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Analysis of medication returns to the pharmacy in a high-complexity hospital in Rio de Janeiro

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Abstract

Objective: Analysis the profile and costs related to return of medication to a large hospital pharmacy. **Methods:** This retrospective observational study collected monthly data on medication returns from June 2023 to May 2024. Data were recorded in spreadsheets upon receipt of returns. Medications that were not reintegrated into pharmacy stock for various reasons were categorized using Microsoft Excel® and categorized by pharmaceutical form, pharmacological class, quantity, and unit value. Financial impact analyses were conducted to assess these losses for the hospital. **Results:** Of the average monthly total of US$7170,88 in medications returned to the hospital pharmacy, US$507,73 represented losses — medications that could not be reintroduced into the pharmacy stock. The substantial value of reused items emphasizes the importance of monitoring the return process. Additionally, it was observed that a majority of medications reintegrated into pharmacy stock were antimicrobials. Although this practice has provided financial benefits to the institution due to the high cost of these medications, it raises an important concern regarding potential treatment failures. The return of antimicrobials may be related to prescription errors, changes in the patient's clinical condition, or misdiagnoses. As a result, these factors significantly contribute to the non-administration of the medications and, consequently, their return to pharmacy stock. **Conclusion:** The results demonstrate the critical need for improving the hospital's medication return process to reduce losses and ensure greater medication safety for patients.

Key words: pharmacy service, hospital; economics, pharmaceutical; patient safety.

Análise da devolução de medicamentos à farmácia em um hospital de alta complexidade no Rio de Janeiro

Resumo

Objetivo: Analisar o perfil e os custos relacionados às devoluções de medicamentos à farmácia hospitalar de grande porte. **Métodos:** Estudo de caráter retrospectivo observacional de coleta mensal dos dados das devoluções de medicamentos, por meio de preenchimento de planilhas conforme o recebimento das devoluções no período de junho de 2023 a maio de 2024. Os medicamentos que, por diversos motivos, não foram incorporados ao estoque, foram compilados com o auxílio do software Microsoft Excel® e classificados de acordo com a forma farmacêutica, classe farmacológica, quantidade e valor unitário. A partir daí foram conduzidas análises sobre o impacto financeiro dessas perdas para o hospital. **Resultados:** Do valor médio de US$7170,88 em medicamentos devolvidos à farmácia hospitalar mensalmente, US$507,73 foram em perdas, ou seja, não puderam ser reintroduzidos ao estoque, enquanto o alto valor de itens reaproveitados demonstra a importância do monitoramento do processo de devolução. Além disso, observou-se que a maior parte dos medicamentos reintroduzidos ao estoque pertencem à classe dos antimicrobianos. Embora essa prática tenha proporcionado benefícios financeiros à instituição, devido ao alto custo desses medicamentos, ela levanta uma importante questão sobre possíveis falhas no tratamento. A devolução dos antimicrobianos pode estar relacionada a erros de prescrição, alterações no estado clínico do paciente e diagnósticos incorretos. Com isso, esses fatores contribuem significativamente para a não administração dos medicamentos e, consequentemente, para sua devolução ao estoque. **Conclusão:** Os resultados obtidos mostram a importância de aprimorar o processo de devolução no hospital visando evitar perdas e aumentar a segurança do uso de medicamentos pelos pacientes.

Palavras Chaves: serviço de farmácia hospitalar; economia farmacêutica; segurança do paciente.

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Introduction

Hospital Pharmacy plays a crucial role in the clinical, administrative, and financial structure of a healthcare institution, as it performs a range of functions related to medications and medical devices. These responsibilities have a significant impact on promoting patient health and managing hospital costs.[1]

Among the activities of the hospital pharmacy are storing, distributing, dispensing, and controlling medications and health products used by inpatients and outpatients. Additionally, it is responsible for fractionating and preparing medications. The policies and procedures governing these activities should be defined with the collaboration of the multidisciplinary team and existing committees.[2]

Medication expenses are among the highest costs for the proper functioning of a hospital, representing up to 20% of its total expenses, and are of great importance in treating most diseases. This underscores the need to implement measures to ensure the rational use of medications. One highly impactful measure in this context is the effective dispensing and/or distribution of medications within the hospital unit to avoid waste.[3]

The distribution of medications to various hospital departments should follow a schedule previously agreed upon with the services. This schedule should consider technical and administrative factors, including logistical considerations and those related to the quality of patient care.[4]

In the hospital context, medication distribution can be classified as centralized when the service operates from a single physical area or decentralized when multiple units handle requests. Additionally, this classification includes distribution systems by collective method, individualized method, unit-dose method, and mixed method.[5]

In the individualized distribution system, medications are dispensed according to the specific medical prescription for each patient. Furthermore, the unit-dose model, considered the safest for the patient, involves distributing medications ready for administration, as prescribed, and separated for each patient. The mixed system combines collective and individualized distribution methods.[6]

To further optimize stock management in any of these systems, an important tool to be used is the ABC curve. This tool classifies medications into three categories (A, B, and C) based on their importance and consumption. Category A medications represent a small percentage of total items but account for a large share of consumption value, requiring greater attention and control. Category B medications have intermediate importance, while Category C medications, although numerous, have less financial impact. This classification helps optimize stock management by focusing resources and efforts on the most critical items for the efficient operation of healthcare services.[7]

Returns involve the process by which medications dispensed to patients but not used are sent back to the hospital pharmacy. This procedure aims to optimize available resources and ensure the maintenance of quality care.[8] Returns can occur for various reasons, such as changes in prescriptions after the item was dispensed, patient discharge, bed changes, death, or any reason that prevented the medication from being used.

An effective approach to monitoring processes in a hospital pharmacy includes tracking quality indicators. This practice is essential for ensuring the safety and efficacy of treatments, enabling continuous performance evaluation.[9] Specifically, the medication return rate is a crucial indicator, allowing for process analysis and improvement, resource optimization, and waste reduction.

Thus, this study aims to analyze the profile and costs related to medication returns in a large hospital pharmacy.

Methods

This study is an observational, cross-sectional, and documentary research with a quantitative approach, analyzing all medication returns from the clinical units of a high-complexity federal hospital during the period from June 2023 to May 2024. In observational studies, the researcher depicts the scenario experienced by a specific population and quantifies factors without intervening.[10]

The study was conducted in a quaternary hospital located in Rio de Janeiro, which is a reference center for the treatment of medium- and high-complexity orthopedic diseases and surgeries performed through the Brazilian Unified Health System (SUS). The hospital's physical structure includes 21 operating rooms, 40 consultation rooms, 255 ward beds, 4 pediatric intensive care unit (ICU) beds, 16 adult ICU beds, 7 semi-intensive care beds, and 21 post-operative beds, as well as a Day Hospital with 18 beds and 3 operating rooms, totaling an area of 70,000 square meters.

The hospital pharmacy's stock sector is divided into bulk stock, where medications are received, stored, and collectively distributed to the central stock, which also serves the Satellite Pharmacies (Central Dispensing, ICU, Surgical Center) and ward requests; ambulatory pharmacy stock and high-cost stock. Medications for inpatients are distributed individually for a 24-hour period, divided into two 12-hour shifts.

When returns are delivered to the pharmacy, they are directed to the Pharmaceutical Supply Center (CAF), where they are visually inspected and classified as unsuitable or fit for reuse. The evaluation criteria include the identification and integrity of the packaging, expiration date, batch number, and storage conditions (for temperature- or light-sensitive medications). After evaluation, medications deemed fit for reuse are logged into the MV Soul® system and reincorporated into the pharmacy stock. Damaged or expired medications are separated and quantified for subsequent disposal. This procedure is conducted monthly by two pharmacy residents, who are also responsible for updating an Excel spreadsheet used to monitor the quality indicator related to this process.

The financial impact of these returns was analyzed using a quality indicator that calculates the percentage of returned items not reintroduced into the stock. This indicator is determined by dividing the total value of non-reusable medications, multiplied by 100, by the total value of medications returned to stock.

Returns that were not reincorporated into the stock were compiled using Microsoft Excel® and categorized by medication, pharmaceutical form, pharmacological class, quantity, and unit value. The financial value was calculated based on the average price available in the MV Soul® system corresponding to the year the medication was acquired.

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Based on the data collection, analyses were conducted on the financial impact of these losses for the hospital, considering the value of items that could be reintroduced into stock and the total value of returned medications. Additionally, financial analyses were carried out regarding medications classified under the hospital's "A curve" due to their significant financial impact.[7] This curve was constructed using the MV Soul® inventory management software based on unit cost and consumption data for the medications. The SoulMV system classifies medications using the ABC curve analysis, an essential tool for efficient inventory management. In this system, Group A items correspond to medications that represent 70% of the total consumption value, standing out for their high economic relevance. Group B includes those contributing between 30% and 70% of the total value, indicating moderate importance. Finally, Group C medications account for less than 30% of the total value and are considered to have a lower financial impact on inventory. This segmentation allows prioritizing the management of critical items, optimizing resources, and ensuring adequate availability.[11]

The study considered as eligible the main pharmacological classes of medications used in the hospital, according to its trauma-orthopedic surgical profile, which include antimicrobials and analgesics.

The method adopted in this research did not involve patient data, healthcare professionals, or external individuals; it was based exclusively on internal information to evaluate the service. Therefore, in accordance with RDC CNS No. 510/2016, approval from the Research Ethics Committee was not required, as per current guidelines.[12]

Results

After analyzing the data and evaluating the quality indicator, it was observed that, during the selected period, an average of $7,170.88 worth of medications was returned monthly to the hospital pharmacy. Of this, an average of $507.73 represented losses, meaning they could not be reintroduced into stock, as shown in Figure 1.
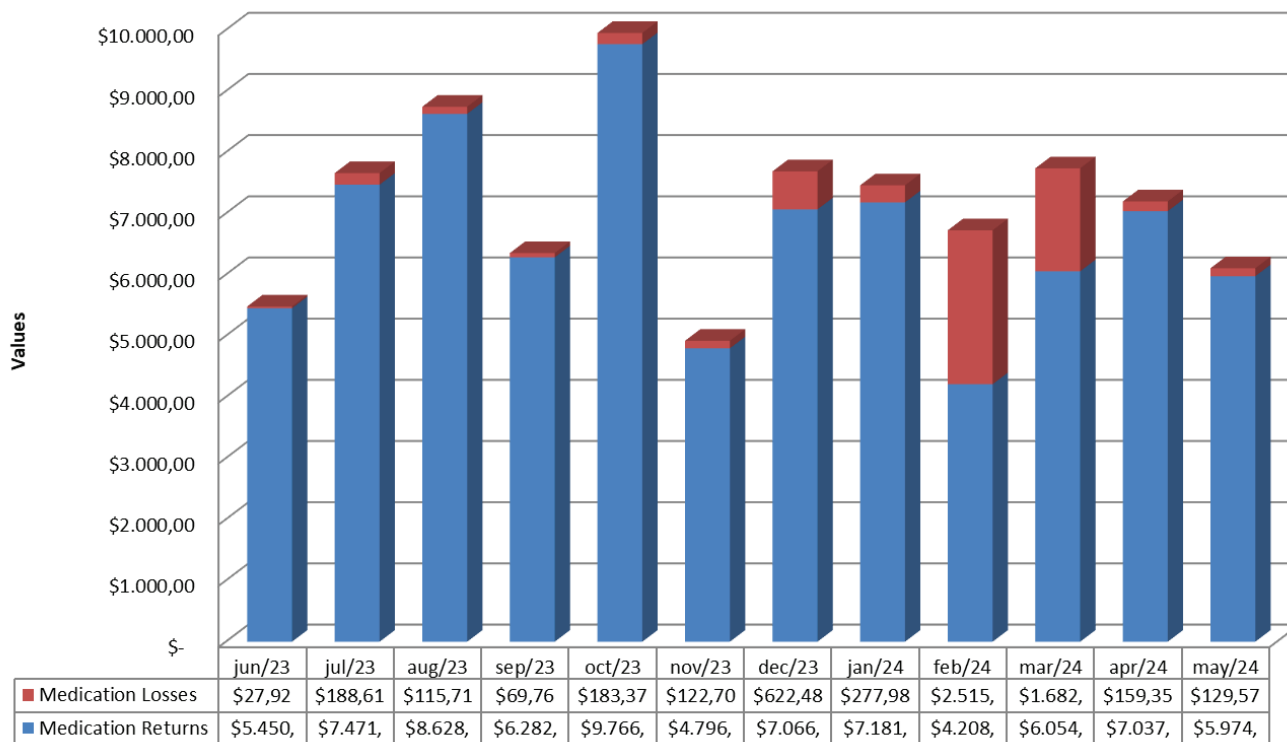
Among the returned medications, a significant proportion was deemed suitable for restocking. For instance, in June 2023, out of $5,484.41 worth of returned medications, $5,456.46 was reintroduced into stock. This trend persisted throughout the analyzed period, with April 2024 registering $7,197.67 returned and $7,038.30 eligible for restocking (Table 1).

Table 1. Value of Medications Returned to the Pharmacy and Medications Reintegrated into Stock by Month During the Analyzed Period

Month	Returned to Pharmacy	Reintegrated into Stock
jun/23	US$ 5.484,41	US$ 5.456,46
jul/23	US$ 7.667,48	US$ 7.478,67
aug/23	US$ 8.745,24	US$ 8.629,51
sep/23	US$ 6.353,31	US$ 6.283,54
oct/23	US$ 9.951,55	US$ 9.768,16
nov/23	US$ 4.914,08	US$ 4.796,75
dec/23	US$ 7.066,11	US$ 6.443,63
jan/24	US$ 7.181,36	US$ 6.903,38
feb/24	US$ 4.208,66	US$ 1.693,13
mar/24	US$ 7.738,58	US$ 6.055,50
apr/24	US$ 7.197,67	US$ 7.038,30
may/24	US$ 6103,42	US$ 5.973,83
Total	US$ 85.211,87	US$ 76.799,93

Source: Prepared by the authors, 2024

Figure 1. Total Medication Returns and Monthly Medication Losses

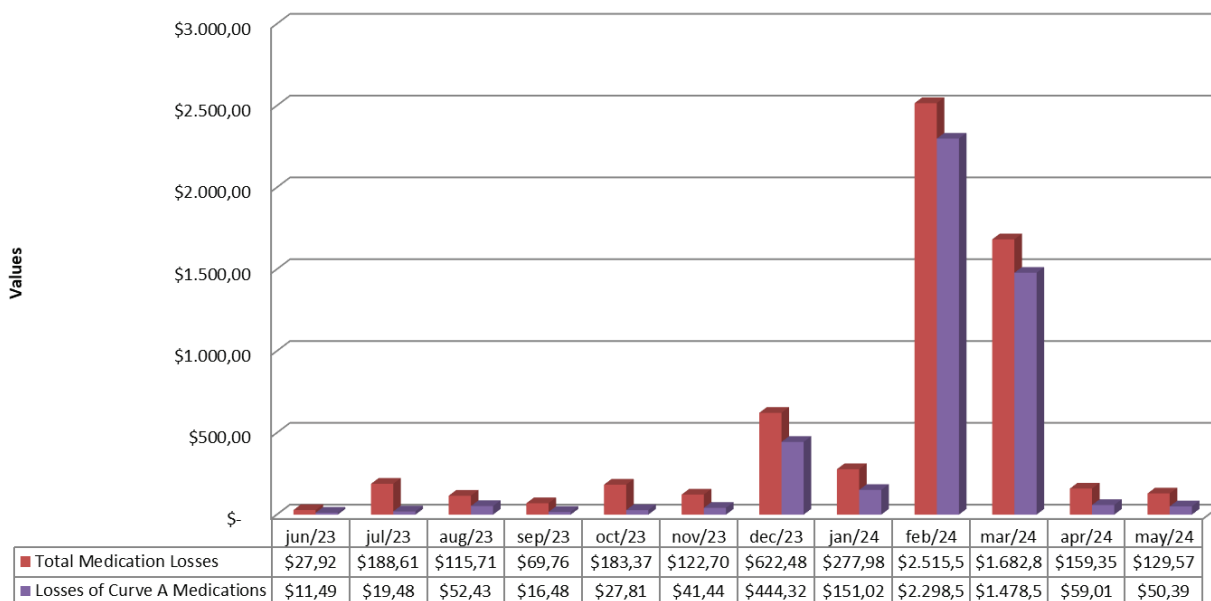|	jun/23	jul/23	aug/23	sep/23	oct/23	nov/23	dec/23	jan/24	feb/24	mar/24	apr/24	may/24
Medication Losses	$27,92	$188,61	$115,71	$69,76	$183,37	$122,70	$622,48	$277,98	$2.515,	$1.682,	$159,35	$129,57
Medication Returns	$5.450,	$7.471,	$8.628,	$6.282,	$9.766,	$4.796,	$7.066,	$7.181,	$4.208,	$6.054,	$7.037,	$5.974,

Source: Prepared by the authors, 2024

The results shown in Figure 2 indicate that most discarded medications belong to the A curve, comprising high-cost medications representing significant financial value for the hospital, thereby justifying greater financial losses.

During December 2023, February, and March 2024, a significant increase in loss value was observed, explained by the quantity of expired medications returned, particularly Esmolol 250 mg/mL,

priced at $354.98 per 10 mL ampoule. This medication is almost exclusively used in emergency and crash carts, highlighting the need for better inventory control of these items.

The interpretation of Figure 3 results indicates that most of the financial value of medications eligible for restocking comprised antimicrobials, a critical class due to the hospital's orthopedic surgical profile. Most of the returned medications in this class

Figure 2. Comparison Between Total Medication Losses and Losses of Curve A Medications

	jun/23	jul/23	aug/23	sep/23	oct/23	nov/23	dec/23	jan/24	feb/24	mar/24	apr/24	may/24
■ Total Medication Losses	$27,92	$188,61	$115,71	$69,76	$183,37	$122,70	$622,48	$277,98	$2.515,5	$1.682,8	$159,35	$129,57
■ Losses of Curve A Medications	$11,49	$19,48	$52,43	$16,48	$27,81	$41,44	$444,32	$151,02	$2.298,5	$1.478,5	$59,01	$50,39

Source: Prepared by the authors, 2024

Figure 3. Comparison Between Total Medications Reintegrated into Stock and Antimicrobial Medications Reintegrated into Stock
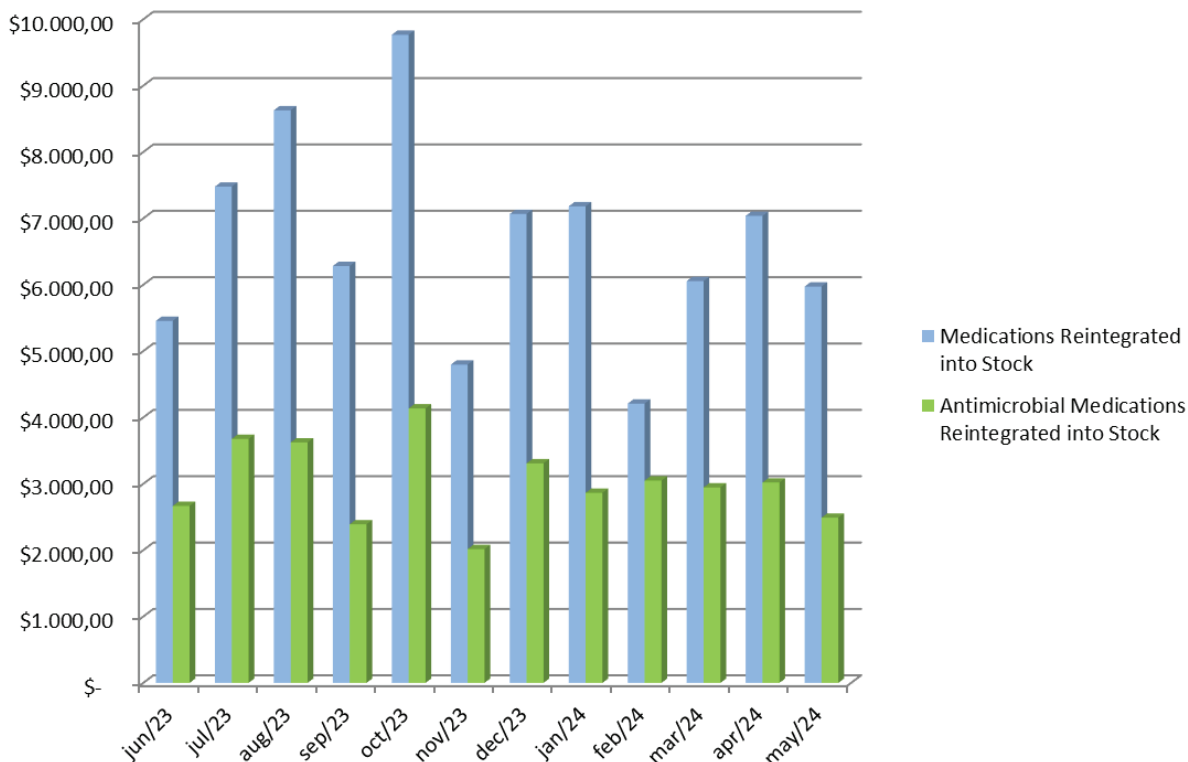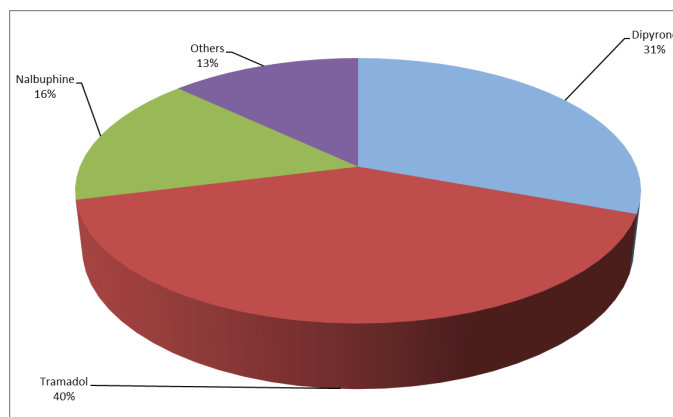

Source: Prepared by the authors, 2024

consisted of vancomycin and meropenem, both empirically used in the institution, i.e., employed in situations where the infectious agent has not yet been identified. This result was particularly notable in February 2024, when antimicrobials accounted for 72% of the total value of medications reintegrated into stock and 49% in June and July 2023 and March 2024.

The analysis of Figure 4 results indicates that the most frequently returned medications were analgesics, such as dipyrone and tramadol, representing 35.7% of the total, followed by antimicrobials, which accounted for 27.8%. This class of medications is also critical for the hospital's orthopedic profile, playing a fundamental role in managing patients' pain. Additionally, these medications are often prescribed "at the physician's discretion" or for urgent interventions.

Figure 4. Analgesic Medications with the Highest Percentage of Returns

Source: Prepared by the authors, 2024

Discussion

The monthly average of medications reintroduced into stock highlights the relevance of the return process, demonstrating the substantial amount of medications that can be recovered, thus minimizing financial losses. As also shown by SENA et al. (2021)[13], the practice of returning medications can bring cost savings to healthcare services when the returned medications are in appropriate conditions for reuse by other patients. Moreover, the data obtained from the analysis of average medication losses indicate the need to structure this routine within the institution and to provide staff training.

The high financial value of returns can occur for various reasons, one being the hospital's individualized medication distribution system. While Lima (2018)[6] emphasized that the collective system can lead to more failures compared to the individualized system—since requisitions are made for all patients in the unit, potentially creating sub-stocks that complicate management and increase patient safety risks—it is important to note that the individualized system is less effective than the unit-dose system regarding medication returns to the pharmacy. The unit-dose system standardizes the distribution and administration of medications, reducing leftover occurrences. In this system, each dose is centrally prepared and distributed close to the administration time, allowing stricter inventory control and minimizing waste[14].

Similar results can be observed in other studies. AlSamanhodi et al. (2017)[15] demonstrated that over-dispensing was a significant factor, contributing to 19.2% of medication returns, suggesting the need for an improved distribution system and adequate inventory management. These findings support the results of the present study, which also observed that the distribution system could increase waste and return rates, underscoring the importance of improving stock control processes.

The results shown in Figures 1 and Table 1 emphasize the importance of establishing well-defined processes and training professionals to properly manage returns, minimizing waste and improving operational efficiency. This demonstrates the importance of the medication return process, which not only minimizes financial losses but also ensures efficient use of available resources in the hospital pharmacy.

Additionally, medication traceability plays a crucial role in this process, enabling tracking of each stage of the medication cycle[16]. This ensures that all returns are accurately recorded and monitored, optimizing workflows and improving information management, which facilitates analyses and actions to optimize healthcare costs[17].

An efficient medication return system, combined with a quality indicator to evaluate this process, plays a crucial role in the hospital's financial health, as unused medication waste can result in significant resource losses[18,19]. The results presented in Table 1 show that without an adequate return system, the hospital would have lost around $80,000 in one year solely due to the disposal of medications that could have been safely reused or redistributed. This demonstrates that implementing and maintaining an effective system not only reduces financial losses but also promotes more sustainable resource management, ensuring medications are used efficiently and economically for the benefit of both patients and the institution.

"A curve" medications, which represent a small percentage of stocked items but a large share of the total medication value, have a significant financial impact on a hospital's budget[20]. The predominance of these medications in the discard category during the analyzed period underscores the importance of effective management and monitoring strategies to minimize financial losses associated with these essential and costly items.

It was identified that most medications reintroduced into stock are antimicrobials, a class that plays a fundamental role in a trauma-orthopedic hospital due to its critical functions in treating surgical patients, particularly those at risk of implant infections, surgical site infections, and osteomyelitis[21].

While reintroducing returned antimicrobials into stock is beneficial, it is crucial to recognize and address the reasons behind the high return rate. The high return rate may be linked to the lack of an effective antimicrobial stewardship program, leading to inappropriate prescriptions, overestimation of antibiotic needs, or inadequate monitoring of use[22]. Furthermore, the absence of clinical pharmacy services in the hospital may contribute to poor antimicrobial management, resulting in less accurate prescribing practices and increased hospital expenses for this medication class and patient hospitalization times[23].

Another prominent class in the hospital is analgesics, which play a crucial role in managing severe pain associated with traumatic injuries and orthopedic surgeries, improving patient comfort and facilitating rehabilitation[24]. The high return rate of medications

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such as tramadol and dipyrone to the pharmacy is due to their frequent prescription as PRN (as needed). Thus, not all patients end up using these medications, resulting in many unadministered doses being returned.

The study by SENA et al. (2021)[12] categorized the reasons and costs of returns, showing that scheduling accounted for 57.1% of the costs related to returning products and/or medications to the pharmacy. This aligns with the findings of this study regarding the high return rate of PRN-prescribed medications, which require careful scheduling by nursing staff.

The limitations of this study include the lack of precise tracking of the reasons for these returns, preventing a comprehensive understanding of the underlying causes and hindering the implementation of effective strategies to improve medication management. Furthermore, the absence of detailed information about the reasons for returns may lead to inaccurate estimates of waste and inefficiencies in resource use, negatively impacting both patient safety and the hospital's financial sustainability. Therefore, further in-depth studies on this subject are necessary.

Conclusion

In conclusion, the presented data emphasize the importance of a structured medication return system for the financial and operational health of a hospital. Implementing well-defined processes and staff training is essential to reducing waste and optimizing pharmaceutical resource management. Adopting a unit-dose medication distribution system, focusing on traceability and administration close to the time of use, can minimize leftovers and improve stock control. Furthermore, it is crucial to address the causes of high return rates, especially for antimicrobials, through effective monitoring and clinical pharmacy services. Reviewing PRN prescriptions can reduce the return of medications like tramadol and dipyrone, which should also be a priority to prevent waste. In summary, efficient return management not only promotes financial sustainability but also ensures the safe and rational use of medications, benefiting both patients and the institution as a whole.

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Contributors

Authors JVFTP, CGP, DSC, JCB, JTM, and AFF contributed to project development, critical review of intellectual content, data analysis and interpretation, as well as drafting the manuscript. DFP participated as the article reviewer.

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Conflict of Interest Declaration

We emphasize that this article has no conflicts of interest. All authors declare no financial or personal connections that could influence the results or interpretations presented.

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