), medicines purchasing represented 22% of the poorer Brazilian income until the 1990 decade. The federal Popular Pharmacy program, adopted by 2004, lessen the difficulties for medicines purchasing. As result, by 2018 the total average expenses in medicines has lowered to 8.5% of the Brazilians' poorer income (VIEIRA, 2018). However, the increasing costs of public medication procurement and the reduction of the per capita amount of investments in the Health Public System (SUS) in the last years (HARTMANN, 2022) resulted in a new cycle of affordability problems.

The RL of medicines is not equally regulated among the countries. In Brazil, after the

National Policy of Wastes Management has been approved in 2010 (BRAZIL, 2010), it took a long time for the inclusion of medicines in the RL system, which is described in the article 33 of the law (BRAZIL, 2010). In fact, medicines, as perishable, are hard to be regulated as returnable goods. Thus, in the middle of the Covid-19 pandemics, the Federal government enacted the Decree 10,388/2020, that regulates the medicines RL system in the whole country (BRAZIL, 2020). According to this decree, all unused medicines of human consumption shall be returned from the citizens to the retailers in order to be destroyed under incineraton or be sent to hazardous wastes landfills. Nonetheless, the decree does not clarify what is exactly an "unused" medicine. This expression was later defined by the Brazilian Normative (NBR) 16,457 of the Brazilian Technical Norms Association (ABNT, 2022) as all medicines that are no longer used by the consumers, regardless expired or not, or that present some quality nonconformity.

The medicines RL, in Brazil, is still incipient as a Federal system, but it is running diferently in several municipalities. In Rio Grande do Sul, the Southern Brazilian State, since 2019, each of the 497 municiaplities have the right to create their own solidary pharmacy in order to receive, redispense or give other correct final destination to medicines. It is possible because of the Law 15,339 (RIO GRANDE DO SUL, 2019). From the time it was enacted until December 2022, 37 municipalities have created or was about to create their solidary pharmacies. These establishments are usually settled close to the Basic Health Unities (UBS) and receive diverse types of medicines from a wide range of sources – citizens, clinics, physicians, pharmaceutical laboratories etc. They cannot redispense (donate to the citizens, after pharmaceutical inspection, and under medical prescription) the following types of medicines: expired, already manipulated, suspected of have been defrauded, ill-identified (with illegible name, or with name in foreign language, other than Portuguese, witouth express expiry date, without prescripetd dosage, fractionated, without concentration or batch identification; with stains, lumps, color problems, moisture, apparent deformation and other damage; with broken seals, and thermolabile. Such statements are common to the laws of the municipalities that already created their solidary pharmacies.

The main idea behind the local programs of medicines collection, inspection, and redirection (either for reuse or correct environmental disposal) is to provide socioeconomic support to citizens that cannot buy their own basic medicines - usually for chronic diseases control. Other motivation, not less important, is the pollution avoidance, once it is very common the incorrect discharge of medicines, in water (through toillets flushes), or in soil (once they are thrown in domestic wastes bins). The solidary pharmacies defy the federal orientation according to that all medicines must be collected only to the correct disposal. Nonetheless, the Brazilian Federal Constitution gives common competencies to the Federal, State, and municipal agents representative of the Executive Power to enact laws on health and environmental issues (BRAZIL, 1988). Considering such arguments and context, this article aims at explore and describe the main

outocomes and challenges of the solidary pharmacies in the scenary of the Brazilian RL system. The main question behind the research is: What are the results and gaps of the solidary pharmacies implementation in Rio Grande do Sul municipalities? Its relevance is underpinned in face of the lack of studies that take the medicines RL as both a tool for pollution prevention and a socioeconomic booster in each municipality. The paper is unfolded in the following sections: after this Introduction, a Methodological section is described, with respective procedures (2); the findings are presented (3); and they are discussed with a subsequent presentation of conclusion and recommendation for further studies (4).

2 Methodology and procedures

This research adopted an exploratory-descriptive approach, which is intended to investigate a not well known phenomenon, or phenomena about which there are not many studies or research tradition (FOX and BAYAT, 2007). This is the case of the RL practiced by the solidary pharmacies of Rio Grande do Sul State. Regardless RL being a relatively well studied field, when applied to medicines, the majority of the studies are addressed to the supply chain optimization operations between the stakeholders (VIEGAS et al., 2019). Differently from this approach, the RL in the public sector, mainly in health management, is intended to improve the socioenvironmental outcomes as a delivery of the public management to the citizens.

Before the research field has started, a questionnaire was elaborated and submitted to the Ethical Committee of the Federal University of Rio Grande do Sul (UFRGS), with the respective Free and Informed Consent Term (TCLE). Both documents received the approval and the Certificate of Presentation of Ethical Appreciation (CAAE) number 461.56621.7.000.5347/2021. The questionnaire was structures in three parts. The first included questions about the structure and procedure work of the pharmacies. Questions as how an when the institution was created, where is it placed, how many professionals work within the pharmacy, which is the average size, days and times of operation, targeted public, requirements for donations, and medicines inspection were arranged in the first part. The second part of the questionnaire grouped questions as the number of persons served by the pharmacy (by day, or week, or mont); types of medicines the pharmacy receives, and types of more demanded medicines by the served people; quantities that the pharmacy receives (in kilograms and respective monetary amounts), that it redispenses, and that is sent to the correct diposal (due expiration or not possibility of redispensation), perceived contribution of the pharmacy to the social and to the environmental causes. Finally, the third part of the questionnaire covered the realized barriers and leverages that the pharmacists observed in their routines as the possible conflict with the Federal Decree of the medicines RL; the problems observed in the medicines inspection; the need for special training to the pharmacists.

The identification of the municipalities that have implemented or were about to implement the solidary pharmacies in Rio Grande do Sul was possible because a nominal list with the contacts of the responsible pharmacists was available in the website of the Health Secretary of Rio Grande do Sul State. Until the middle of 2022, this list presented 22 pharmacies in the following cities: Arroio dos Ratos, Áurea, Barra do Rio Azul, Bento Gonçalves, Bom Princípio, Canguçu, Caxias do Sul, Charquadas, Farroupilha, Flores da Cunha, Getúlio Vargas, Ibirubá, Ivoti, Jacutinga, Lagoa Vermelha, Marques de Souza, Morro Redondo, Nova Petrópolis, Pareci Novo, Rio Grande, Santiago, Santo Antônio da Patrulha. Along the 2022 year, other 15 municipalites were added to this list, including Alvorada and Cachoeirinha, among other. From August 2021 to December 2022, all the pharmacies listed were contacted through call phones and e-mails.

As in May 2022, a video ellaborated by the researchers with the main questions was sent to all the pharmacists responsbile to these pharmacies, using the Whats'App social media. Also, new calls and e-mails were sent to all of them, and the Access to Information Law (BRAZIL, 2011) was applied to contact the Ombudsman service of each municipality. It was supposed that, while appealing to the Access to Information Law, the publoic managers would be compelled to send the informations. Also, the Ombudsman of Rio Grande do Sul State was contacted.

Until October 2022, there were only two answers registered by the researchers, then two municipalities were visited, so the number of answered questionnaires reached four. After the visits and the Ombudsman service using, other five municipalities sent answers. The time for data collection was closed in January 2023 with nine questionnaires answered. Only one municipality provided full quantitative data.

3 Findings

The main findings of the research can be found in the Figure 1. It contains the answers given by the pharmacists of the following municpalities:Barra do Rio Azul (the first to provide answers), Cachoerinha (visited), Canguçu, Farroupilha (the only to provide full quantitative data and the oldest establhishment), Ibirubá (sent incomple and uninteligible/unorganized reports), Getúlio Vargas, Ivoti, Jacutinga, Marques de Souza (visited). The municipality of Farropuilha was the only to accept a two hours interview carried out online with two pharmacists, enabling to complete the information provided by e-mail. The municipality of Ibirubá was ignored in the results because the respective pharmacist or manager sent just unstructured and not understandable data. So, the research ended with eight complete questionnaires answered, but with a noticeable scarcity of quantitative data.

The researchers realized that the solidary pharmacy program, as idealized through the State Law 15,339/2019, is neither well organized nor transparent, because the majority of the

municipalities refused to answer and/or to provide records of the medicines flows. It represents a huge gap to the public management of these municipalities, because the goods, once reaching the public pharmacies, are supposed to become public as well, therefore, they would suppose to be subject to public control, management, and transparency principles. Some public managers of the contacted pharmacies argued that they have no time to participate in the research, and many of them answered that they have not structure to provide records of the quantities that are received, inspected, resispensed, and sent to the hazardous wastes landfills. Another common gap is about the periods of the records (whether by semester, or by month), and about the unities they adopted (whether number of pills/capsules, or kilograms). Because there is not a technical norm to rule the activity of the medicines reverse flows that include the redispensing activity, such gaps end as a tricky question to the pharmacists.

Figure 1 – Main answers provided by the pharmacists

Municipality	**First bock answers**	**Second block answers**	**Third block answers**
Barra do Rio Azul	Started in August 2011. Placed in the Basic Health Unity of the municipality. Keeps one pharmacist and one assistant. Any person can have medicines since presenting a health prescription from the Brazilian Unified Health System (SUS). Work in dayly baisis, Monday-Friday, 7:30-1:30 a.m. and 1:30-4:50 p.m. Donations can be accepted in all collected points of the municipality	Service is not much required. The average of persons served is of 1/week, mainly females of 65-75 years-old (agriculture workers). Main demanded medicines: antihypertensive, multivitaminic. There is not records of the quantities of medicines that enter and are redispensed or sent to the landfill. Realizes the social and the environmental benefits.	The main barriers are operational, related to the transportation of medicines between municipalities (collaboration with other pharmacies). The Federal Decree 10,388/2020 is not a hurdle, but an incentive to the correct disposal of wasted medicines.
Cachoerinha	Sarted in November 2021. Placed in the Basic Health Unity of the municipality (200 square meters). Keeps six pharmacists, 9 asistants, 5 internships payed by the Municipality. Work in commercial time, daily. To receive medicines, the citizen must be resident in Cachoeirinha.	Has no information about the quantities of persons served, and about the amounts of medicines donated, redispensed, and sent to the correct disposal. Observes that the environmental prevention vision was improved after the pharmacy implementation.	Has no knowledge about the Federal Decree 10,388/2020. Missing better defined criteria for the register of medicines flows and other operational routines.
Canguçu	Satred in November 2019. Keeps one	Has no records of the quantities received or	Does not believe that the Federal Decree

	pharmacist and one assistant. Costs of the professionals amounted R$ 8,456.32 (up to 2022), payed by the municipality. Opens in daily bases from 9 a.m. to 5 p.m. Any citizen can have the medicines having a SUS prescription, regardless resident or not in the municipality.	redispensed, but controls the number of prescription that are received (did not informed the number of prescriptions it keeps). The main types of medicines it receives are for diabetes, hypertension, painkillers, vitamins	10,388/2020 goes against the activities of the solidary pharmacies.
Farroupilha	Stared in July 2015. It is placed close to the Basic Health Unity of the municipality.Has two pharmacists in charge of the work since December 2020. Works in daily basis in commerical time. Only residents in Farroupilha, with per capita income of 1.5 minimum wage and with age of 18 or above can receive the medicines, as long as they have a SUS medical prescription.	Redispensed 505,275 unities of medicines in 2022, which represented R$ 890,078.49. Served 11,034 persons in 2022. Quantities sent to correct disposal were 138,044 unities, representing R$ 432,125.65. Since July 2015, there were sent to correct disposal 3.79 tons of medicines wastes. The main reason of the program is to avoid environmental impacts mainly to the water, besides to serve needy people.	The main barriers of the program is lack of time to organize the work, to train professionals. Does not think that the Federal Decree 10,388/2020 represents a threat to the municipalities that run redispensing programs.
Ivoti	Started in April 2021. Has one pharmacist as main responsible. Placed close to the Basic Health Unity of the municipality. Opens in daily bases, in commercial time. The citizens must be resident in Ivoti and have a SUS prescription to receive medicines.	Have not full records. From May to August 2022 has received 80,892 unities (R$ 62,802) and redispensed 68,408 unities (R$ 52,933.70). Has no records on the quantities that are sent to the landfill. Realizes the relevance of this service to the environment.	Considers the inspection the more hard part of the work because it demands to much attention from the pharmacist. Consiers important that the pharmacist has continuous education and trainging for the pharmaceutical assistance. The Federal Decree 10,388/2020 is not a threat to the solidary pharmacies, but a national law for the solidary pharmacies would be important as well.
Getúlio Vargas	Started in October 2021. Keeps two pharmacists and an assistant. Receives medicines from several sources in the city and from other solidary pharmacies as well. Work in daily bases from	Receives manty types of medicines, mainly antidepressants and multivitamins, as well as medicines to tackle diabetes. Many children are served by the pharmacy. Redispensed	Did not answered.

	7:30 to 11:30 a.m. and 1-5p.m. For receiving medicines, the citizen must be a resident of Getúlio Vargas, and must have a SUS prescription.	17,000 unities since the beginning of the program until November 2022	
Jacutinga	Started in September 2021. Operates close to the Basic Health Unity of the municipality, with a pharmacist ans assistants. Works daily, from 7:30 a.m. to 5 p.m. Serves all citizens that present SUS prescription.	Serves an average of 20 persons by month, mainly citizens above 60 years old. High blood pressure medicine are the most demanded. The mian focus of the pharamcy is to avoid incorrect discharge of medicines.	Realizes that structural rules for the operation of the paharmacy are precarious. A national guideline for the solidary pharmacies is necessary. The Federal Decree 10,388/2020 is satisfactory to avoid incorrect medicines discharges.
Marques de Souza	Started in January 2022. It is placed close to the Basic Health Unity of the municipality, in 30 square meters. It keeps a pharamcist ans assistants. Work in daily basis from 8 a.m. to 5 p.m. To receive medicines, the citizen must have a SUS prescription and low income.	It has no records about the quantities received and redispensed, or sent to the landfill. The most common medicines that flows to this pharmacy are contraceptives, antihypertensives, vitamins and food supplements.	Did not answered.

(1)First block questions: time of the solidary pharmacy creation, placement, number of professionals working, average size, days and times of operation, targeted public, requirements for donations, and medicines inspection. (2) Second block:number of persons served by the pharmacy, types of medicines it receives/are more demanded, quantities it redispenses and send to the correct diposal, perceived contribution of the pharmacy to the social and to the environmental causes. (3) Barriers and levearges the pharmacists perceive in their routines and regarding the Federal Decree of Medicines Reverse Logistics.

4 Discussion, conclusion and recommendation to further research

The reverse flows of medicines for possible reuse has been discusssed for long time (MACKRIDGE al., 2007), but after the recent pandemics, many scholar are trying to renew the debate around the relevance of this theme (ALHAMAD etcal., 2018;ALHAMAD and DONYAI, 2020; ALSHEMARI et al., 2020; VIEGAS et al., 2022). It is justified mainly due the supply chain disruptions that took place in the pharmaceutical field (among others) that resulted in high costs to the public procurement of medication. In Brazil, the average socioeconomic profile of the population indicates a difficult condition to acquire basic medicines. This situation is partially attenuated by philanthropic action.

The arising of the solidary pharmacies in Rio Grande do Sul has helping many municipalities to develop and provide local policies for reducing socioeconomic unequalities and

to support better environmental conditions. This research was focused on the operational conditions, main outocmes and challenges of the solidary pharmacies. After 18 months of investigation screening 22 municipalities, only nine of them engaged in this research, and eight provided significant responses. The pharmacists analyzed the outcomes and gaps of their operations. It was possible to realize the lack of structure of such establishment, and the differences between the local and the Federal systems of medicines reverse logistics. According to the majority of the interviewed pharmacists, the way in which the federal policy of medicines RL is founded does not represent a threaten to the local systems; rather, the loal and the Federal policies complement each other. However, it is also highligjhted that the pharmacists need to be supported by more transparent policies and practices that enable the society to get data about the amounts of medicines that flow through the solidary pharmacies. Not only the lack of quantities (in physical and monetary amounts) are a problem, rather thant the better control of the classes of medicines that come from the society to the needy people. Having more accuracy about such data is crucial to design effective policies to the SUS pharmaceutical asssitance and to improve the quality of life and the environmental aspects of the solidary pharmacies programs. Thus, it is recommended that further research provide better strategies to these municipalities organize their work and improve their records. It could be work under the lenses of the participatory system of the SUS and other instances of the environmental policy system.

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