AUTOMATION OF ABC ANALYSIS TO OPTIMIZE THE MANAGEMENT OF MEDICINES AND MATERIALS

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Introduction

The use of management tools has become essential in the planning and control of processes, especially in institutions that deal with more complex activities, such as those in healthcare [1]. In the hospital context, maintaining inventory and efficiently managing the turnover of materials are crucial challenges, requiring strategies such as ABC analysis [2], which allows the categorization of items based on demand or consumption and value, assisting pharmacists and inventory managers [3, 4]. Although spreadsheets are widely used, specialized software can streamline this process, saving time and resources [5]. However, these do not always meet the specific needs of the health area [6], and many managers resort to manual alternatives. Programming languages such as R and Python emerge as accessible and flexible alternatives, enabling the creation of customized tools, optimizing management, and reducing operating costs. In this context, we perceive an opportunity to develop an innovation with automation to perform ABC analysis, allowing any user to perform it easily and quickly, even without prior knowledge of programming languages.

Material and Methods

This is an experimental development project based on data and reports from the technical and scientific literature, in addition to the authors' experience. The target audience includes pharmacists and professionals who use tools for the management of medicines and materials in healthcare.

The R and Python programming languages were used through web-based and free access platforms: RStudio Cloud and Google Colab, respectively.

The ABC classification was based on the 80/20 rule, with optional customization. The results were compared with the traditional method (spreadsheet) in terms of accuracy, ease of implementation, time efficiency, and reproducibility. In addition, a public guide for automating ABC analysis was prepared.

Results and Discussion

The present study developed scripts in Python and R to automate ABC classification in the management of medicines and materials. The approach, developed by a pharmacy student, uses a script that performs all the analysis steps in a single command, after importing a base spreadsheet structured with the minimum necessary data (description of the items, quantity consumed in the period, and unit price). Using the base spreadsheet as the primary source of data allows healthcare professionals, even without programming knowledge, to perform the analysis more intuitively since they are more familiar with using these.

The developed scripts not only optimize processes but also minimize human errors common in manual analyses, facilitating and streamlining data interpretation. For development, generative artificial intelligence was used, such as ChatGPT, as support in building and verifying codes and resolving doubts.

Based on the traditional method, efficient commands were created for the classification, which replicate the manual process, but with the advantage that the programming languages perform the operations automatically and in a short time.

The effectiveness of the scripts was evaluated by comparison with a traditional method using spreadsheets, employing the same base spreadsheet. The results showed remarkable consistency in drug classifications, demonstrating the effectiveness of the processes with consistent results between the three methods.

Additionally, a stopwatch was used to measure the execution time of each approach, revealing that the automated analysis with R and Python was significantly more time efficient compared to the traditional method. Although both require basic programming knowledge, automation through R and Python considerably reduces the errors associated with manual data handling. Furthermore, time efficiency is crucial in a hospital environment, where quick decisions can directly impact care.

A guide for automating ABC analysis has been developed, offering a step-by-step guide on how to use classification in these languages. This guide will be made publicly available, allowing interested parties to use it for studies or for decisions in the management of medicines and materials.

This study emphasizes that, even without technical training in programming, managers and researchers can adopt automated practices, such as ABC analysis, to improve studies and the management of medicines and materials. This approach represents a significant advance in the area, promoting efficiency and effectiveness in hospital management processes and contributing to the improvement of pharmaceutical care. The adoption of these practices can result in direct benefits for both organizations and patients, ensuring that the right medicines are available at the right time.

Conclusion

The automation of ABC analysis in R and Python proved to be an efficient alternative compared to the traditional spreadsheet method. Although both require basic knowledge, the use of R and Python not only reduces execution time but also minimizes human error. This approach highlights the growing importance of technology in optimizing data management.

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